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Model Crop(s) and Differentials

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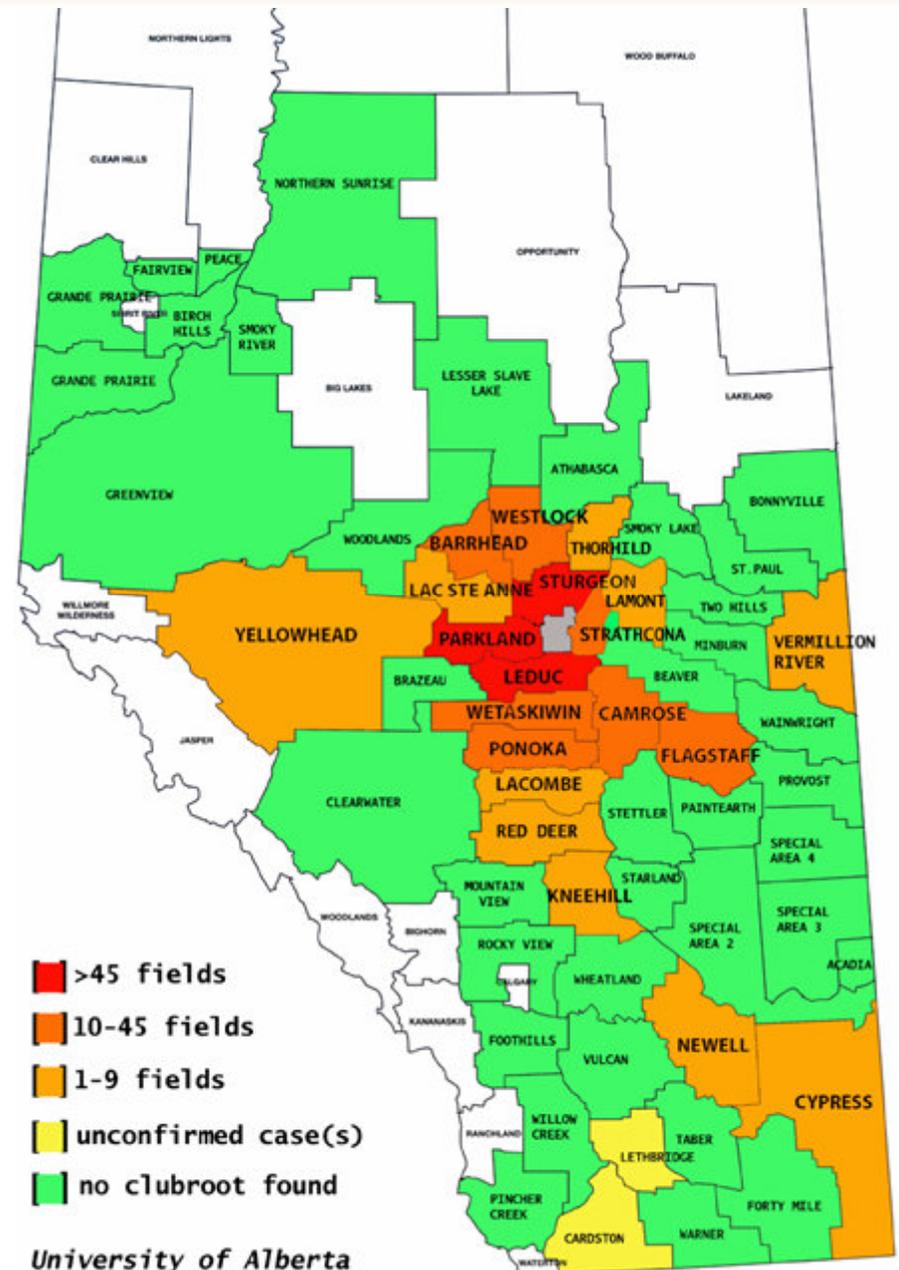
Clubroot Summit, March 7, 2012

Support: CRMI

Canada 

□ Research questions

- Does response in other species predict response in canola?
- Would use of model crops be more effective than studies on canola?
- Do we need a new differential set for Canada?



Research questions

- ❑ *Does response in other species predict response in canola?*
 - Short answer – **Yes!**

- ❑ *Would model crops be more effective than studies on canola?*
 - limited space, e.g., containment, growth cabinets
 - with pathotypes that don't occur in the region

- ❑ *Need for a differential set for Canada?*
 - Reaction of existing differential sets to Canadian collections is not consistent (Howard, Strelkov).
 - Seed of several differential lines is very scarce, and as a result, more valuable than gold.

Arabidopsis thaliana

Advantages

- Small size, short lifecycle
- Small, sequenced genome
- Lots of mutants available
- Widely used as a model for canola in genetic studies and susceptible to clubroot

Disadvantage

- Growth habit VERY different from canola and other *Brassica* crop spp.

N.B. Assessment underway.





Wisconsin Fast Plants (RCBC)

Brassica crop species selected for:

- Small stature
- Short generation time (~1 month)

Advantages

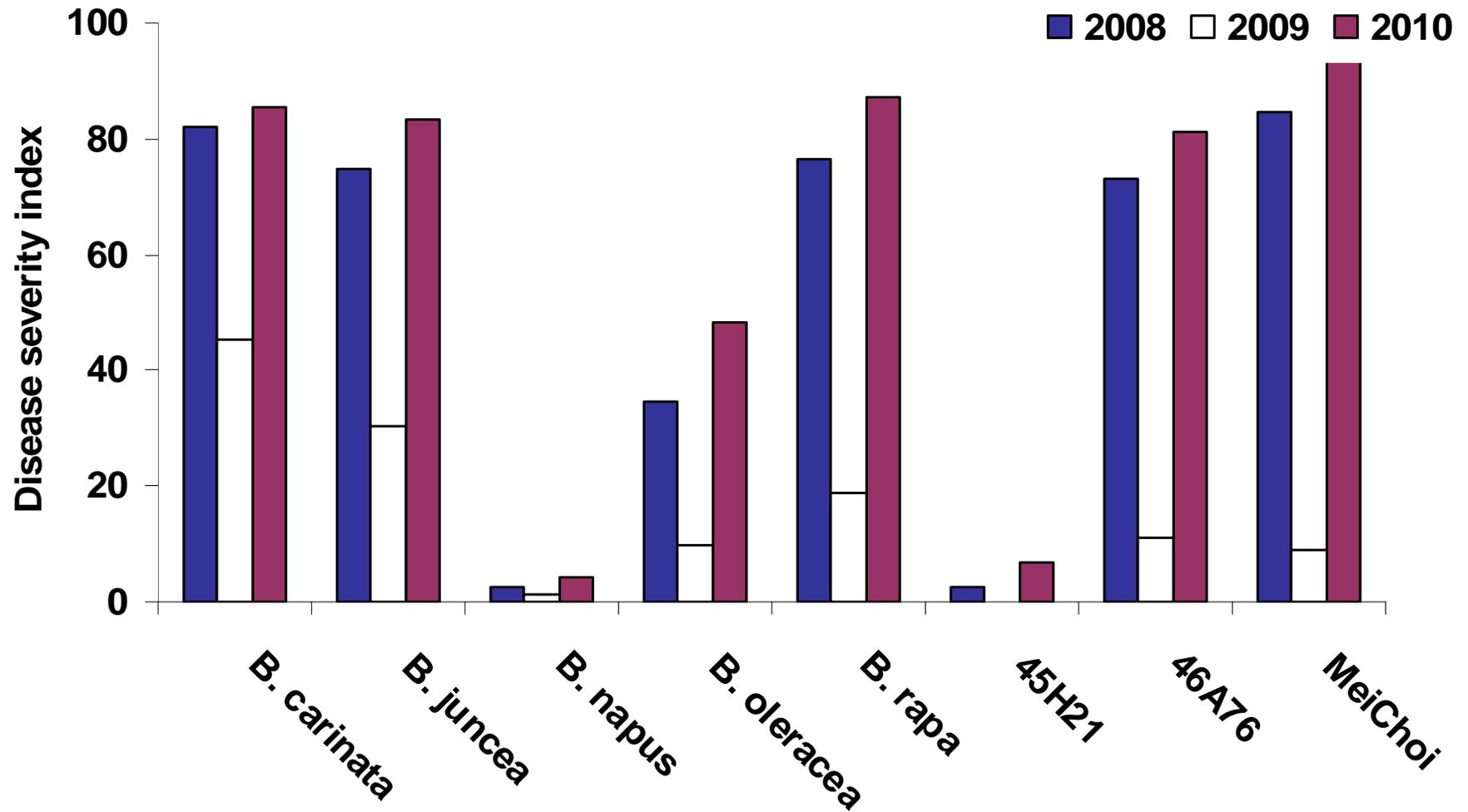
- Consistent seed availability (expensive!)
- Used in many studies of *Brassicae* spp.

Disadvantage

- Clubroot reaction not known.

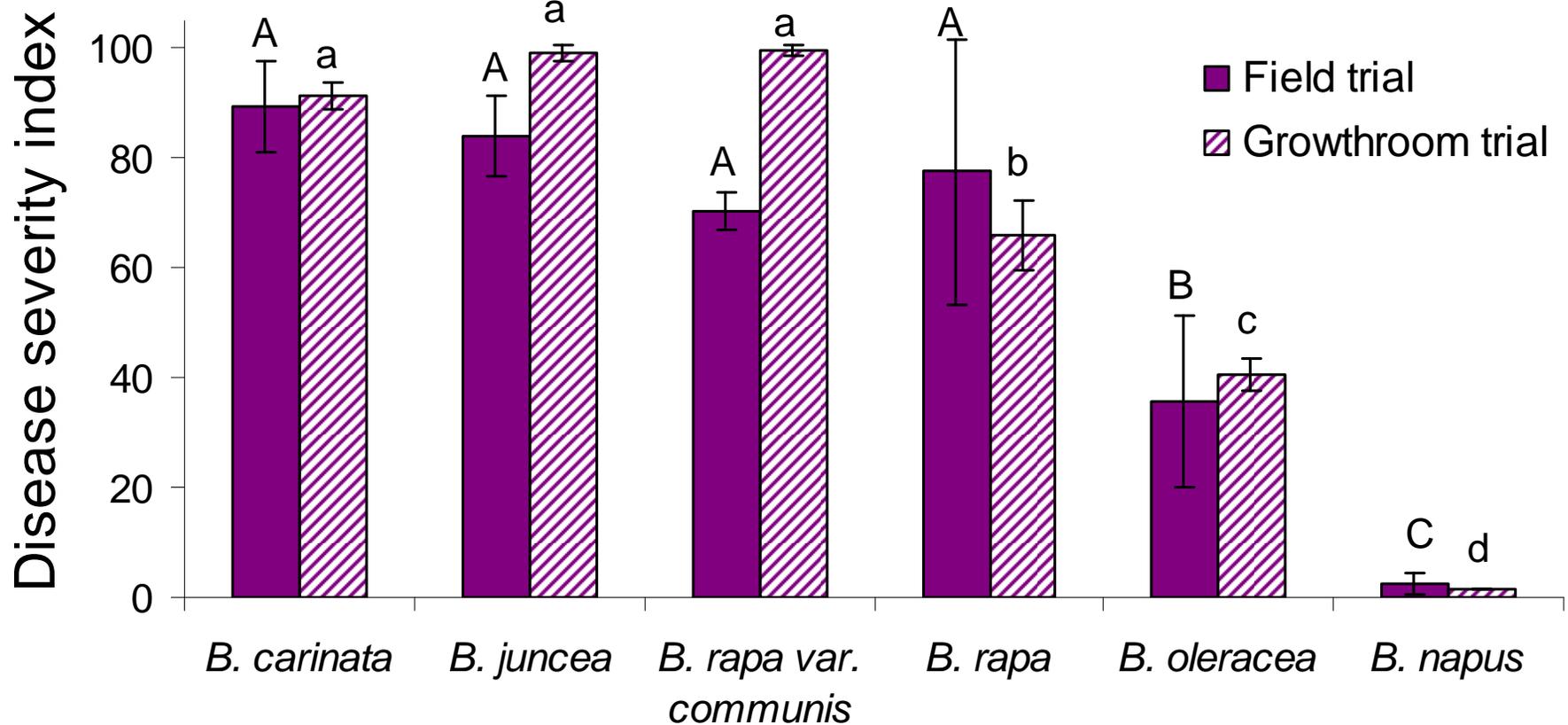


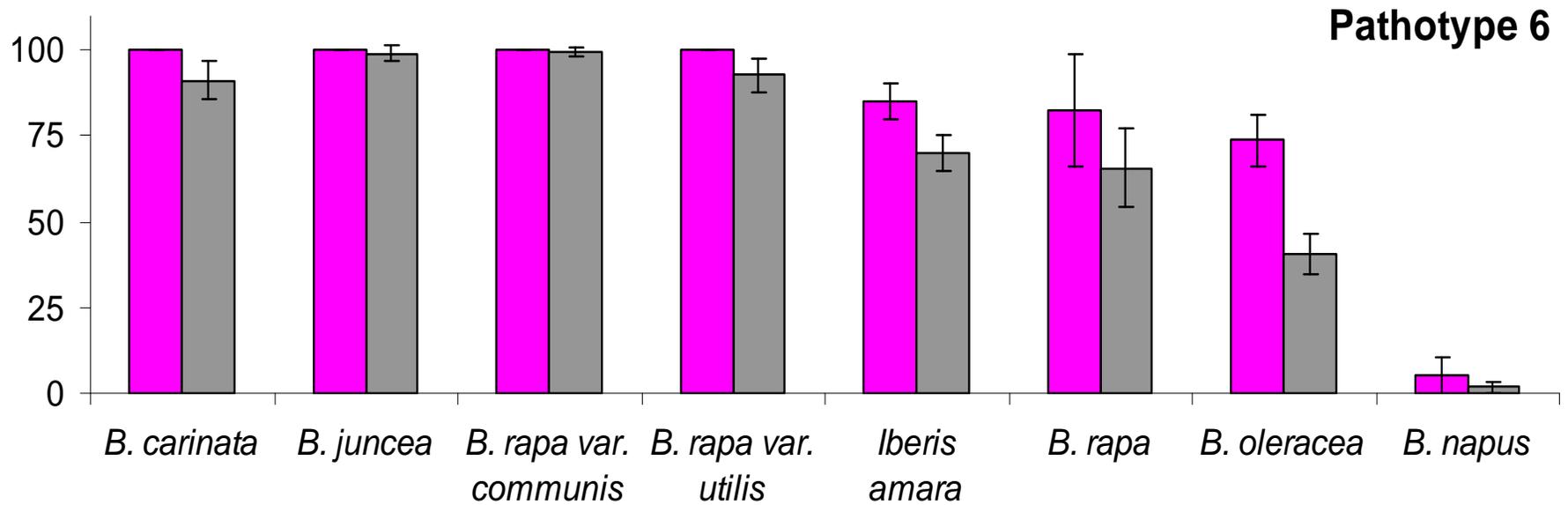
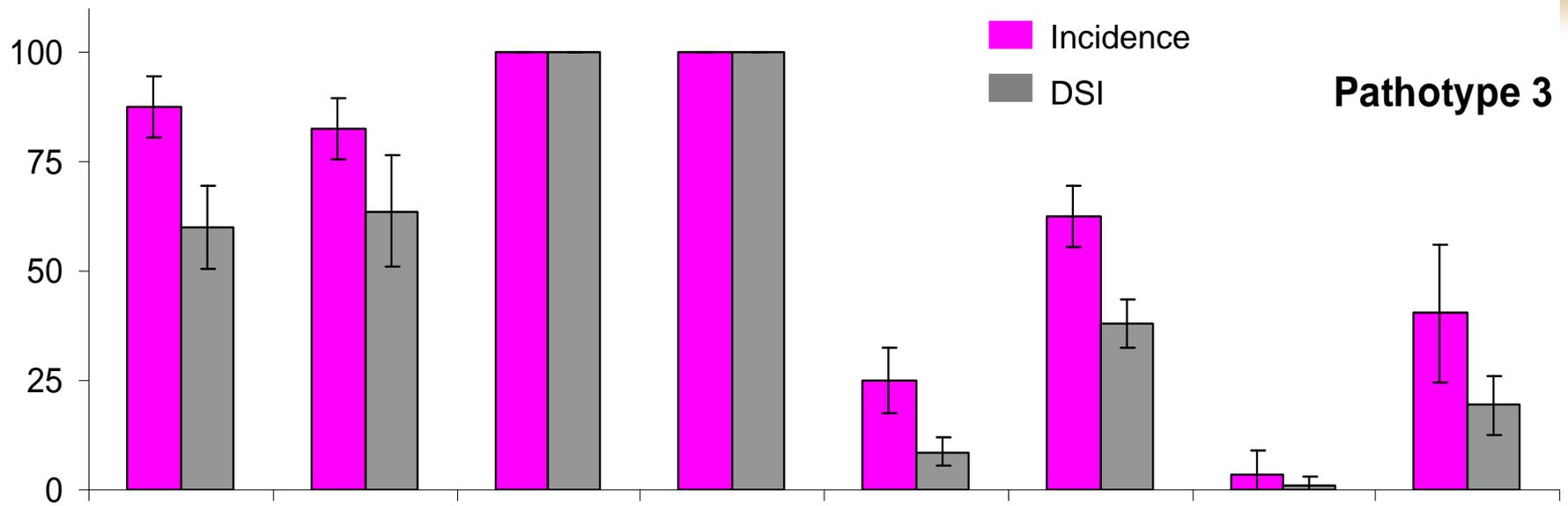
Reaction of Fast Plants to Pathotype 6

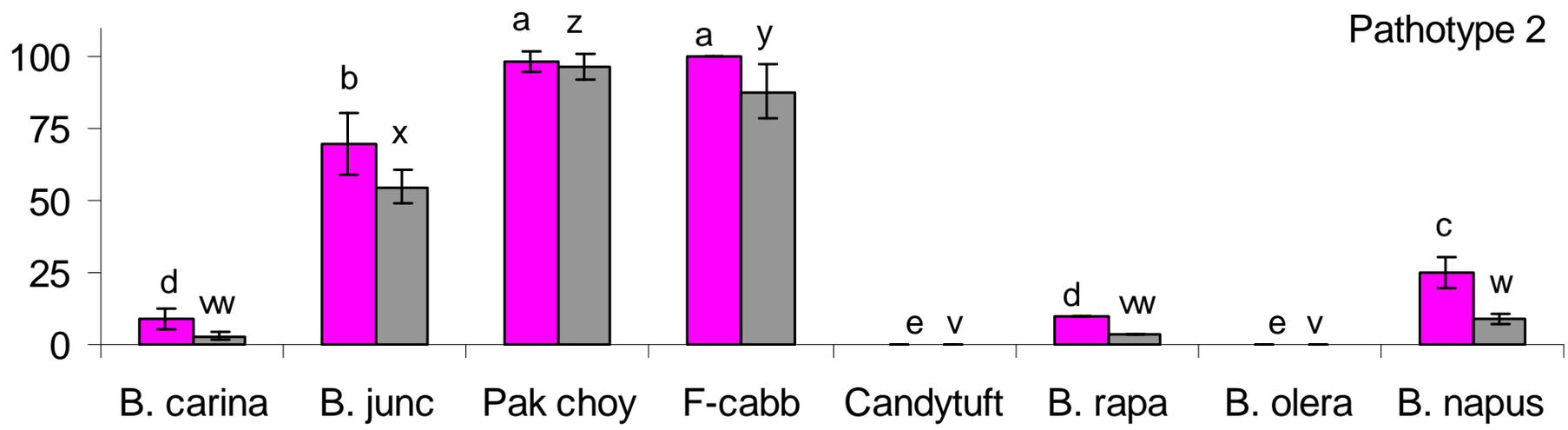
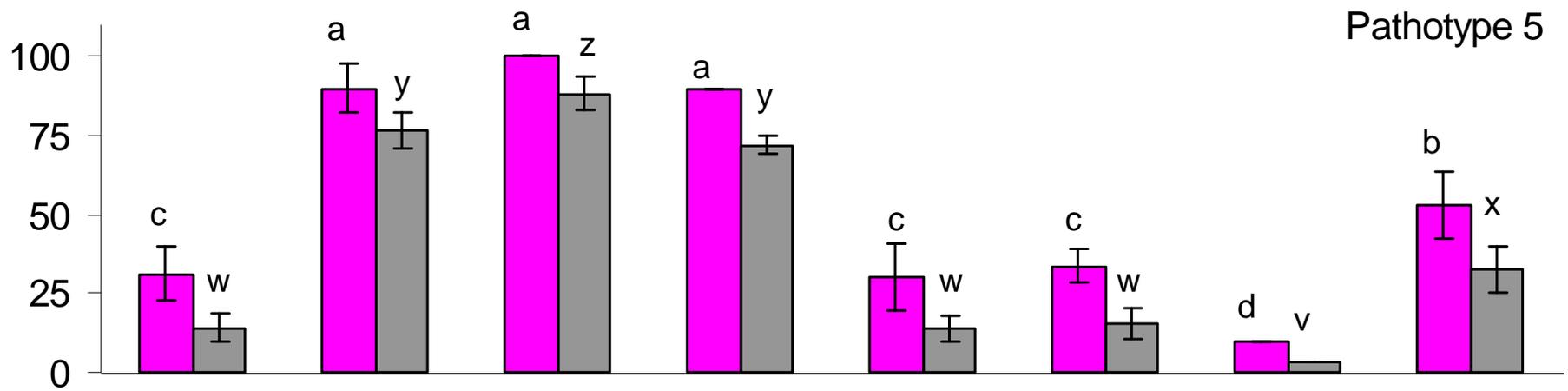


Clubroot Reaction of Fast Plants to P6 in Field (mean) vs. Growth Room Trials

$r = 0.91; P < 0.0001$









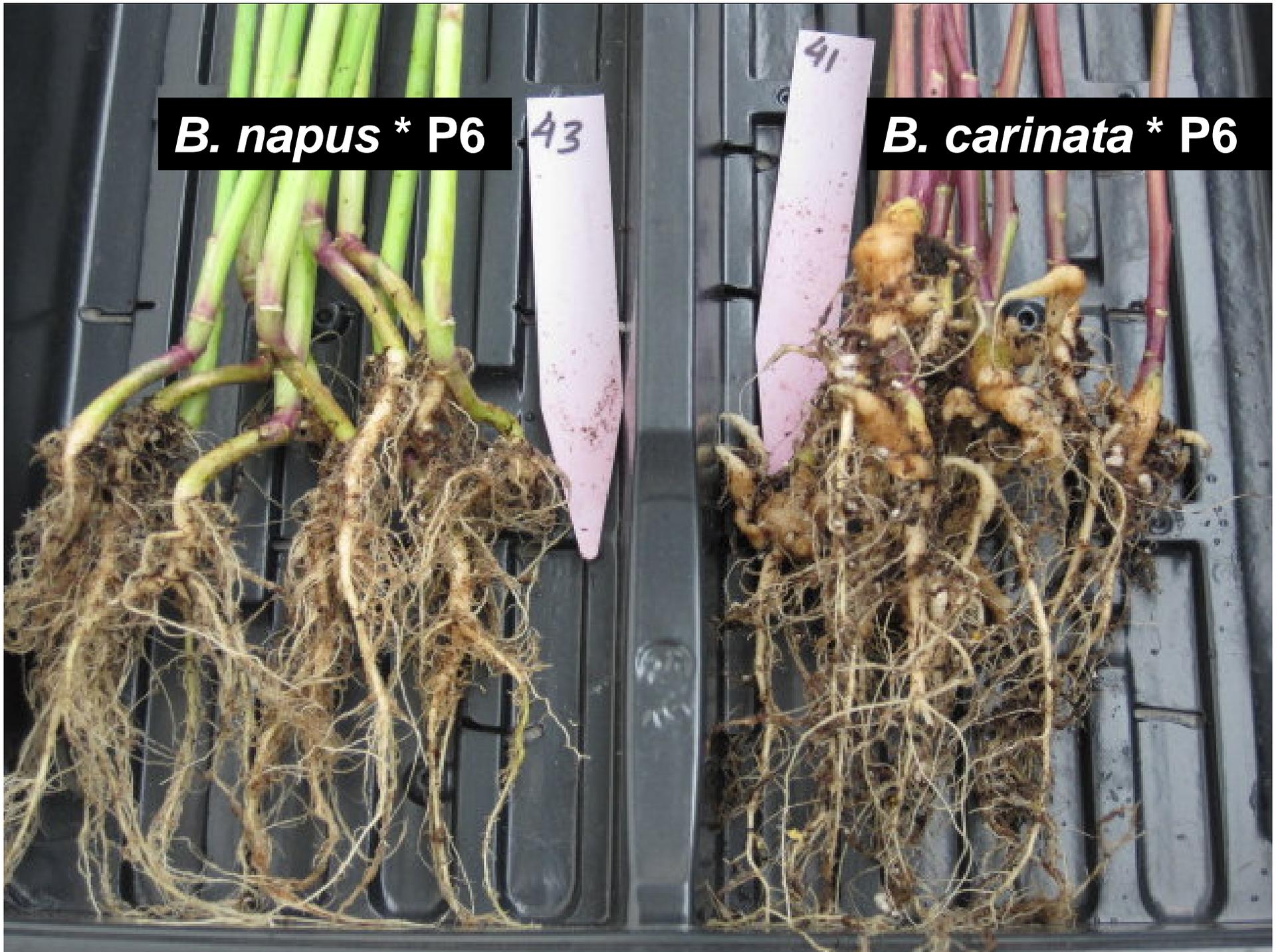
***B. rapa* subsp. *Chinensis* var. *communis* (Pak choy) *P6**

***B. napus* * P6**

43

***B. carinata* * P6**

41





Results

Field trials

- *B. carinata* and *B. juncea* were highly susceptible, several lines of *B. rapa* were moderately susceptible, and *B. napus* and *R. sativus* were resistant.
- The response was consistent over years.

Growth room trials

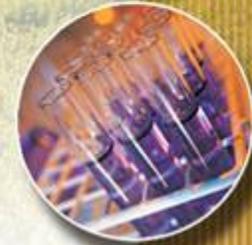
- Response to pathotype 6 under controlled conditions was strongly correlated with those from the field.
- A strong interaction in response to the pathotypes was observed for several of the lines.

Focus on differentials

- Problem with canola – MTAs required, weak, slow germination, rapid turnover of lines/cultivars
- Vegetable Brassicas – Slow turnover of cultivars, no MTAs, consistent response to pathotype 6 under controlled conditions, strongly correlated with results from field trials.
- Shanghai pak choy has potential as universally susceptible check – rapid germination, commercial line with no MTA, international access
- RCBC have potential – differential reaction, consistent seed availability, no turnover

Focus on differentials (cont'd)

- Need to include representatives of the newest resistance sources, to test for development of new races
- The reaction of genotypes of a range of other *Brassica* crop spp. are being examined to determine if any might be useful in a new set of Canadian differentials. Need to co-ordinate this with breeders and industry
- **Questions:** How urgent is the need to new differentials? Should we characterize differentials based on single-spore isolates? How do we co-ordinate these studies?



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