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Characterizing blackleg resistance in commercial canola cultivars

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Importance of canola

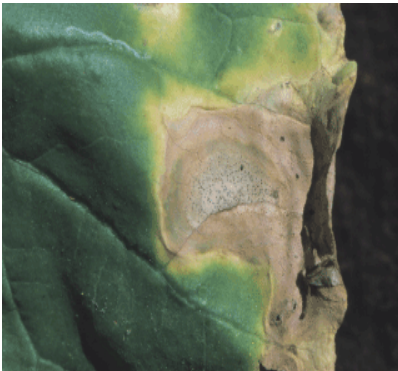


❖ Second largest crop

❖ > \$19.3 billion

<http://www.saskcanola.com/industry/canolaquickfacts.php>

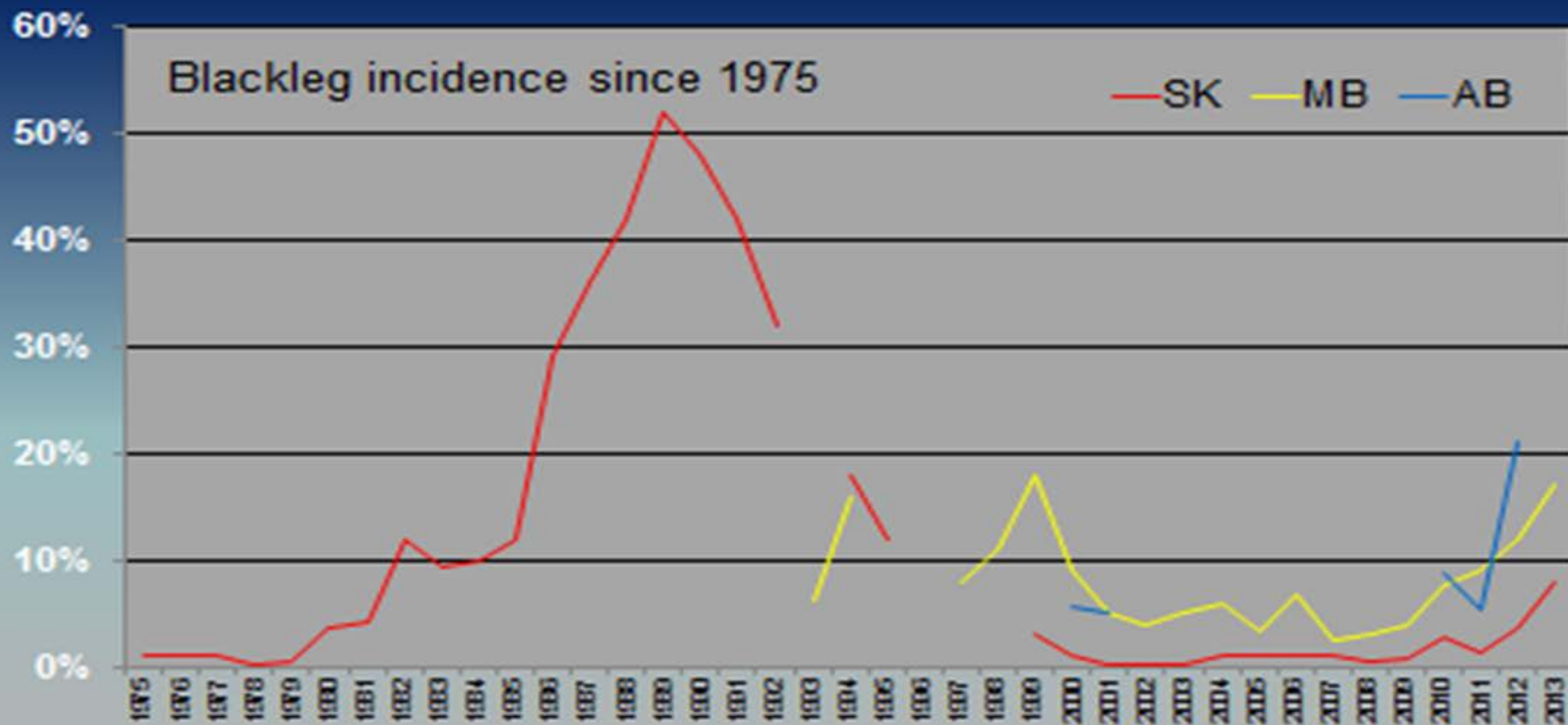
Blackleg of canola caused by *Leptosphaeria maculans* (Lm)



In western Canada, *L. maculans* was first reported in 1975, and increased rapidly in the 1980s

Blackleg of canola

The disease has been on the rise in recent years



Information from Canola Council of Canada

Plant Resistance

1. Qualitative resistance



2. Quantitative resistance

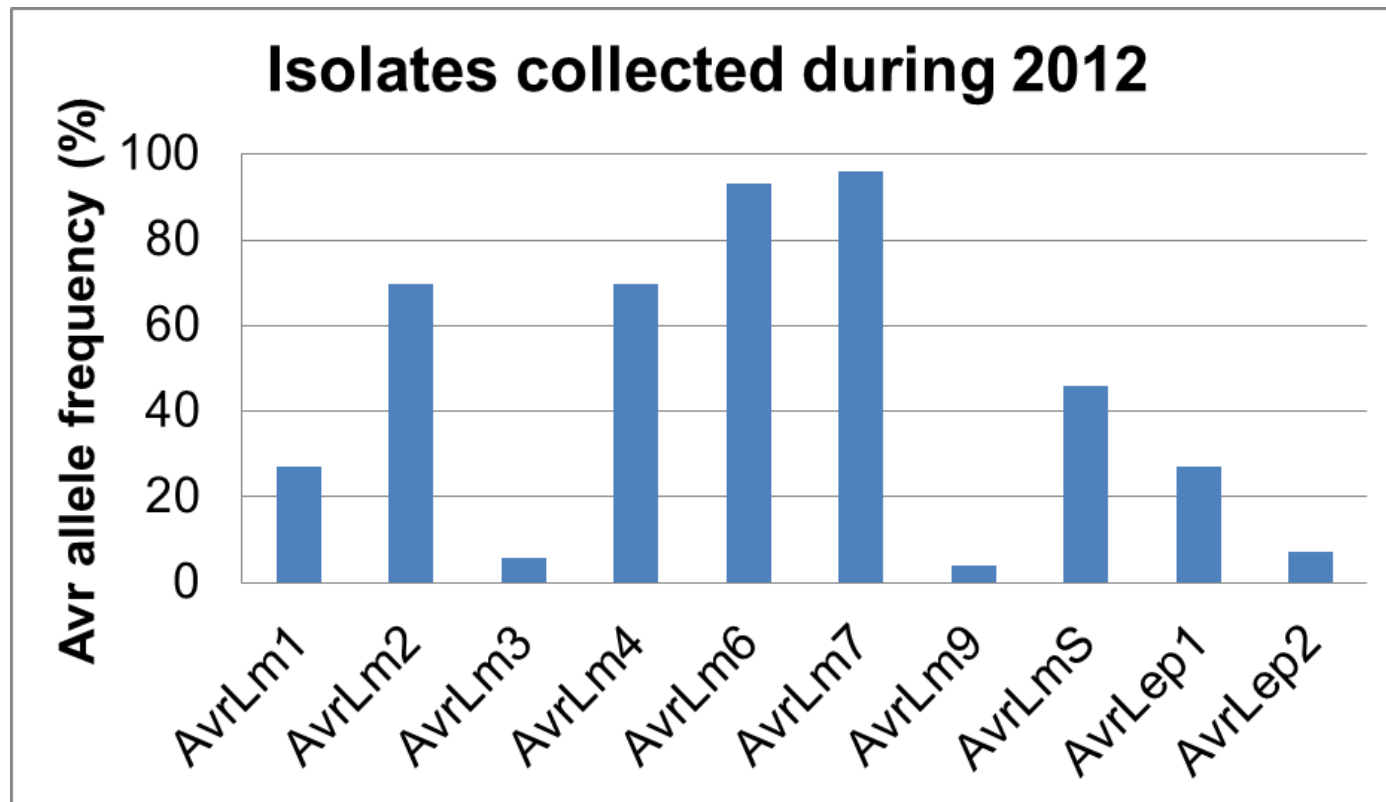


L. maculans displays high evolutionary potential to adopt to a novel resistance gene, as, illustrated by breakdown of *Rlm1* in France and *LepR3* in Australia

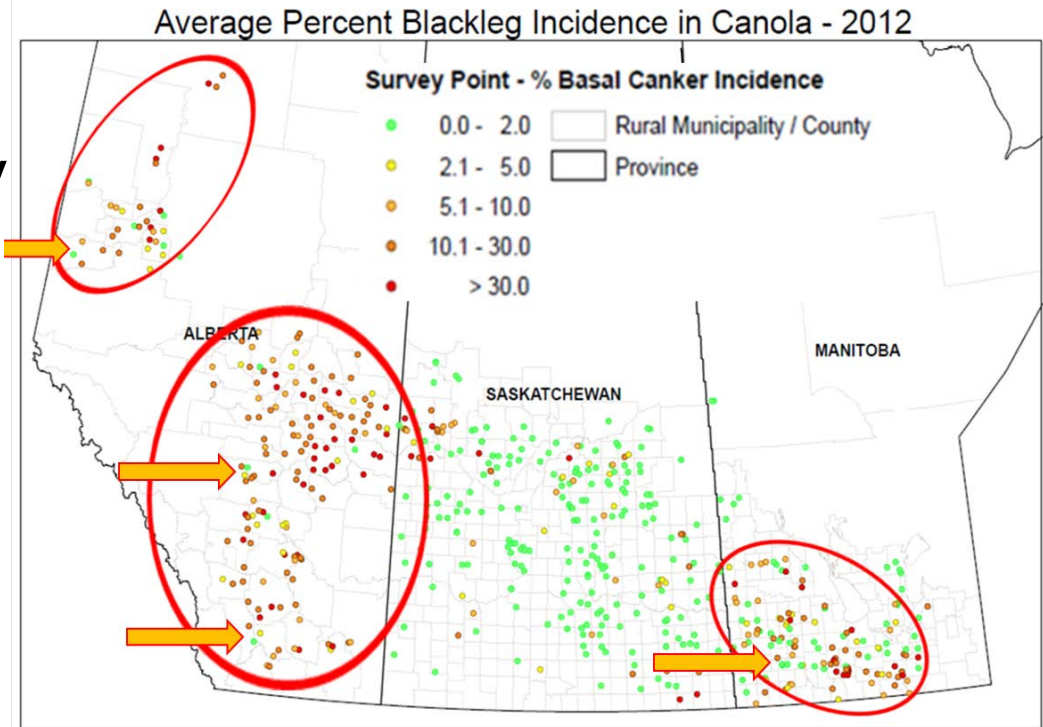
Frequency of *AvrLm* in pathogen populations have been studied in Europe, Australia and Canada

In Canada Kutcher et al. in 2007/2008 found that *AvrLm3* was ~30% in isolate collected (1997-2005)

Recently, a study revealed that *AvrLm3* was below 10% or even absent in isolates Collected (2012/2013)



- (Zhang et al. 2015) *Rlm3* is the most common
- Low frequency of *AvrLm3* indicate that *Rlm3* has Broken down
- >50% of the CCC carry quantitative resistance (Zhang et al. 2015)



Questions:

- Why blackleg damage is not wide spread (all-over)
- Is there any additional factors, playing a role?
- How does non-race specific resistance work?

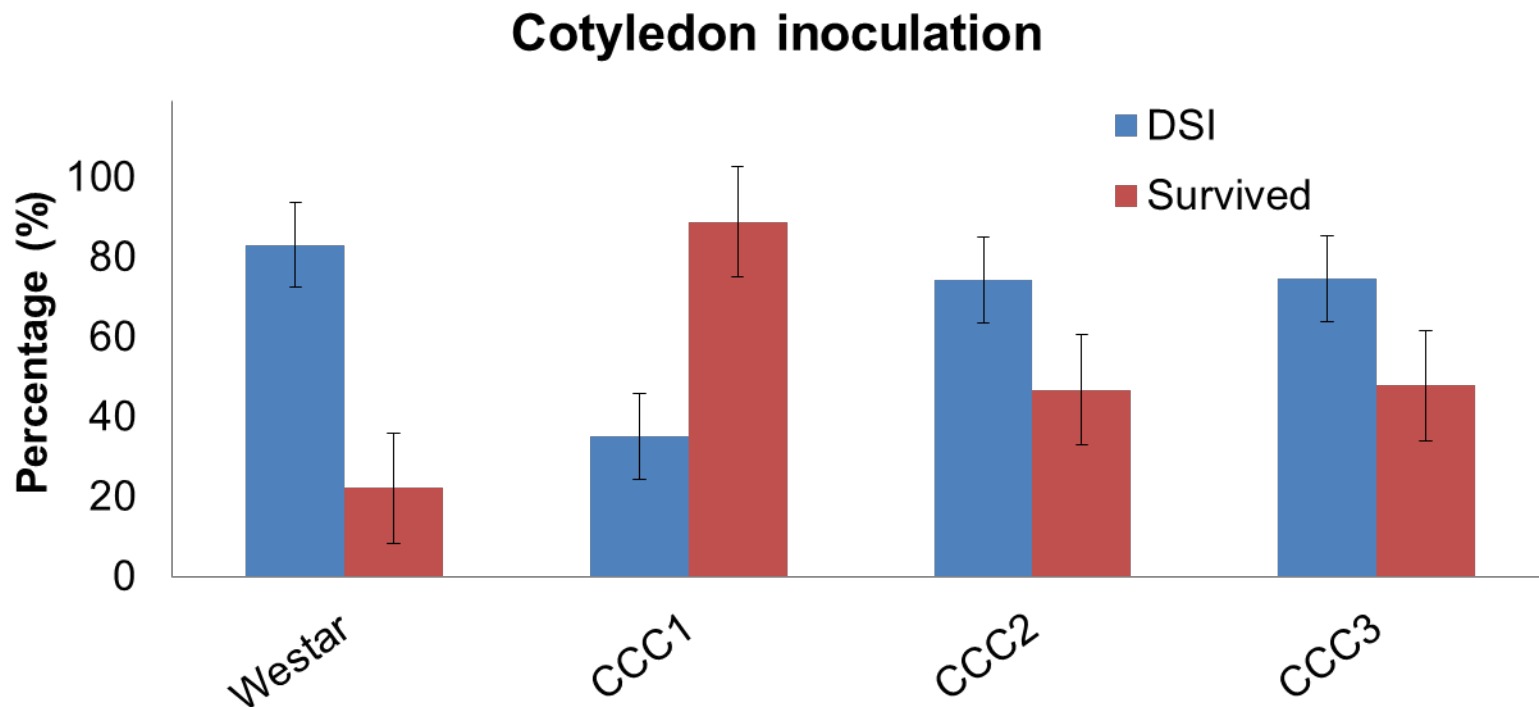
Objectives:

1. To characterize blackleg resistance in commercial canola cultivars (CCC) carrying no corresponding R genes, in comparison to “Westar” against a virulent isolate of Lm
2. Investigate the mechanism of blackleg resistance based on phenotypic assessment of disease severity

- ❖ Three CCC were selected and raised in GC along with Westar
- ❖ Two types of inoculation used to simulate the distance from point of inoculation to stem
- ❖ Inoculated on 14 day plantation and Kept in dew chamber for 24 h
- ❖ At 7 dpi plants transplanted 5' pots and kept in greenhouse
- ❖ plants were rated at 5.3 stage Using (0-5) scale, DSI measured
- ❖ Each trial repeated three times



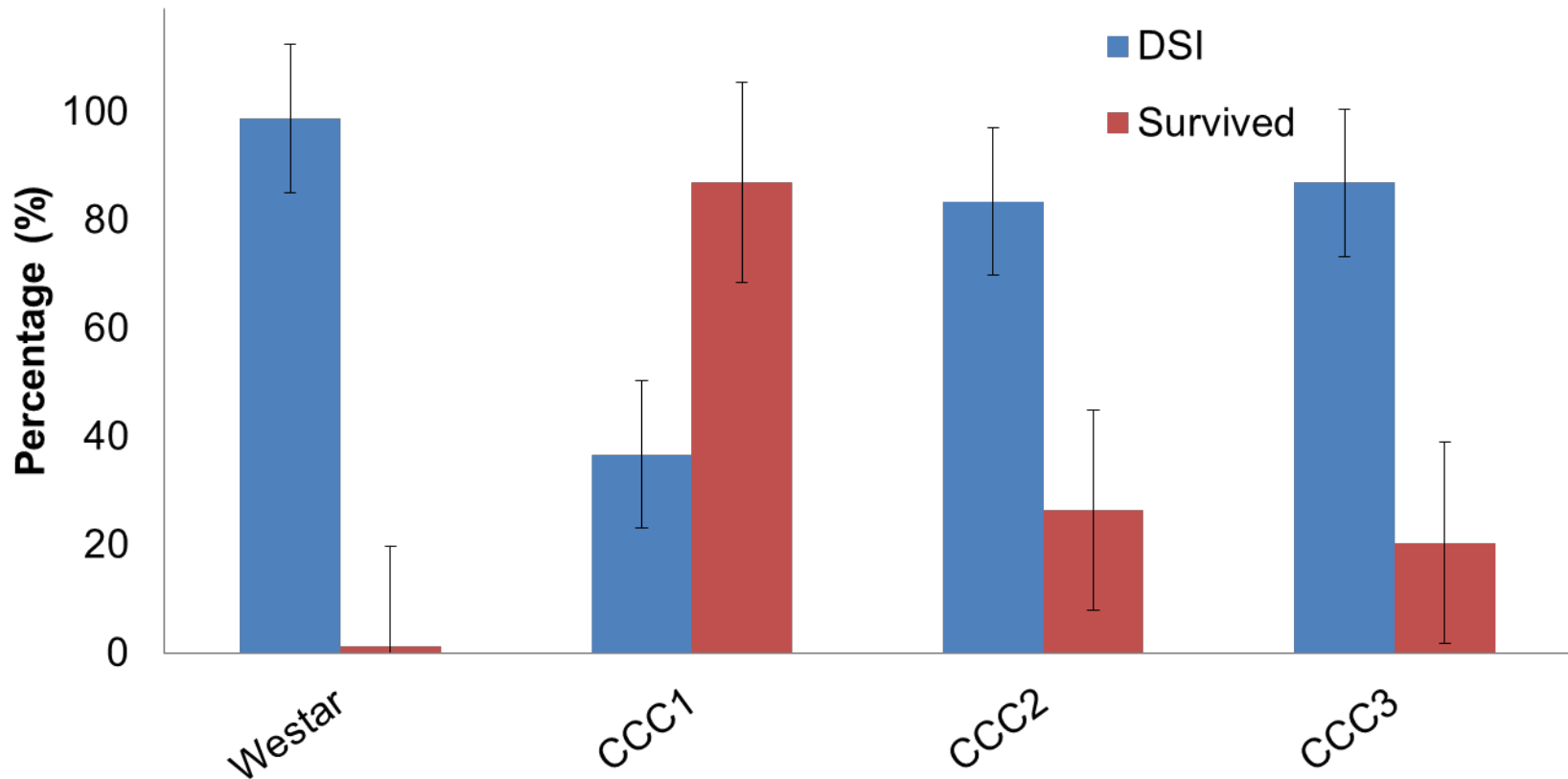
CCCs showed lower disease severity index (DSI) and higher plant survival at plant maturity when compared to Westar (S)



Indicating slower blackleg disease development in CCC stems, compared to that in Westar

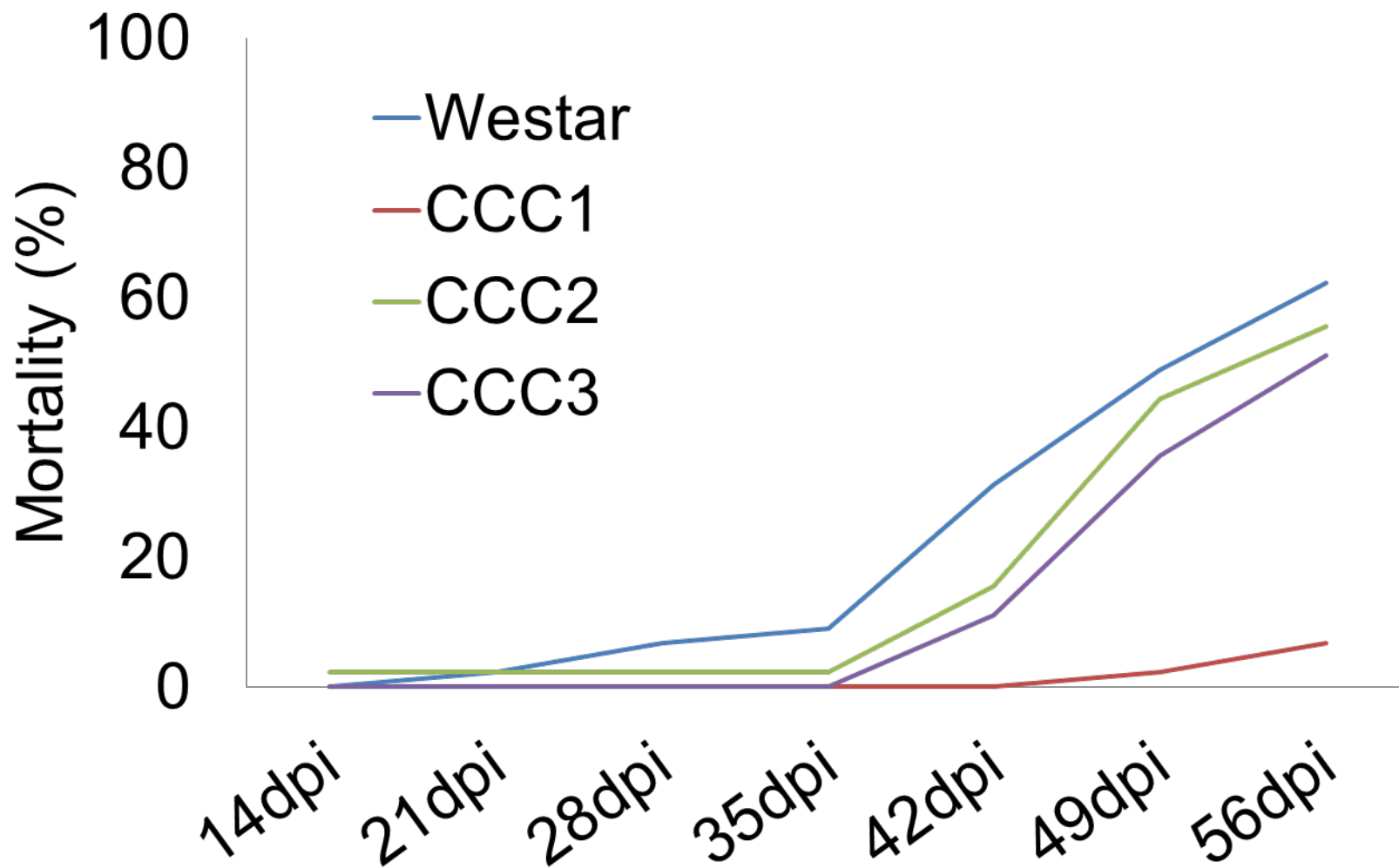
Lower DSI and higher plant survival at maturity were also observed with CCCs

Petiole Inoculation

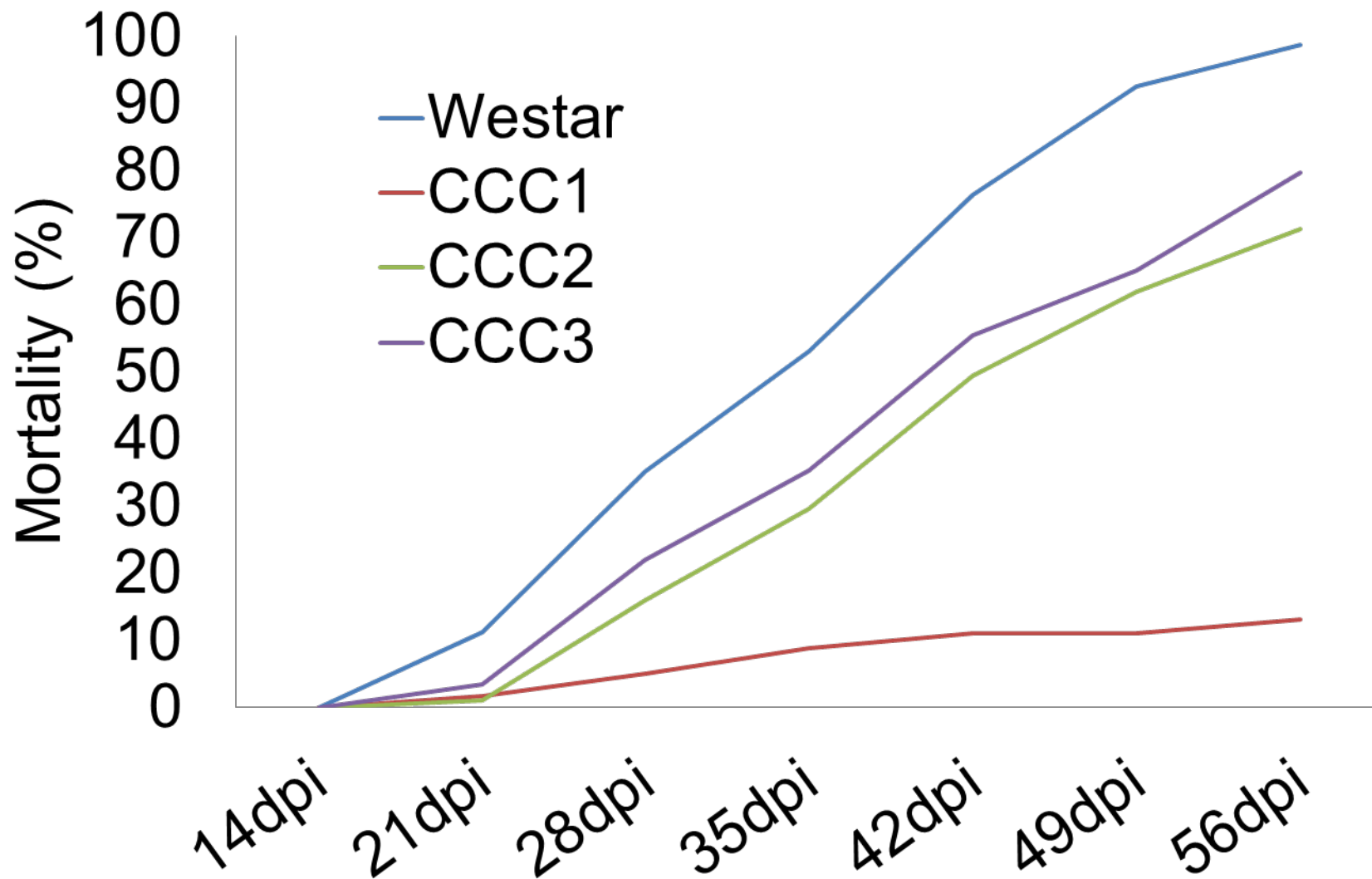




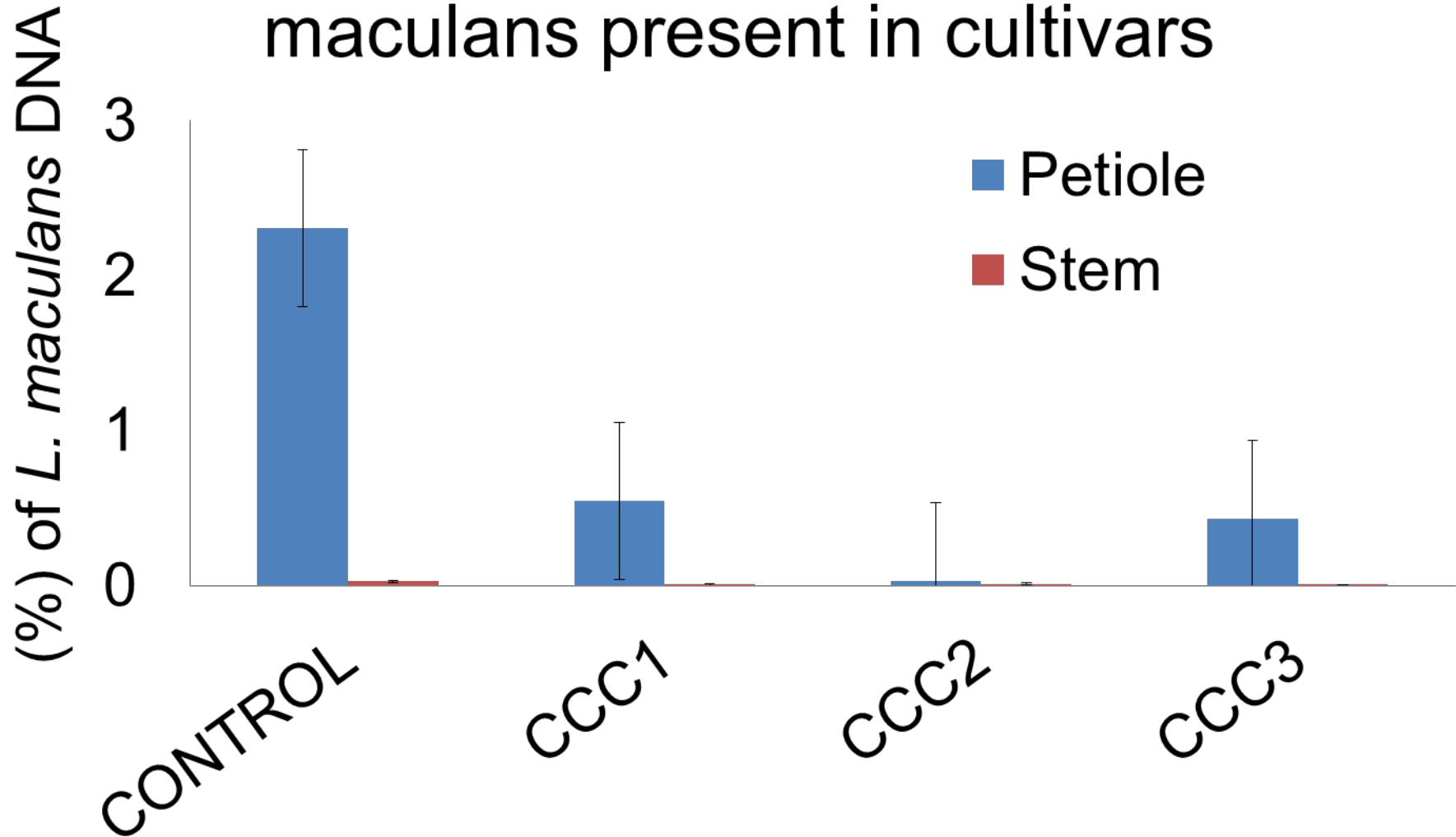
Cotyledon Inoculation



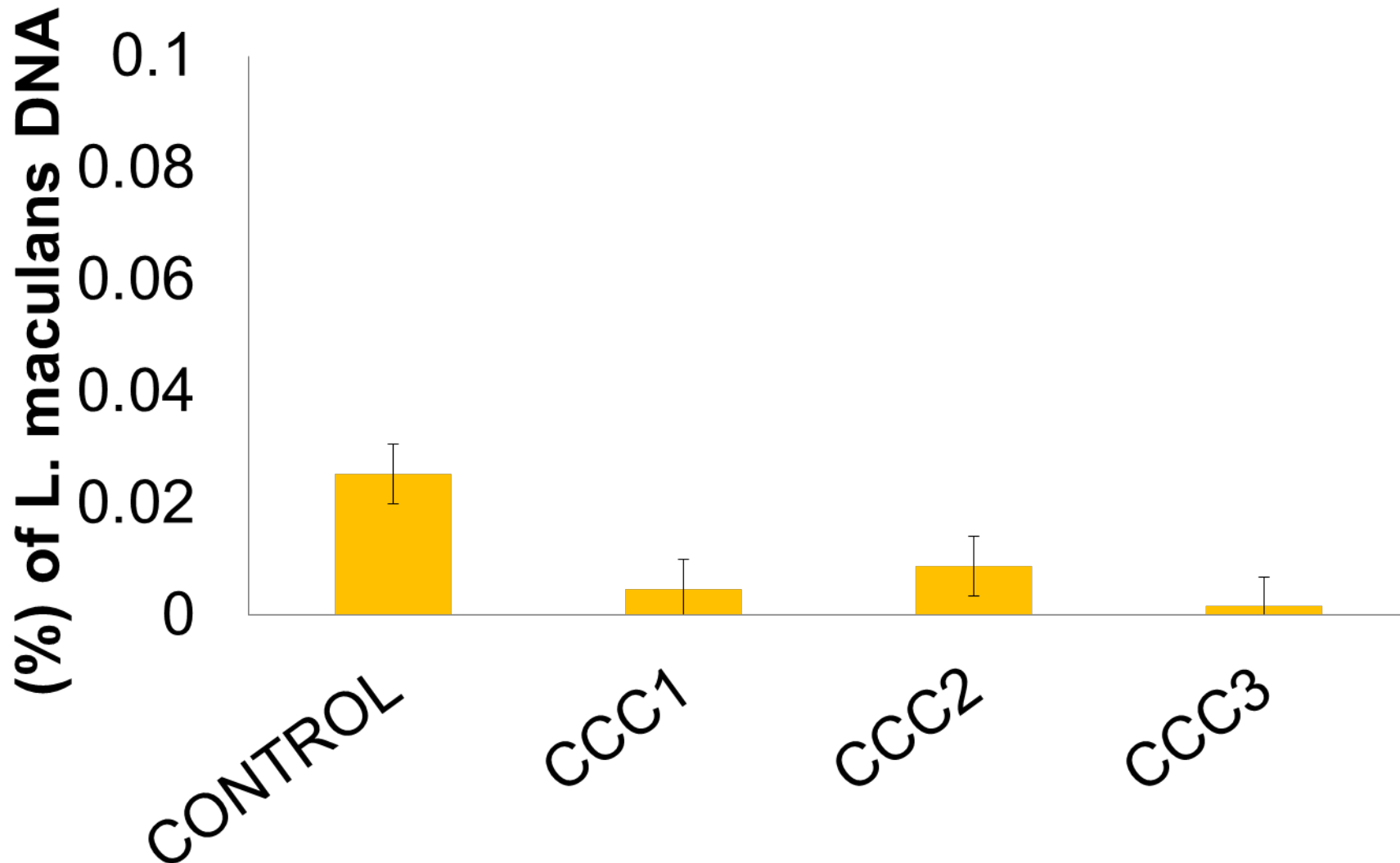
Petiole Inoculation



Ratio of DNA of *Leptosphaeria maculans* present in cultivars



Stem



Conclusion

These commercial canola cultivars showed lower DSI and higher survival in both cotyledon and petiole inoculation trials, relative to Westar

Lm spreads more slowly from infected cotyledons into the petioles/stem of CCCs relative to Westar

Blackleg development was also slower in CCC stems

CCC resistance to blackleg is due to reduction of Lm spread into the stem from the infected cotyledon, limiting disease development in stem.

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Thank you very much

Any Questions!!