



Expression of major gene resistance in canola tissues

Vicki Elliott¹, Angela Van de Wouw² and Steve Marcroft¹


¹Marcroft Grains Pathology;
²School of Botany, University of Melbourne

Introduction



- Major gene resistance:
 - Often referred to as seedling resistance
- Anecdotal evidence that major gene resistance is expressed throughout the plants life
 - Pod infection in the field

Is it really 'seedling resistance'?








Is seedling resistance only expressed at the seedling stage?

- Inoculated by wounding and applying droplet of spores on:
 - Cotyledon
 - First four true leaves
 - 5-10 leaf stages
 - Pods
 - Stems
- Cultivars: AV-Garnet (*Rlm1*) and CB Telfer (*Rlm4*)
- Isolates: D13 (*avrLm1*, *AvrLm4*) and D14 (*AvrLm1*, *avrLm4*)

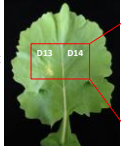







Isolates D13 and D14 differentiate major gene resistance at the cotyledon stage

	cv. AV-Garnet (<i>Rlm1</i>)	cv. CB Telfer (<i>Rlm4</i>)
D13 (<i>avrLm1</i> ; <i>AvrLm4</i>)		
D14 (<i>AvrLm1</i> ; <i>avrLm4</i>)		

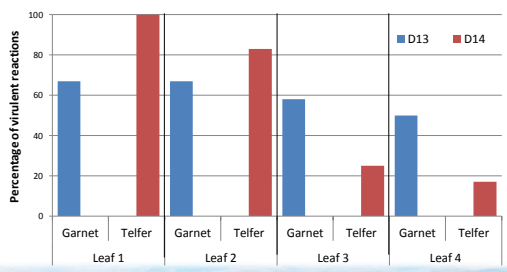


Similar responses to isolates D13 and D14 on leaves to those on cotyledons


cv. AV Garnet (<i>Rlm1</i>)		
cv. CB Telfer (<i>Rlm4</i>)		



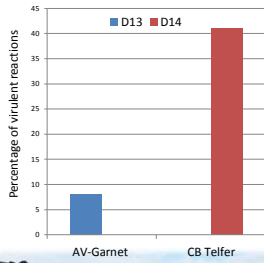
Leaf lesions only observed for the virulent isolate on the first 4 true leaves



Leaf	Cultivar	D13 (%)	D14 (%)
Leaf 1	Garnet	68	0
	Telfer	0	100
Leaf 2	Garnet	68	0
	Telfer	0	82
Leaf 3	Garnet	58	0
	Telfer	0	25
Leaf 4	Garnet	50	0
	Telfer	0	18



Leaf lesions were observed for only the virulent isolate in all 5-10 leaf stages



- All leaves from 5-10 leaf stages were inoculated with both isolates
- Low percentage of virulent reactions for both cultivars
 - AV-Garnet leaves very waxy
- No lesion development with avirulent isolate

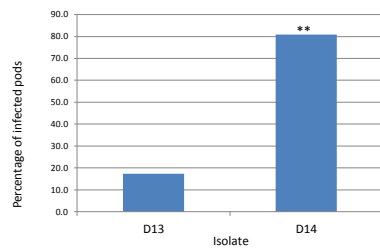
Over 100 leaves across 12 plants were tested for each cultivar

Pod inoculations

- Pods of cv. CB-Telfer were inoculated with isolate D13 or D14
- Each isolate was inoculated onto 24 pods spread across three plants
- Lesion development was scored 17 dpi



Lesions were observed on over 80% of pods inoculated with the virulent isolate



D14 (virulent isolate) caused significantly more lesions on pods than the avirulent isolate (D13) ($p < 0.001$)

Gene-for-gene interactions were also assessed in the field

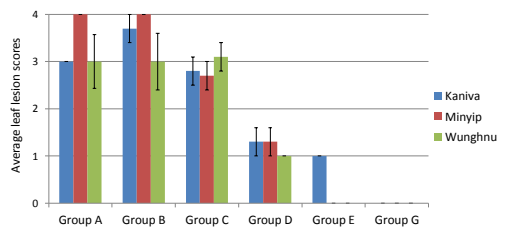
Leaf lesions were scored (0-4 scale) at blackleg monitoring sites in Victoria.

Plants at different sites were at different growth stages:

- Streatham: 5 - 6 leaf
- Minyip: 4 - 6 leaf
- Wunghnu: 8 leaf - bud

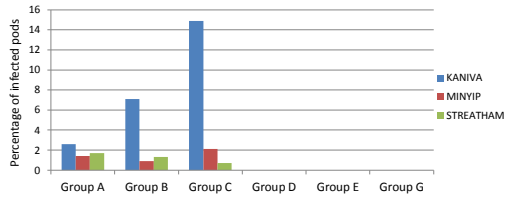


Field results



Leaf lesions only observed in cultivars with 'ineffective' major gene resistance.

Pod infection data from the field is consistent with glasshouse results

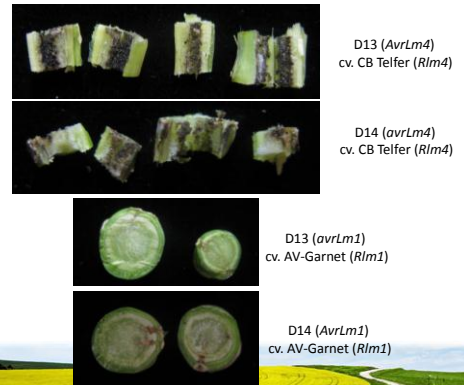
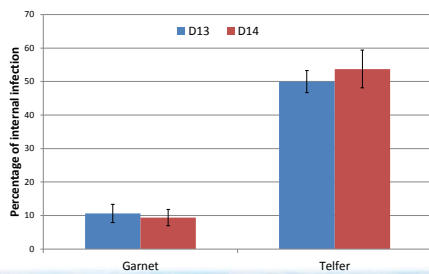


Pod infection was only observed on cultivars with ineffective major gene resistance.

Expression of major gene resistance in stems?

- Stems of AV-Garnet and CB Telfer were inoculated at the axil of the oldest leaf with isolates D13 or D14
 - AV-Garnet = stem elongation
 - CB Telfer = setting pods
- 8 weeks post inoculation, stems cut at the inoculation site and crown and assessed for internal infection

Major gene resistance was not expressed in stems



Conclusions

- ‘Gene-for-gene’ interaction (major gene resistance) evident at cotyledon, all leaf stages and pods
- Gene-for-gene interaction appears to be lacking when stems are directly inoculated
- Need to abolish term seedling resistance
 - ANY SUGGESTIONS??