Seedborne Transmission of Clubroot of Crucifers

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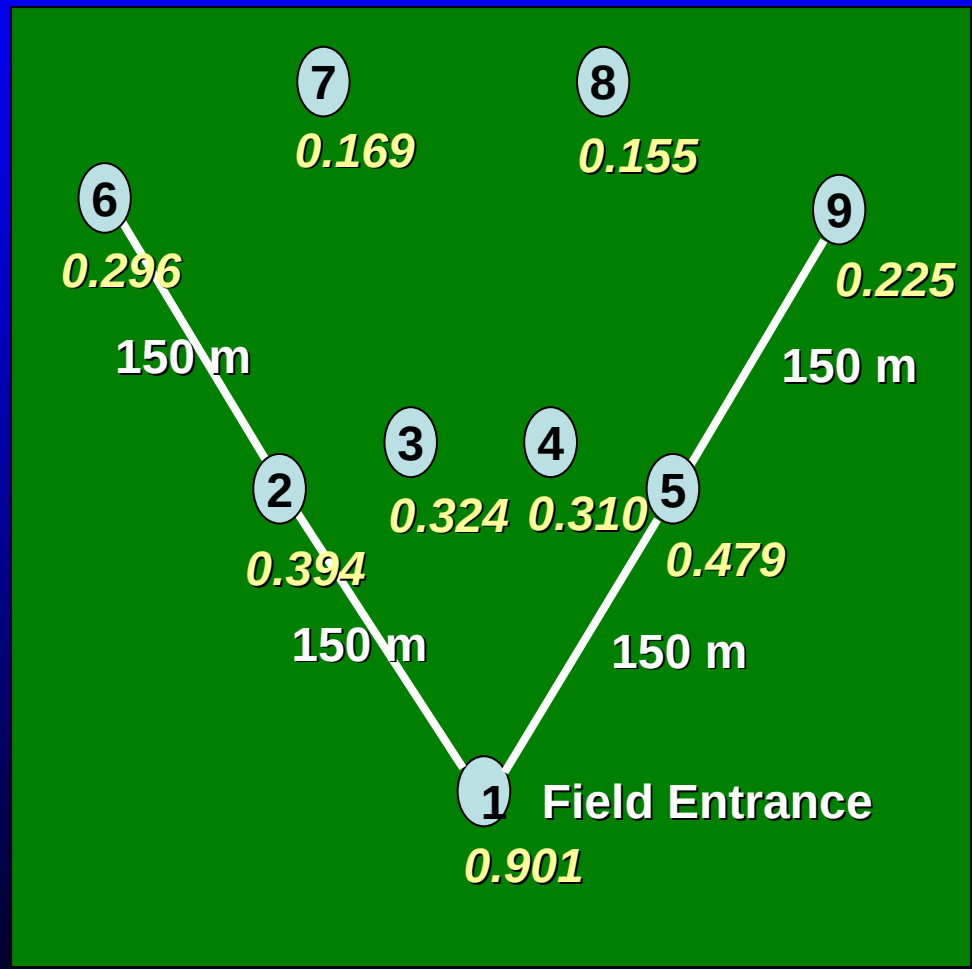
Outline of Presentation

- Introduction and background
- Study objectives
- Detection of seed infestation levels, natural infestation of seeds and tubers
- Effects of seed cleaning
- Evaluation of seed treatments
- Conclusions

Clubroot Spread

- Soilborne pathogen
- Movement of infested soil
  - Machinery
  - Soil erosion and water run-off
- *Possibility for transmission of resting spores as seedborne contaminants?*



Frequency of infection

Seedborne Clubroot Transmission

- Many non-refereed fact-sheets & websites mention this possibility but provide no data
- Little information available in refereed literature
  - Warne (1943): introduction of clubroot to a garden on infested seeds
  - Hazra et al. (1998): presence of dried root fragments mixed with seeds
- *Large gap in knowledge on this topic*

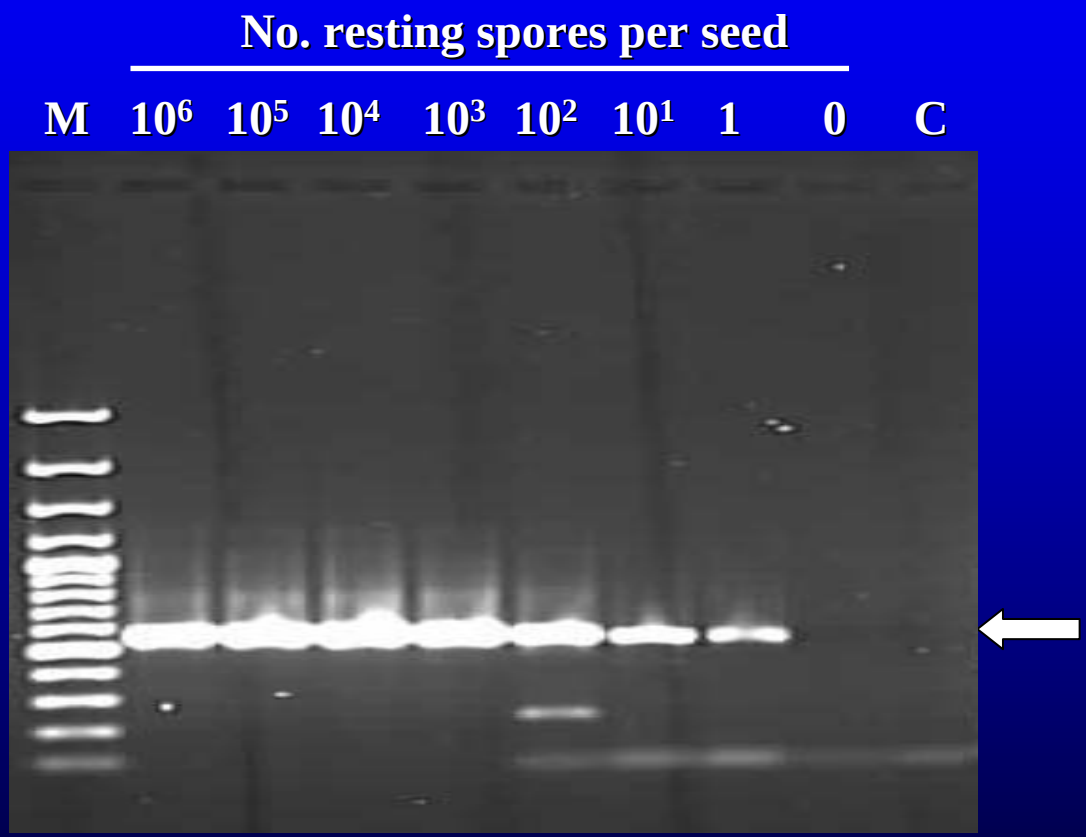
Study Objectives

- **Evaluate risk posed by seedborne transmission of clubroot**
- **Assess the efficacy of seed cleaning & treatments**
- **Develop recommendations for growers & industry**

Support obtained from the CSGA, ACPC/ACIDF & industry partners; currently just past ½ way point of the research

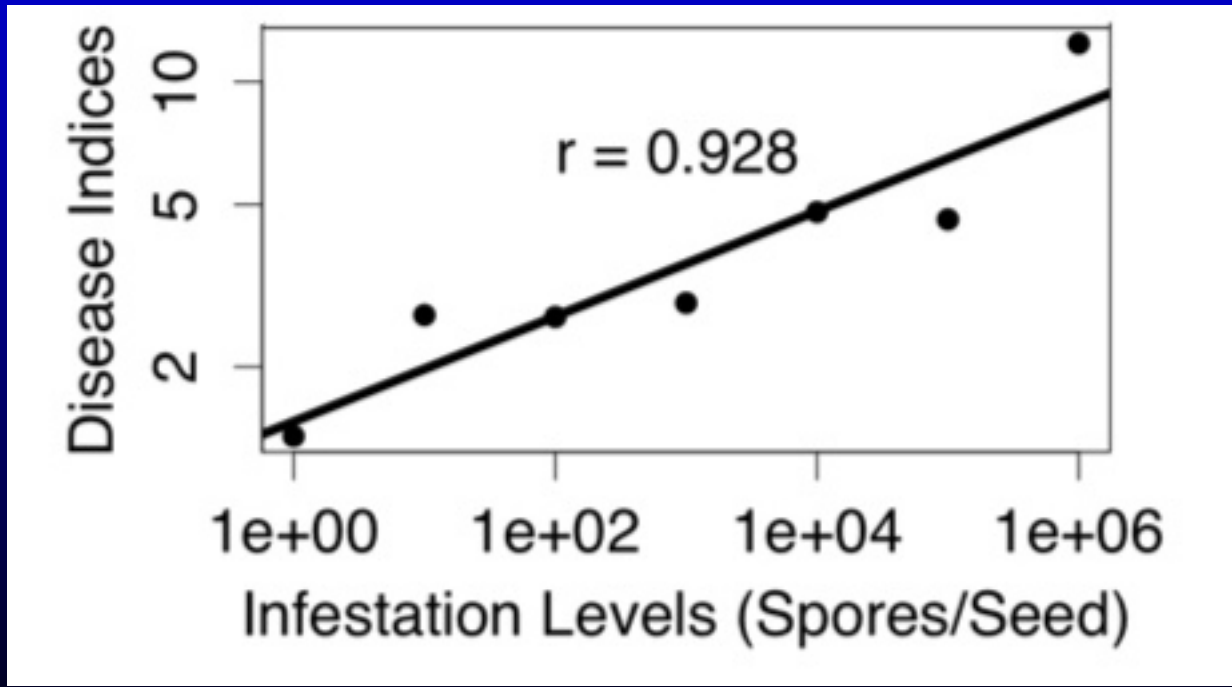
Detection of Seed Infestation Levels

- **Could detect as little as one resting spore per canola seed**
  - **Artificially inoculated seedlots**
- ***How many spores are needed to cause disease?***



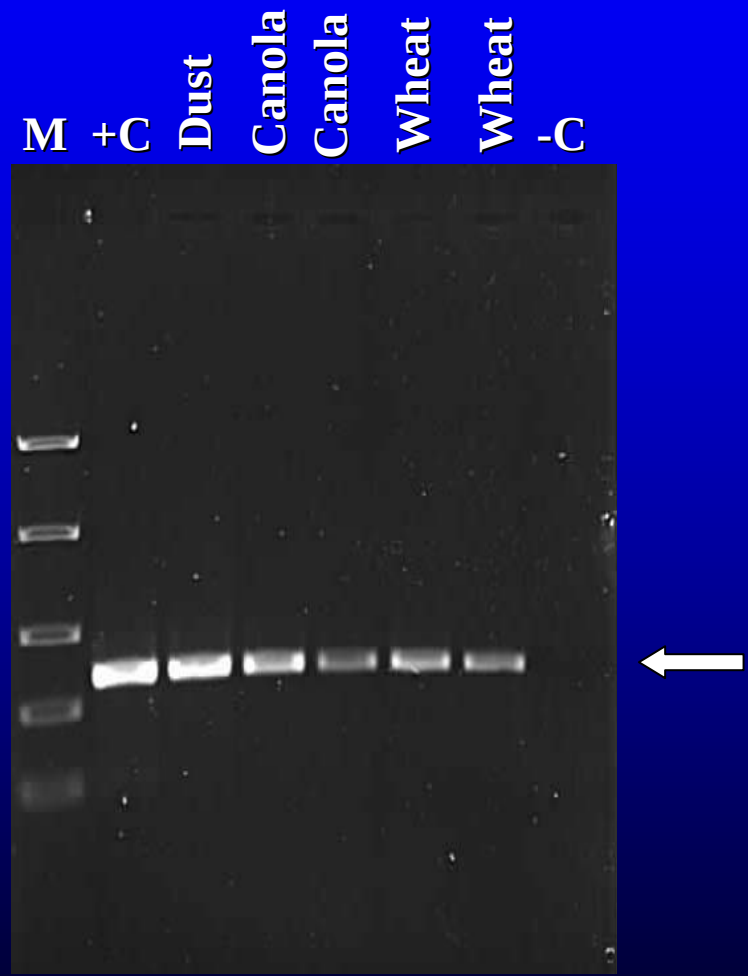
Seed Infestation Level & Clubroot Severity

- **Under greenhouse conditions, even trace levels of infestation could cause some clubroot**
  - **Optimal conditions for the pathogen**



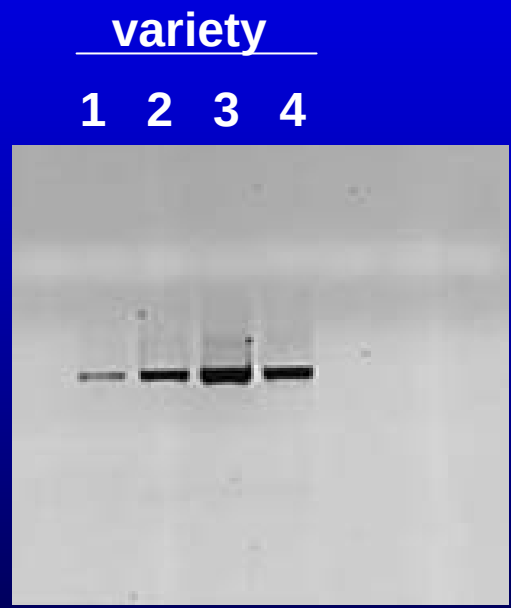
Evidence of Natural Seed Infestation

- **Tested farmer-harvested seeds of various crops for the presence of *P. brassicae* inoculum**
- **Found on canola, wheat, rye & barley**
- ***What about potatoes?***



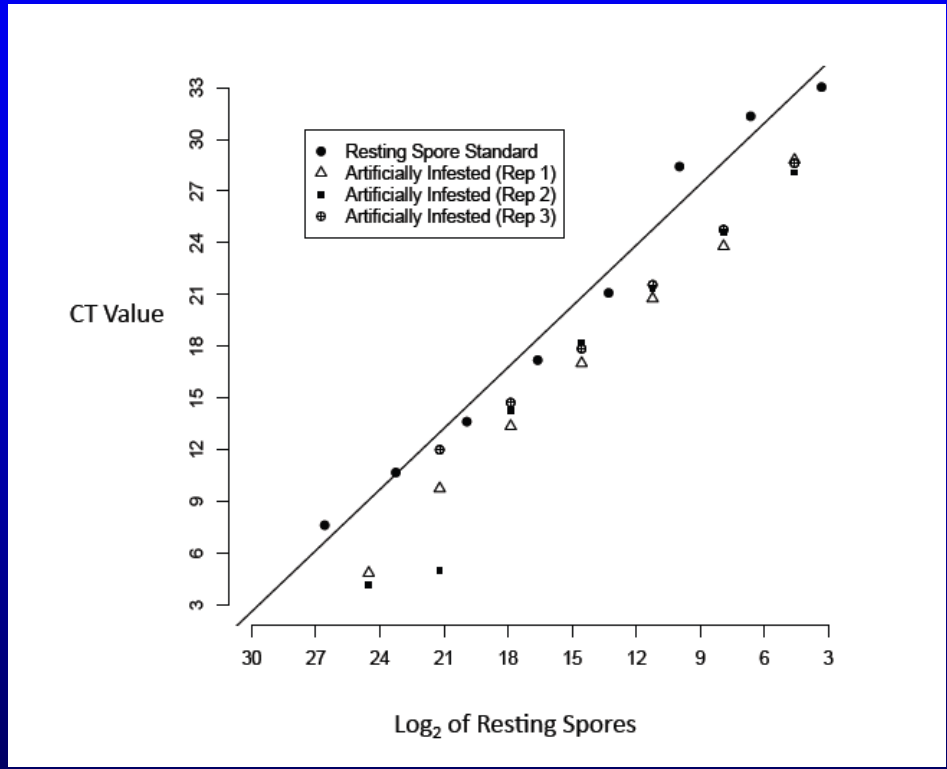
Infestation on Potato Tubers

- Four varieties of potatoes grown in clubroot-infested field in southern Alberta
- Subjected to PCR testing
- Presence of *P. brassicae* DNA detected



Quantification of Inoculum Levels

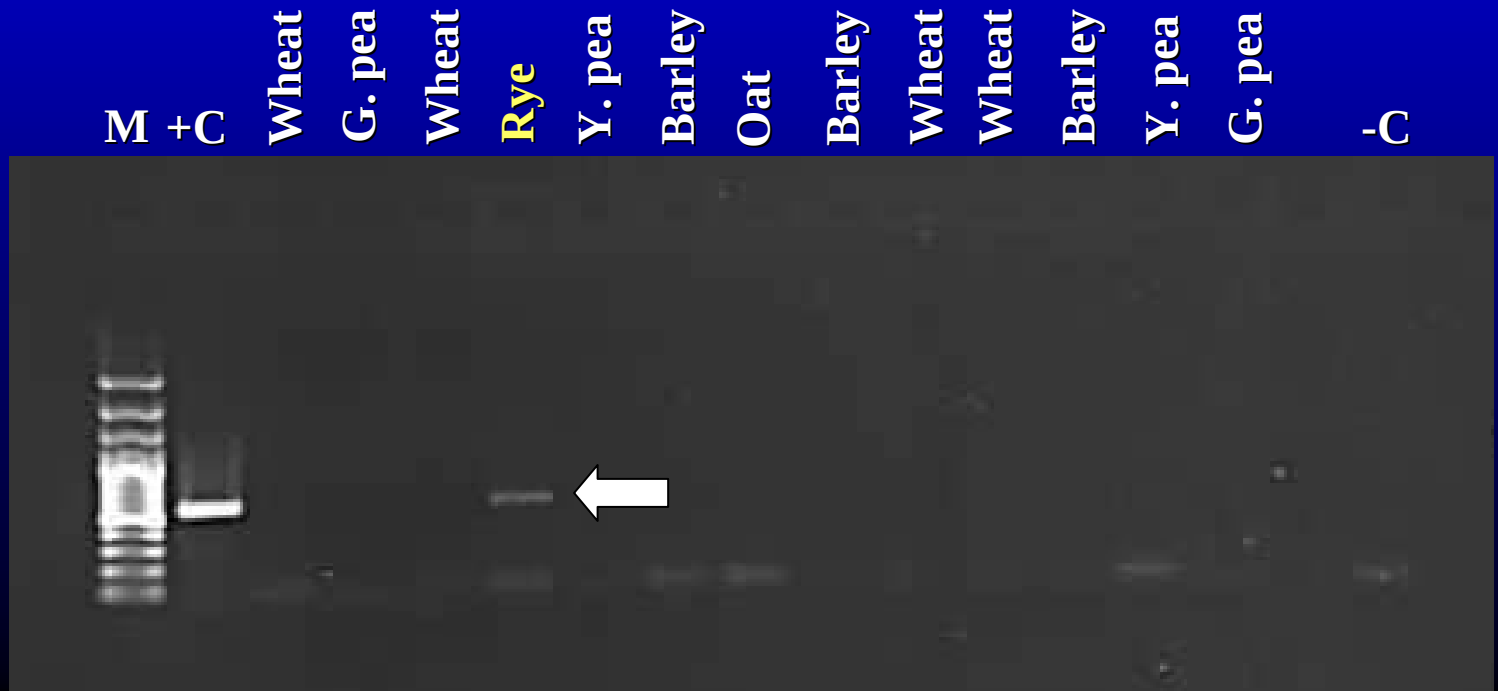
- Developed quantitative PCR technique to quantify DNA levels and relationship to spore levels and clubroot severity
  - Validation through bioassays



Standard curve of average C_T values plotted against Log2 of serial dilution of spore DNA

Effect of Seed Cleaning

- Examined cleaned seeds of numerous crops
  - Seed cleaning plant in clubroot epicenter
  - No information on whether seedlots came from clubroot fields, or whether they were infested prior to cleaning



Naturally Infested Seeds

- **Naturally infested seeds & detection of *P. brassicae* after seed cleaning suggest small risk of seedborne transmission**
  - **Secondary to movement on equipment**
  - **Role in dissemination to other regions? Fast dissemination of pathotypes?**
- ***To further reduce any risk and allay concerns, seed treatments represent attractive option***

Evaluation of Seed Treatments

- Fungicides commonly used as seed treatments
- Fungicide effective against *P. brassicae*, powdery scab

This research is currently underway

Dynasty	Seed & soilborne diseases
Prosper FX	Seed rot, damping-off, early root rot, seedling blights, seedborne diseases, insecticide
Prosper 400	
Vitavax RS	Seed rots, damping-off, seedling blights, early root rot
Helix Xtra	Seed & soilborne diseases, insecticide
Nebijin	Potato powdery scab, clubroot on Brassicas

Conclusions

- Seedborne transmission of clubroot is possible and could be a secondary mode of disease spread
- Low-levels of infestation enough to induce some disease
  - Conducive conditions probably required
- Seed cleaning may help reduce risk but not eliminate it completely
- Efficacy of seed treatments is being studied

Acknowledgments

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