



Clubroot Management

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Outline

- **Dan's tales**
- **What doesn't work**
- **What does work**
- **What you need to do**
 - > Grower
 - > Retail/agronomist staff
 - > County/municipality staff
 - > Oil & gas / construction

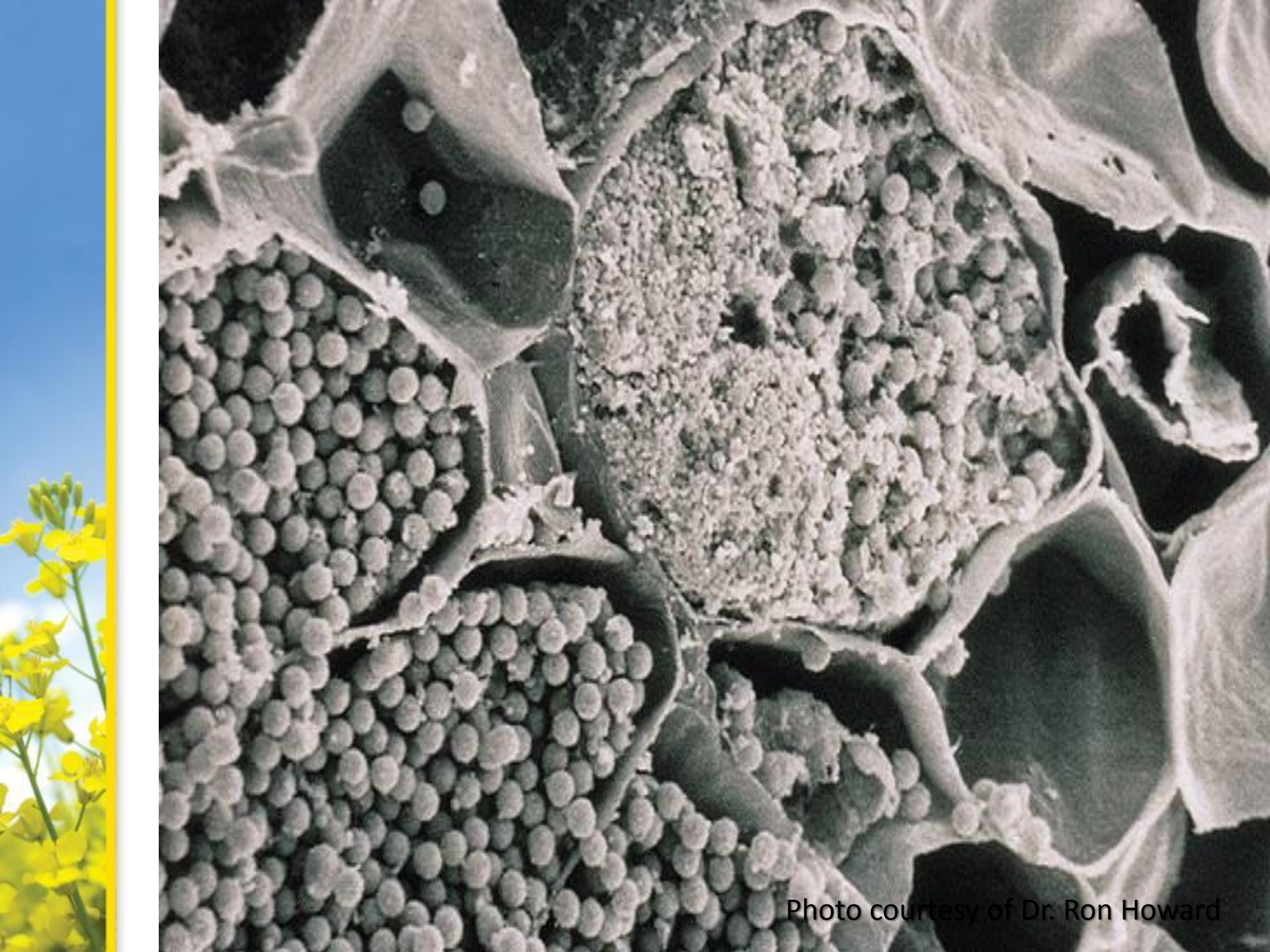


Photo courtesy of Dr. Ron Howard

Why is clubroot spreading?



Why is clubroot spreading?



Finding the disease too late

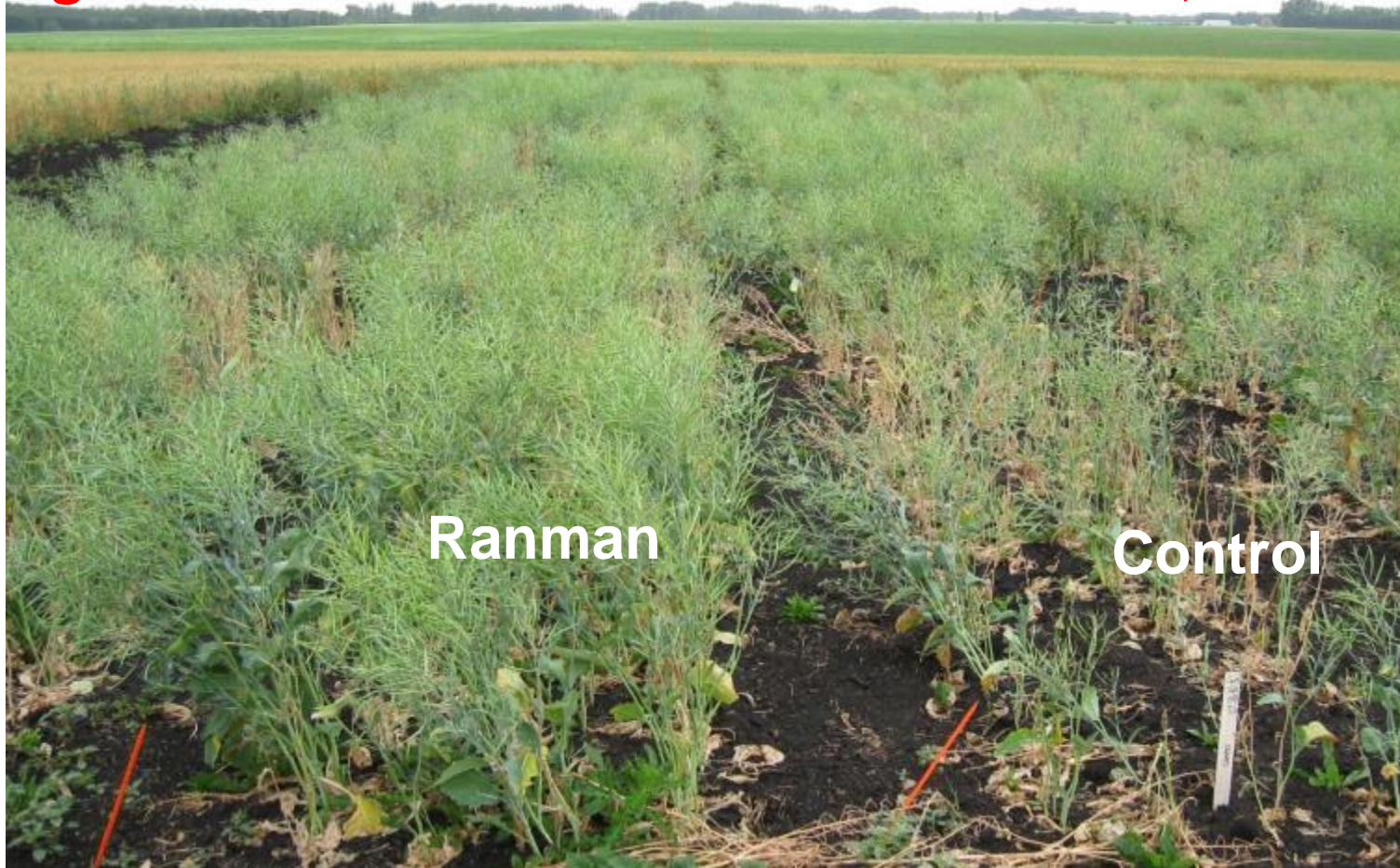
Clubroot – What Does Not Work



Clubroot – What Does Not Work

1. Fungicides

Effects of chemical soil treatments on canola growth in clubroot-infested soil – Leduc, 2008



Ranman

Control

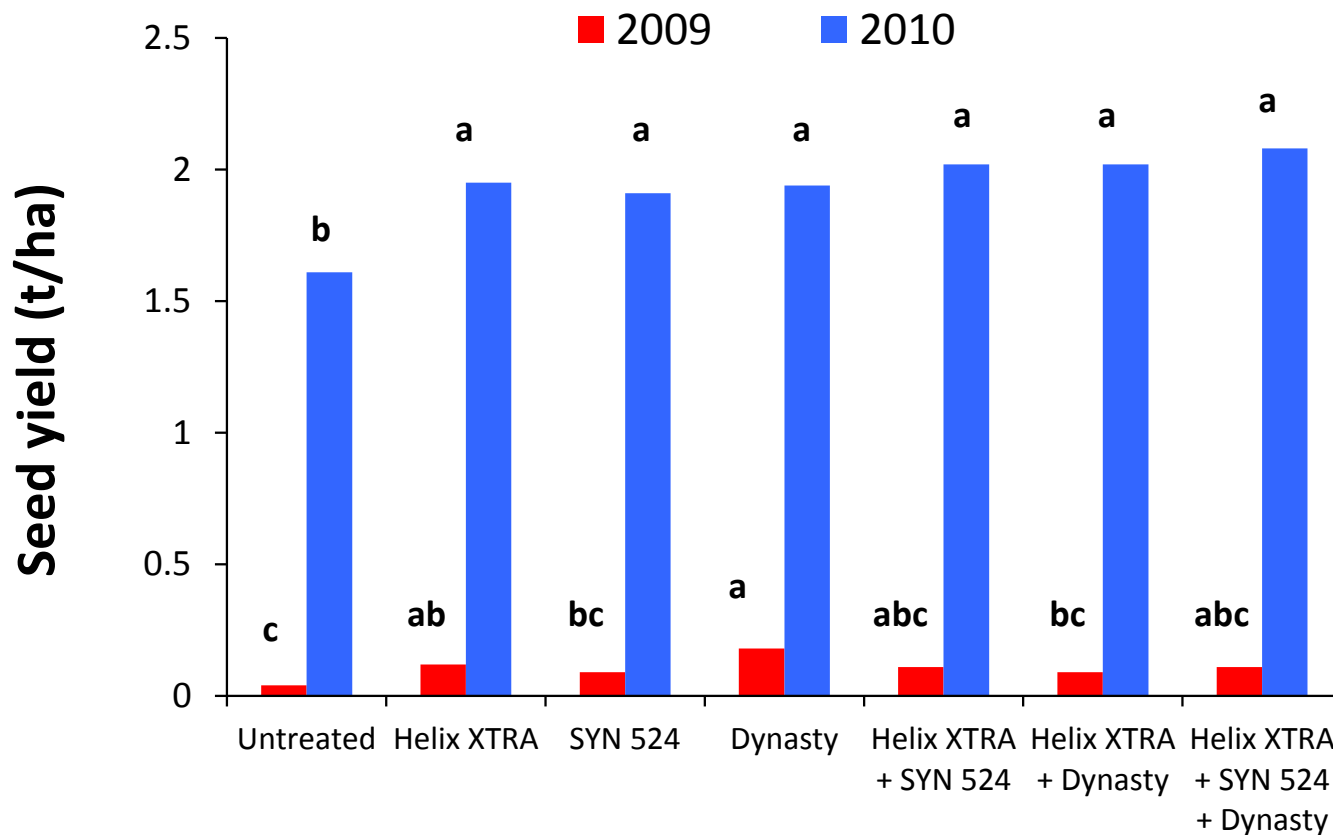
Clubroot – What Does Not Work

1. Fungicides

- **Terraclor applied at 90 kg/ha reduces the severity of clubroot, promotes growth, and improves yield.**
 - At 90 kg/ha it costs \$1100/ac
- **Ranman (7.5 L/ha) improved plant height in 2007 and plant cover and yield in 2008.**

Clubroot – What Does Not Work

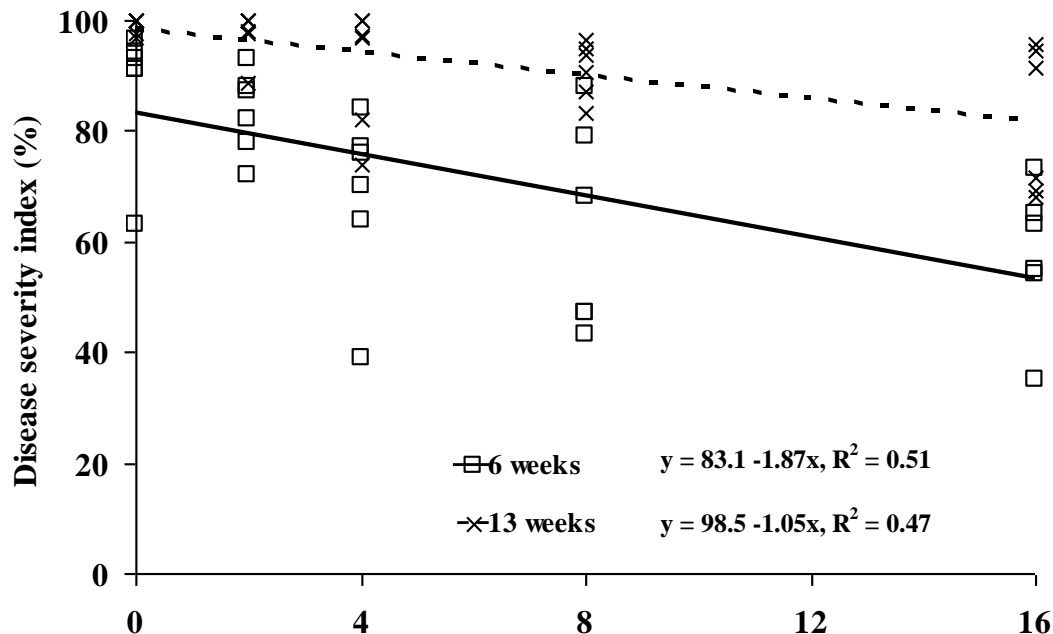
2. Seed Treatments



- Seed treatments increased yield but did not reduce disease

Clubroot – What Does Not Work

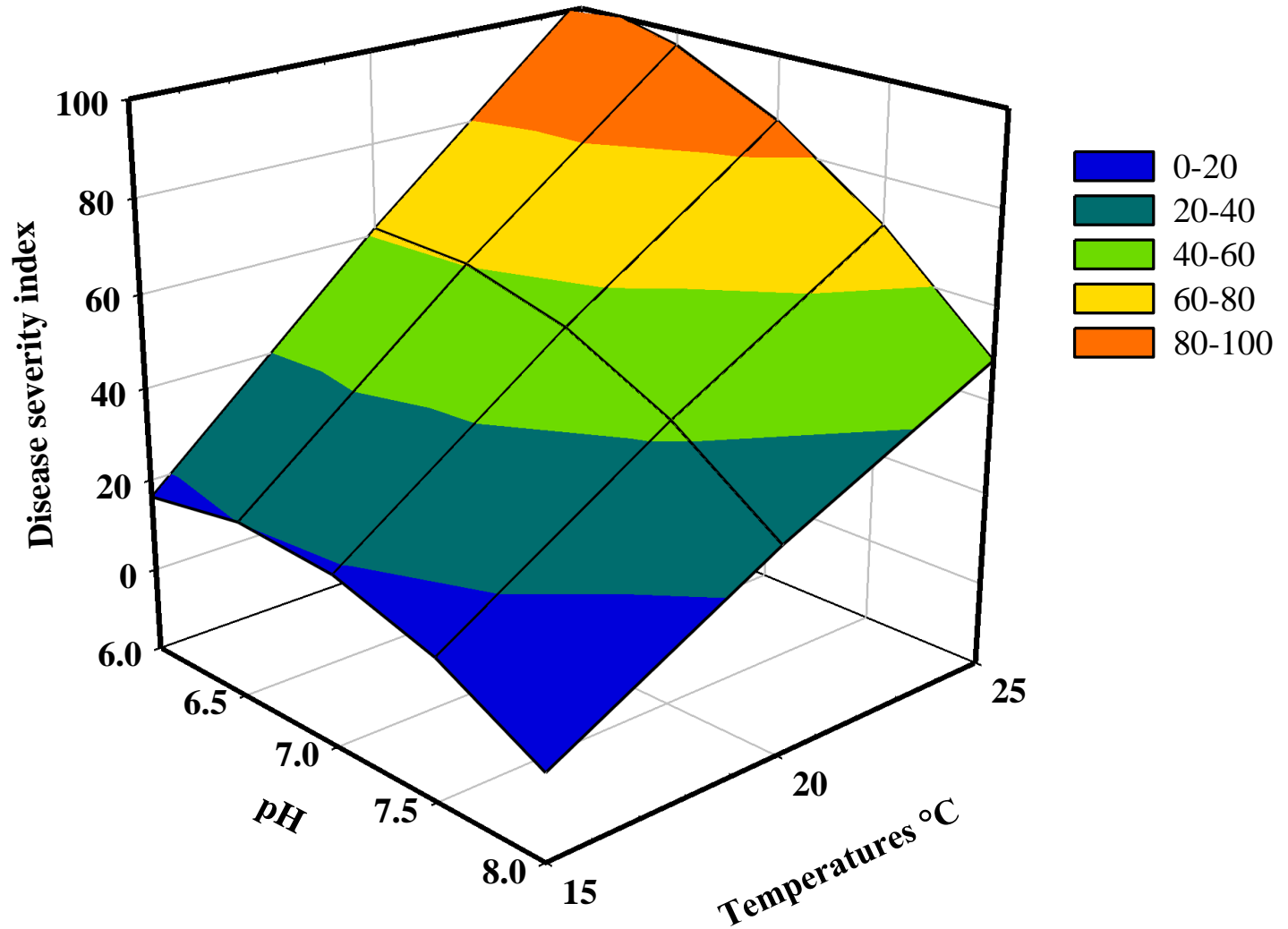
3. Boron



- greenhouse and field testing revealed that boron could reduce both the incidence and severity of clubroot
- phytotoxic effects were also observed, even at moderate rates of application

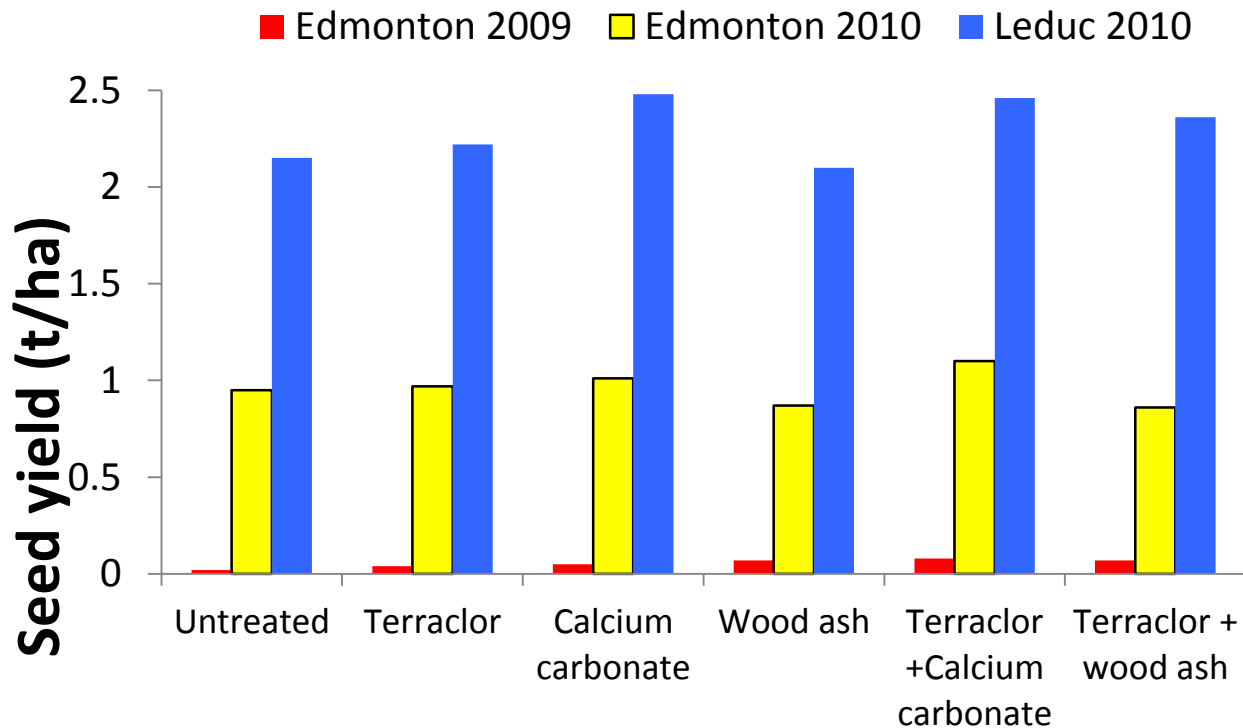
Clubroot – What Does Not Work

4. Liming Soil



Clubroot – What Does Not Work

5. Other Soil Amendments



Clubroot – What Does Not Work

6. Bait Crops

Effect of repeated cultivation of bait crop (*B. rapa* cv. Reward) on the subsequent clubroot on canola

	St. Albert		Leduc	
	June 2008	May 2009	June 2008	April 2009
	Index of disease severity (%)			
Crop for entire season	43	61	49	61
Crop seeded for 4 cycles	34	61	49	55
Crop seeded for 3 cycles	35	65	53	61
Crop seeded for 2 cycles	45	70	60	59

Means in a column were not significantly different based on a protected LSD at $P \leq 0.05$

Clubroot – What Does Not Work

7. Tillage



Clubroot – What Does Not Work

8. Crop Rotation

- Crop rotation will not eliminate *P. brassicae*
- Crop rotation will not prevent *P. brassicae* from arriving in a field.
- Crop rotation will not prevent *P. brassicae* from spreading to another field.
- Movement of *P. brassicae* is the same risk in canola crop as in other crops.

Clubroot – What Does Work!



Clubroot – What Does Work!

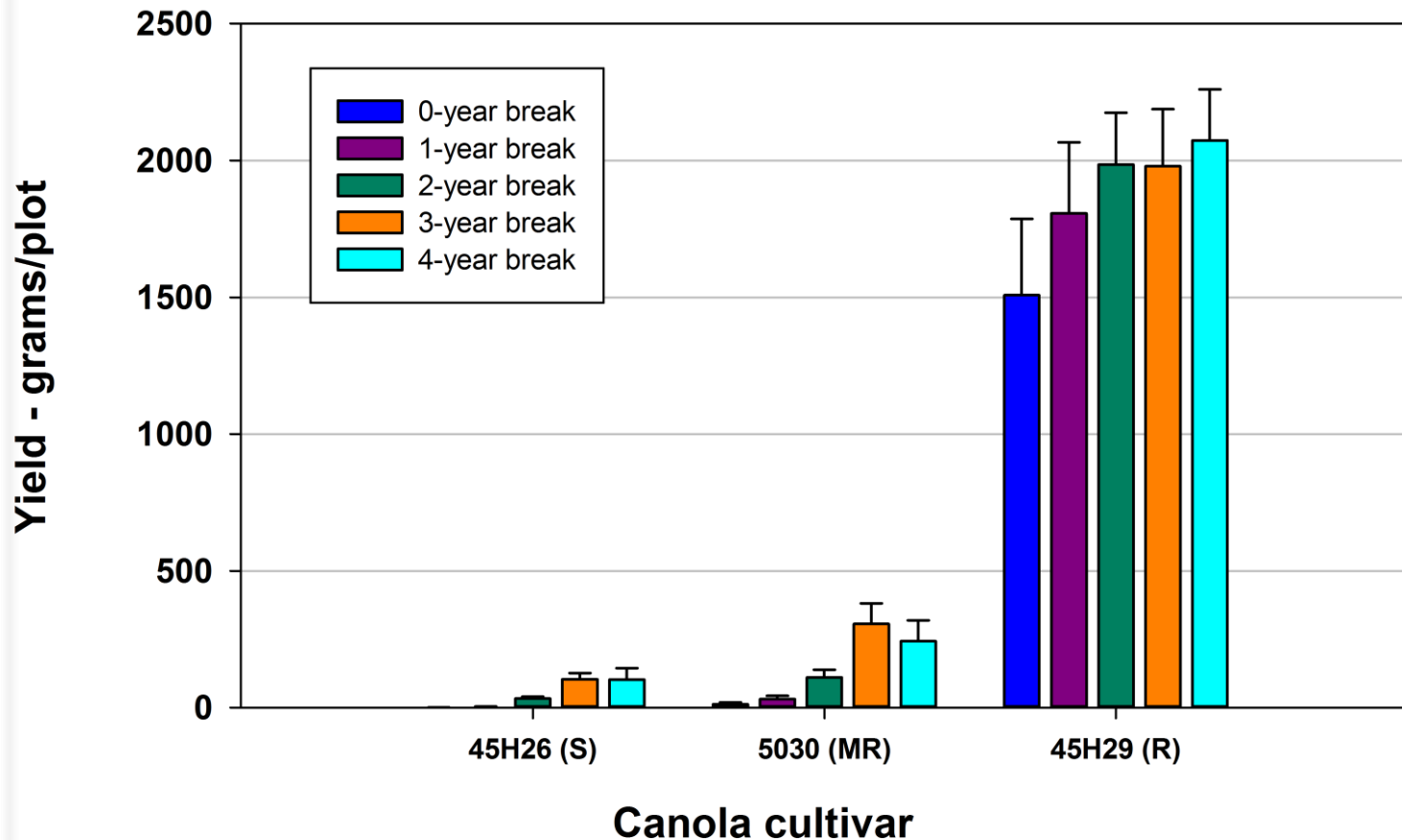
1. Crop Rotation



Clubroot – What Does Work!

1. Crop Rotation

Effect of cultivar and rotation on yield of canola - Quebec 2012



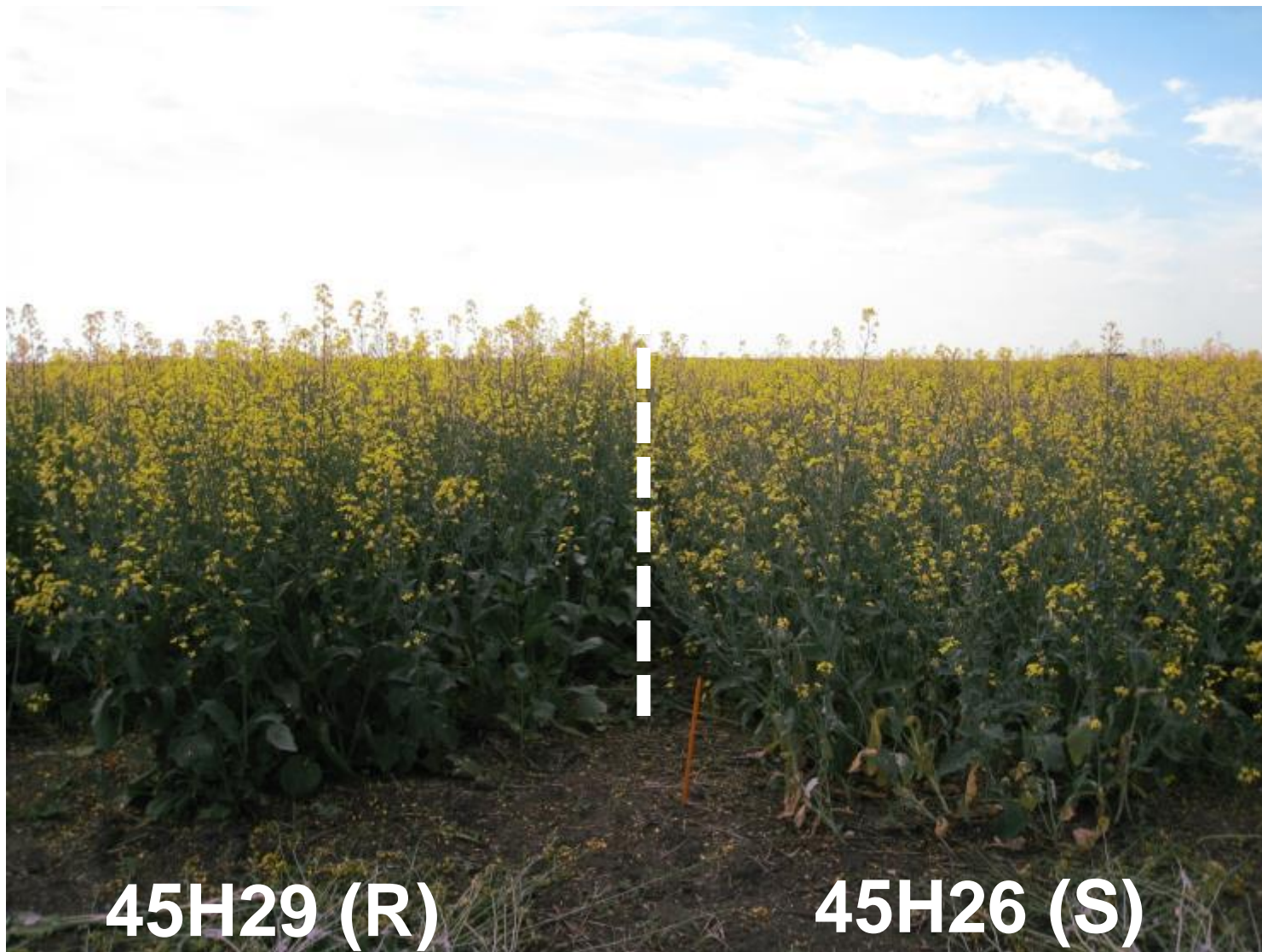
Clubroot – What Does Work!

1. Crop Rotation

- A >2-year break from canola reduced *P. brassicae* resting spores in the soil substantially
- Long rotation is not enough for S or MS varieties to reach yield potential in heavily infested fields
- A resistant cultivar, in conjunction with a >3-year crop rotation may allow maximum yield potential in heavily infested fields, as well as reducing the pathogen inoculum loads in the soil

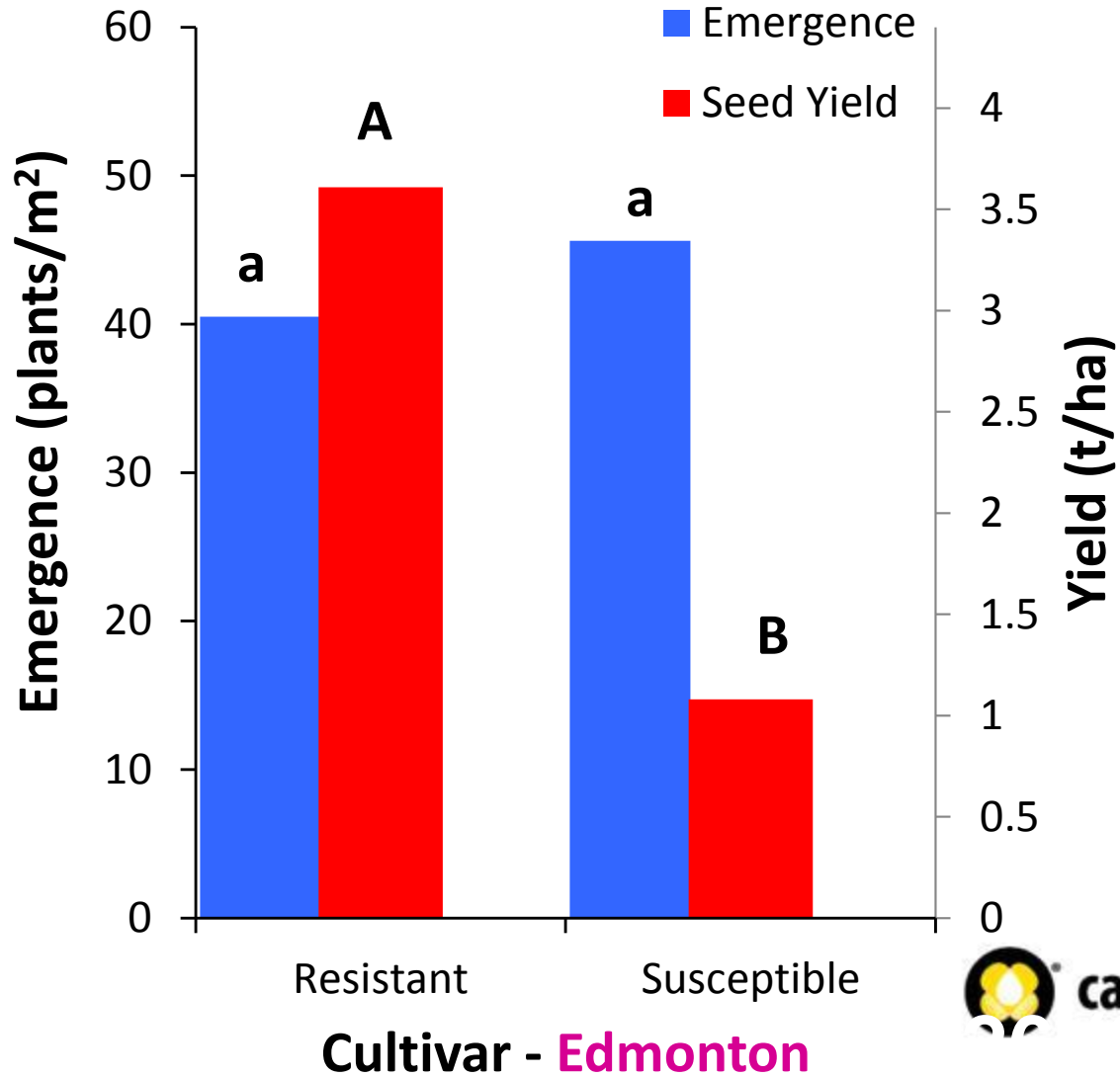
Clubroot – What Does Work!

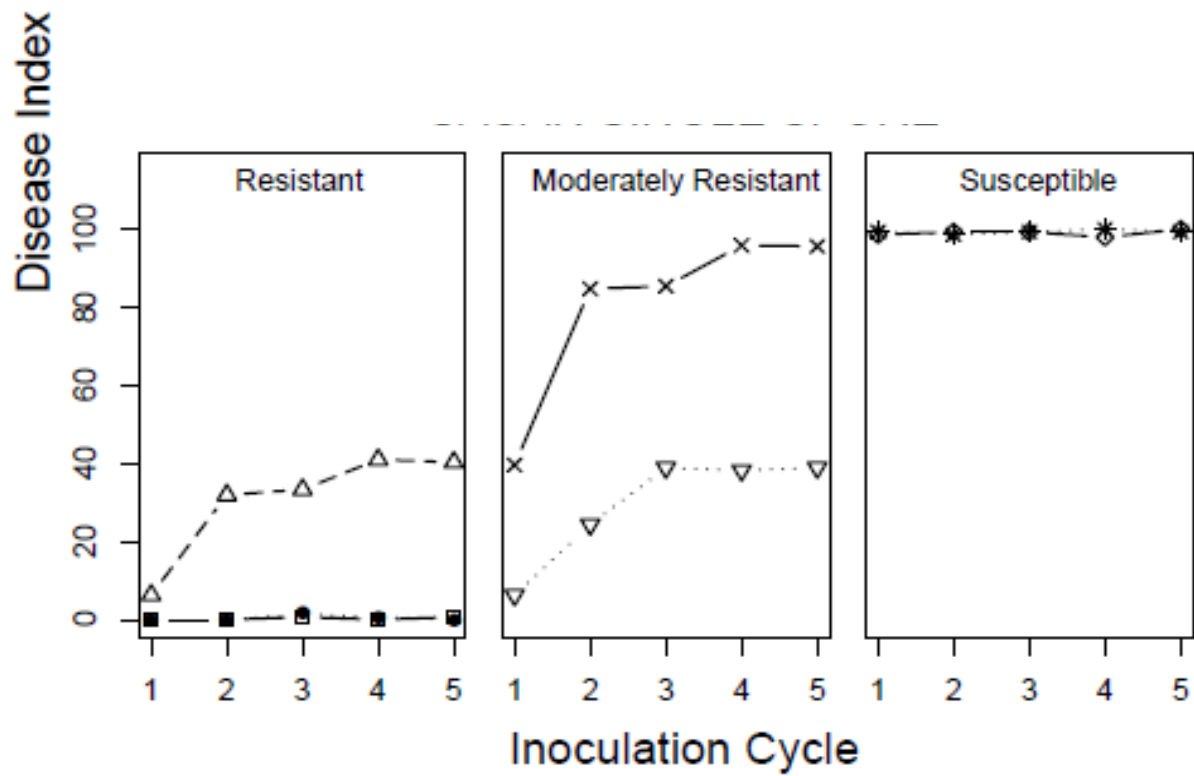
2. Clubroot Resistance



Clubroot – What Does Work!

2. Clubroot Resistance





□ ECD 02 • ECD 04 △ CV-R × 08N823 ▽ ECD 15 ◇ CV-S * ECD 05

Protect your resistant varieties

Clubroot resistance does break down

- > Happens in all areas of the world
- > Has been broken in the lab at the University of Alberta

Prevent resistance breakdown by:

- > Using a long rotation
- > Rotate between Pioneer and Monsanto's clubroot resistance source varieties

Pioneer Hi-Bred source

45H29 (Pioneer)
9558 GC (Viterra)
D3152 (DuPont)

Monsanto source

74-47 CR (Dekalb)
1960 (Canterra)



Bayer source

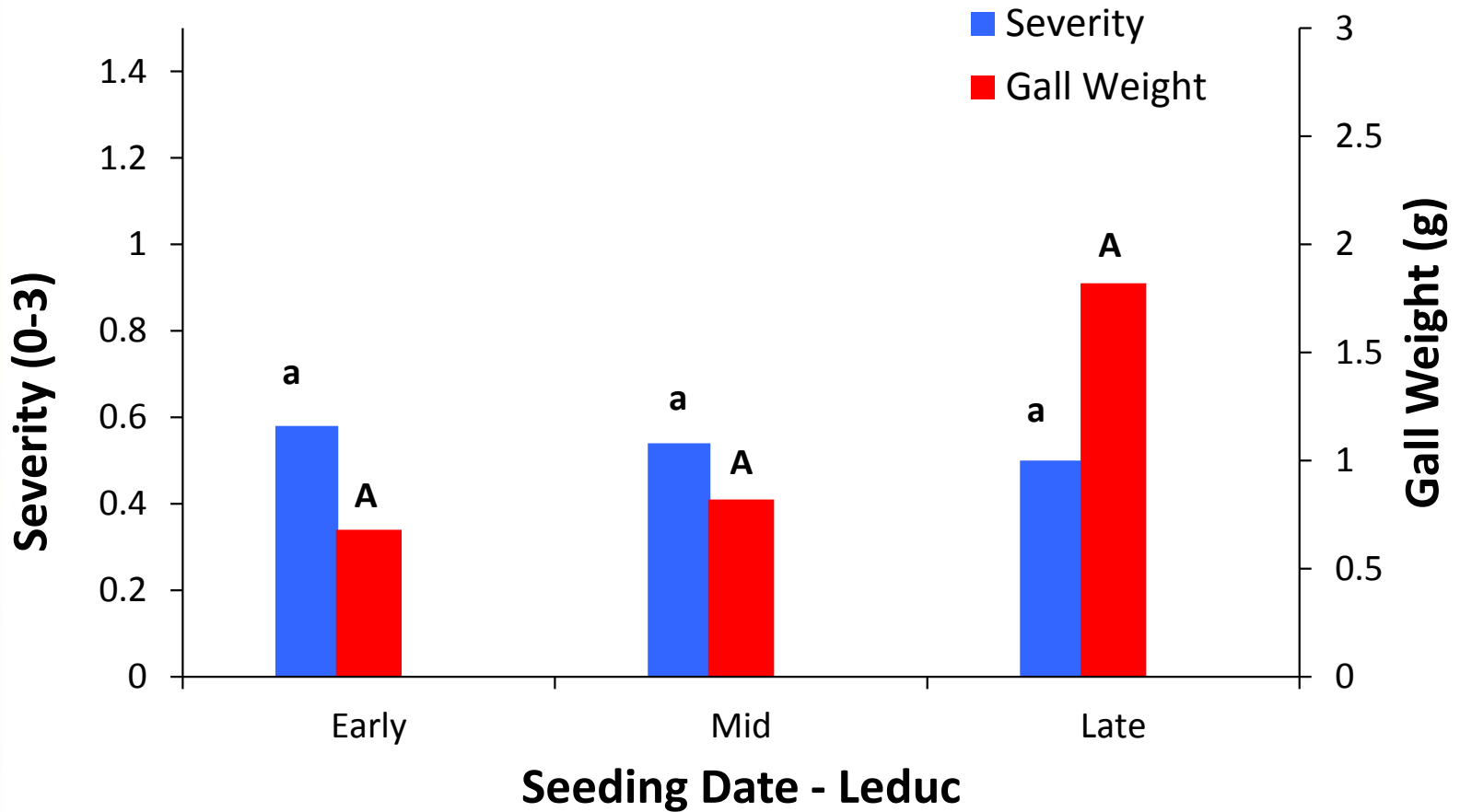
L135C

DL Seeds source

6056 CR

Clubroot – What Does Work!

3. Seeding Date



Clubroot – What Does Work!

4. Sanitation



Clubroot – What Does Work!

5. Early Identification



Clubroot – What Does Work!

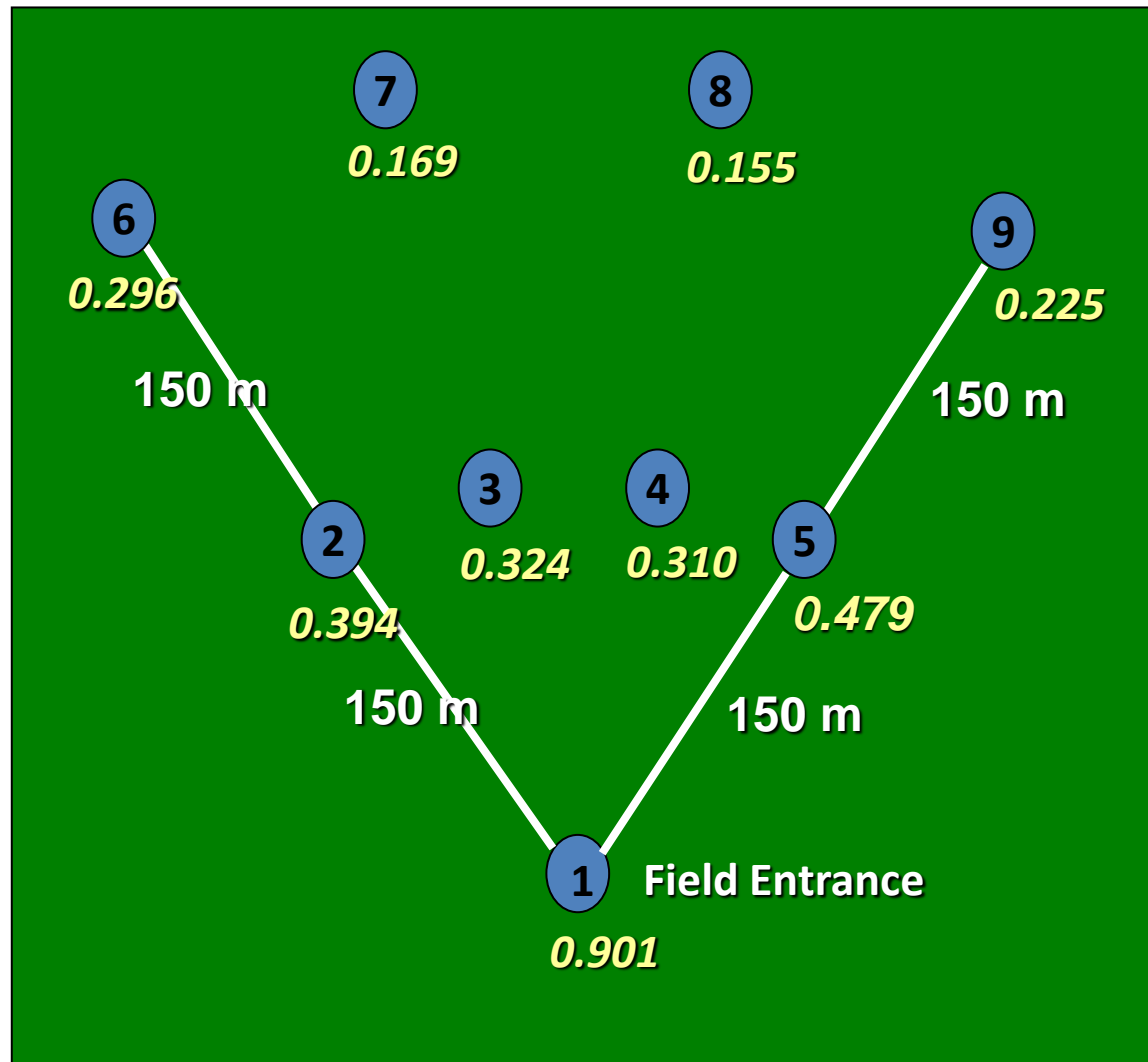
6. Tillage

- Reduced tillage



Clubroot – What Does Work!

7. Quarantine / Isolation



Clubroot – What Does Work!

8. Eradication?



Clubroot – What Does Work!

8. Eradiction?

Fumigation



No Vapam

Vapam @ 100
mL/m²

Clubroot – What Does Work!

8. Eradication?

Fumigation

Effects of different Vapam concentrations on growth of canola in clubroot-infested soil under greenhouse conditions



Clubroot – What Does Work!

9. Brassica weed control



Clubroot – What Does Work!

10. Planning

- Clubroot is not only a canola problem



Clubroot – What Does Work!

11. Clean inputs

- Cleaned and treated seed is essentially no risk



Clubroot – What Does Work!

11. Developing a clubroot management plan

Plan should include

- How will you quarantine a field?
- How will you plan your field work?
- When will you sanitize your equipment?
- When will you use resistant varieties?

Assessing risk – what are the main factors involved introduction?

- Normal farm operations (high risk regions)
- Used equipment
- Custom operators
- Construction/petroleum/utilities
- Recreational traffic
- Livestock
- Hay/manure
- Common/untreated seed (potatoes especially)
- Wind/water erosion
- Vegetable/nursery

What you need to do - FARMER

1. Prevention

- > Know risks of introduction
- > Base sanitation on risk

2. Identify clubroot early

3. Develop a clubroot management plan

4. Work with your municipality

What you need to do - RETAIL

1. **Develop a clubroot management plan**
2. **Prevention – do not spread clubroot**
 - > Know risks areas/fields
 - > Know risks of transmission
 - > Base sanitation on risk

What you need to do - COUNTY

1. Consult with rate payers

- > Regulate on basis of provincial clubroot management plans

2. Develop local clubroot management plan

- > Provide support to local growers to develop theirs

3. Education / awareness programs

What you need to do – PETROLEUM / UTILITIES

1. Consult with land owners

- > Contract your responsibilities

2. Prevention – do not spread clubroot

- > Know risks areas/fields
- > Know risks of transmission
- > Base sanitation on risk

3. Eradication?

- > Soil fumigation?