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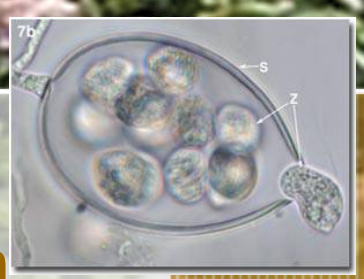
Prince Edward Island CANADA — Department of Agriculture



Periodic displacement of *Phytophthora infestans* strains in Canada necessitates re-evaluation of late blight control strategies

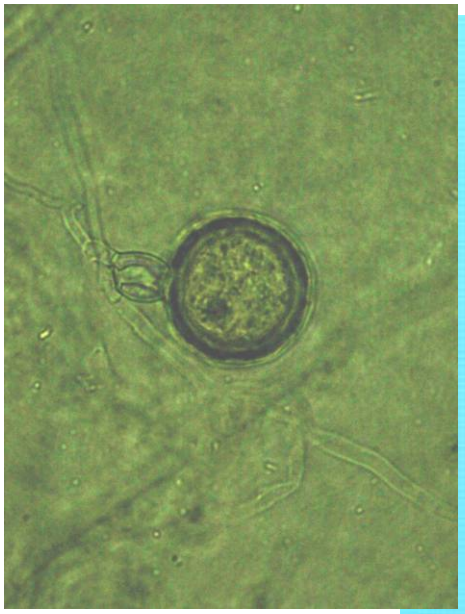
R.D. Peters and L.M. Kawchuk

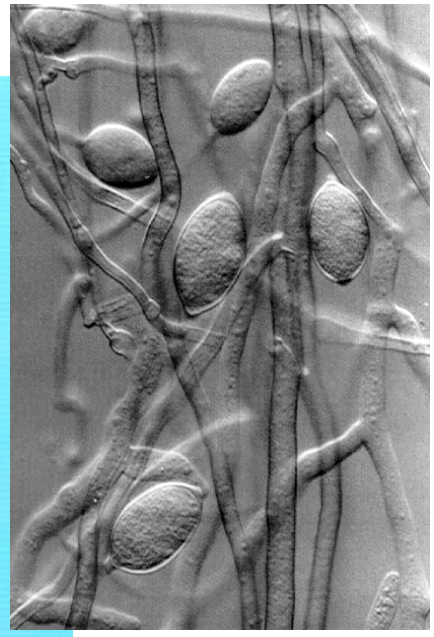
31st Annual Tomato Disease Workshop
November 1-2, 2016
Kanuga Conference Center, Hendersonville, NC

Canada

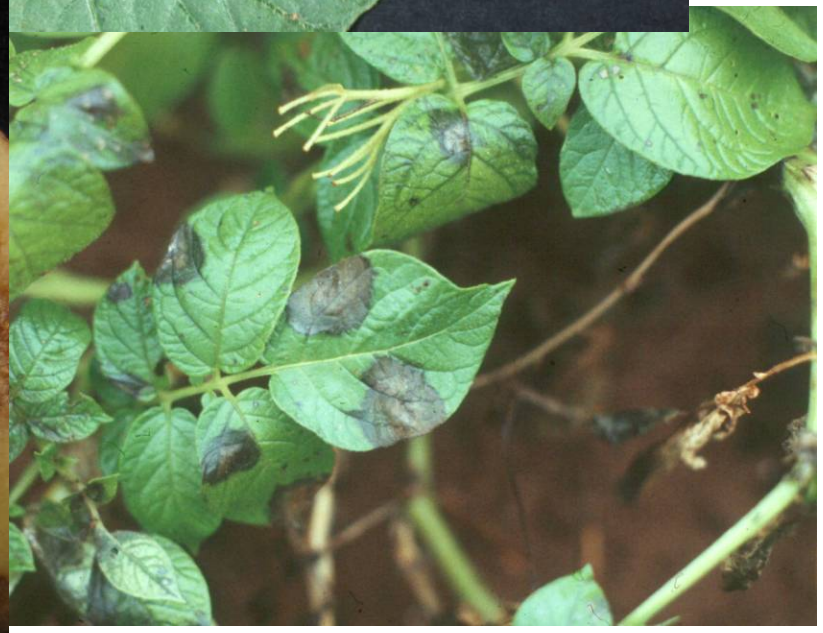
Late Blight = *Phytophthora infestans*

- oomycete (related to algae)





Symptoms of Late Blight *on Potato*



Symptoms of Late Blight *on Tomato*

Late Blight (*Phytophthora infestans)*
Canadian Surveys

(Larry Kawchuk, AB; Fouad Daayf, MB;
Khalil Al-Mughrabi, NB; Rick Peters and Anne MacPhail*, PE)
*work in PEI also supported by PEIDA, Brian Beaton, Carol Banks, Marleen Clark

- samples of infected potato and tomato tissue collected and sent to closest researcher
- isolation of pathogen into pure culture
- isolates sent to:

Charlottetown	- mating type, metalaxyl sensitivity - allozyme genotype
Lethbridge	- DNA fingerprinting (RFLP with probe RG57)

Late Blight – Historical Significance

- Irish Potato Famine
- Anton De Bary

A starving boy and girl in Cork hoping to find a potato.

Illustrated London News - 1847

The ruined Village of Tullig in County Clare.

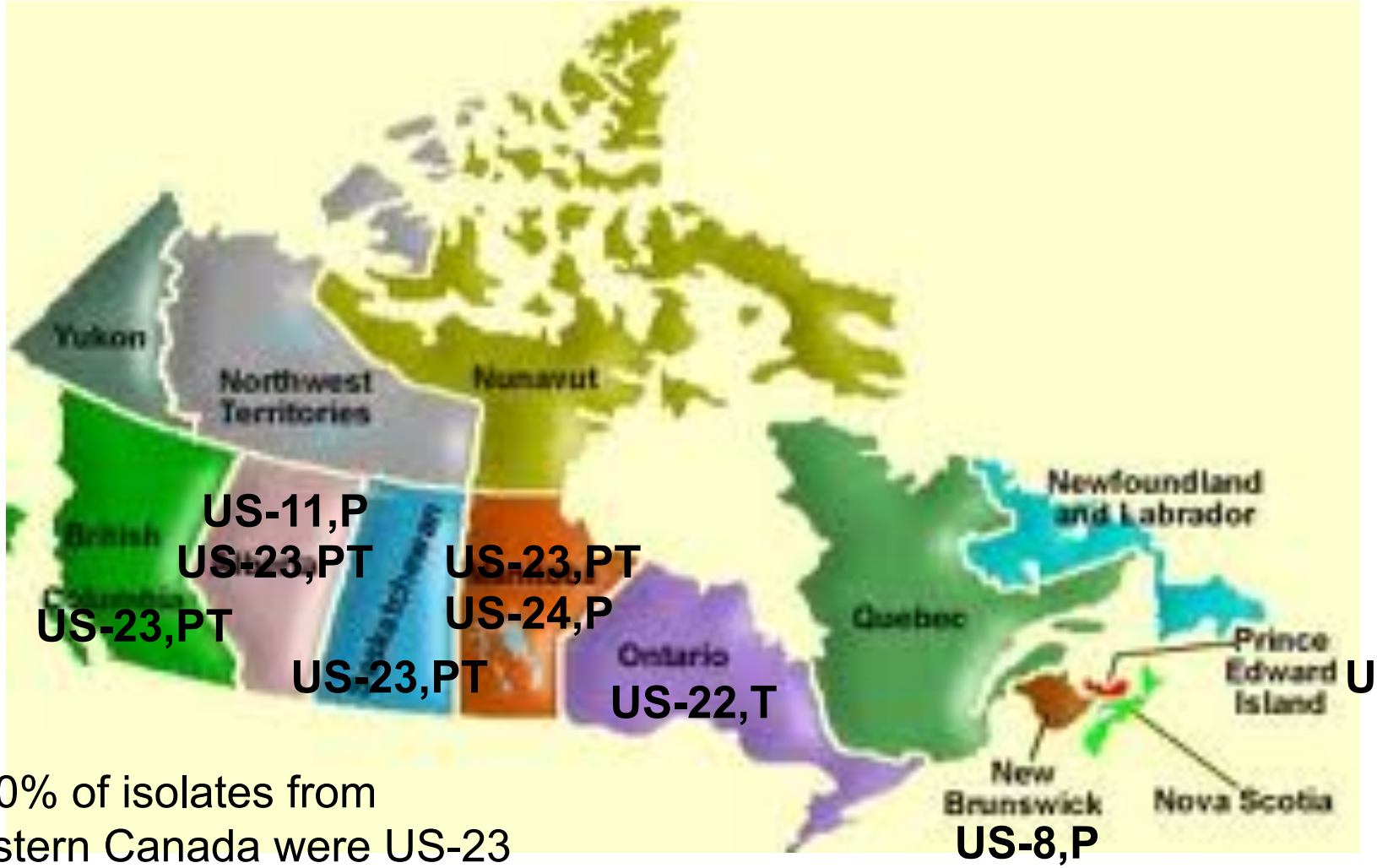
Illustrated London News - 1850

DISTRIBUTION OF GENOTYPES OF *P. INFESTANS* IN CANADA 1993

DISTRIBUTION OF GENOTYPES OF *P. INFESTANS* IN CANADA

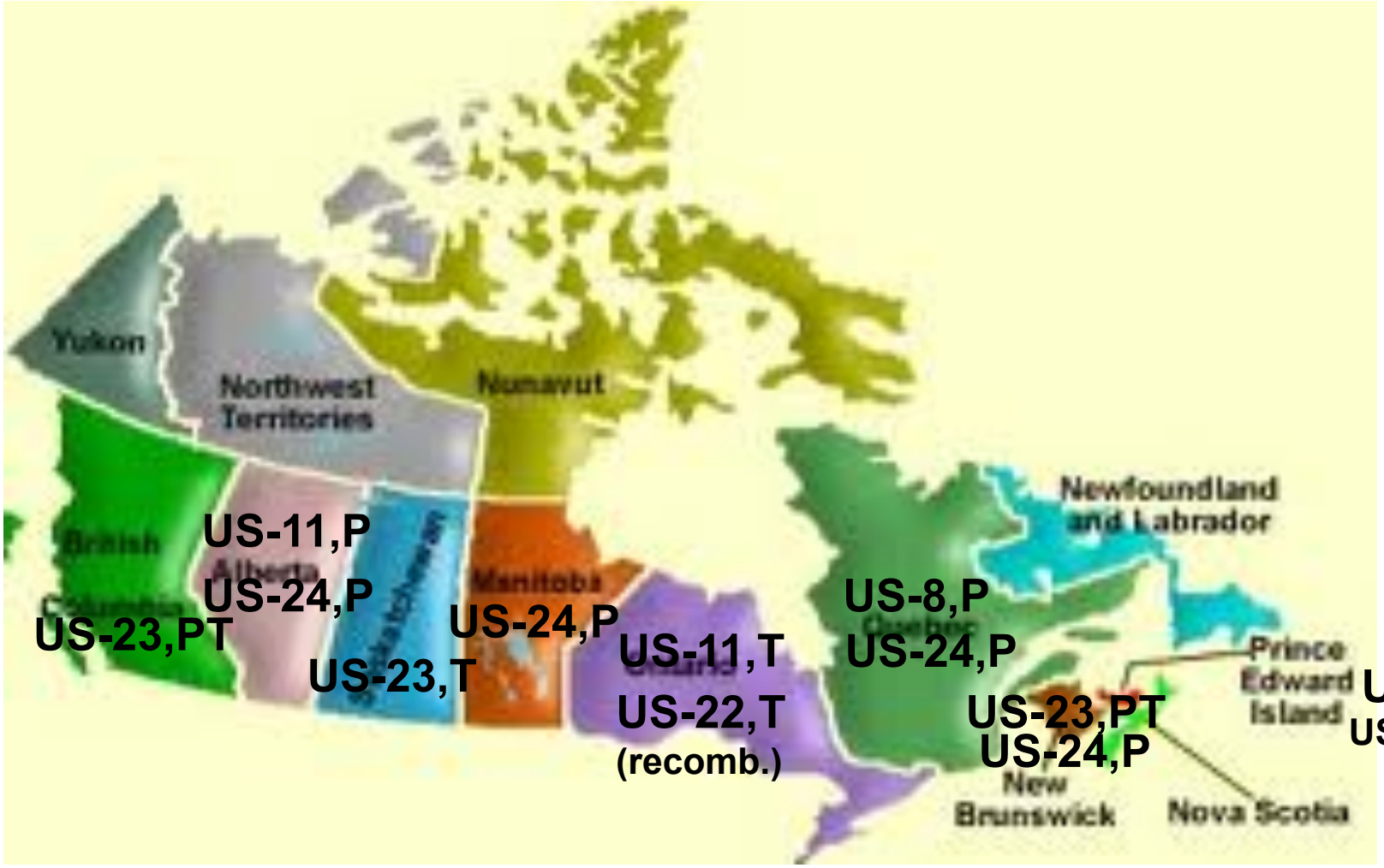
1996

Late Blight (*Phytophthora infestans*) 2010 Canadian Survey

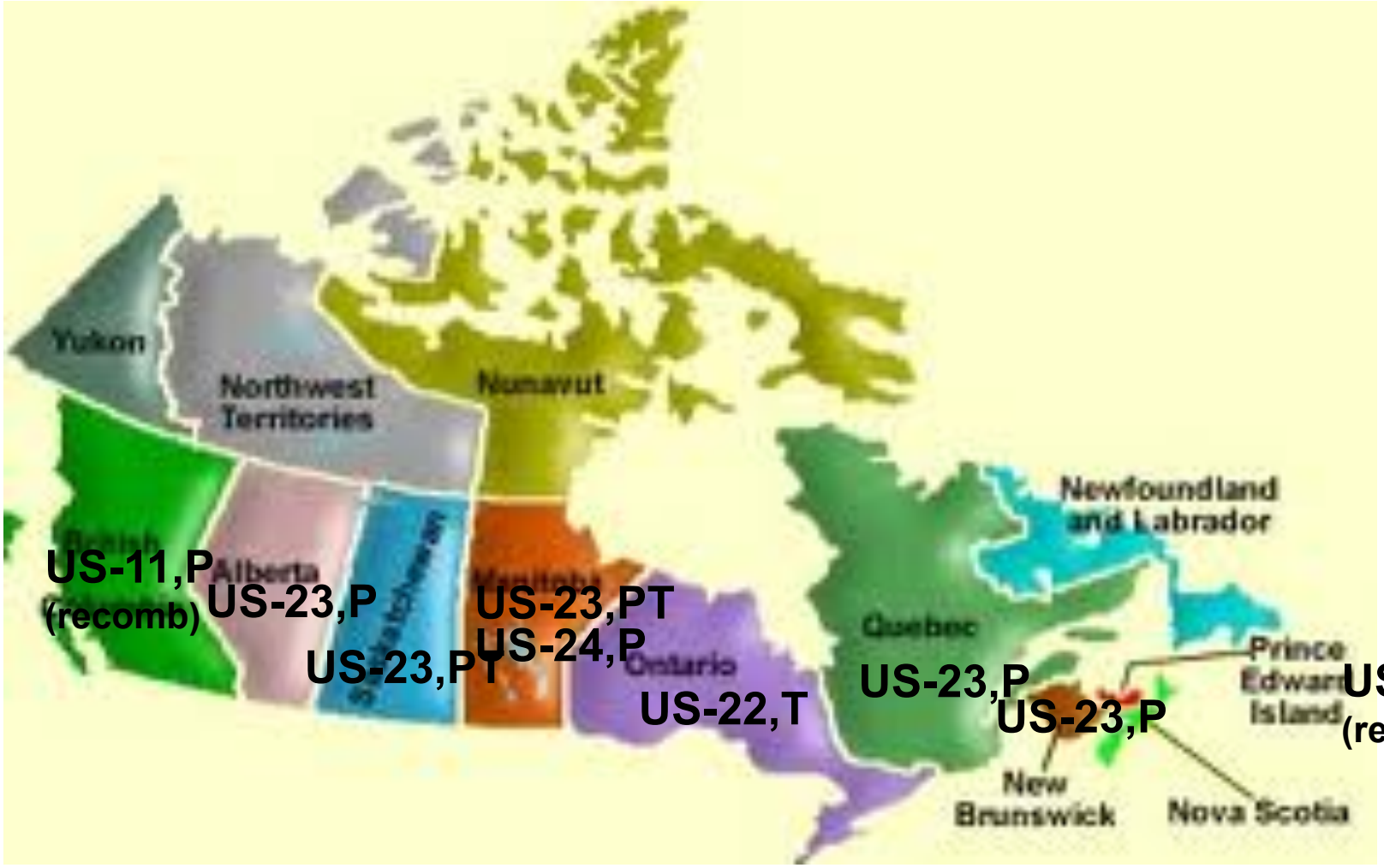


- 80% of isolates from western Canada were US-23

Late Blight (*Phytophthora infestans*) 2011 Canadian Survey

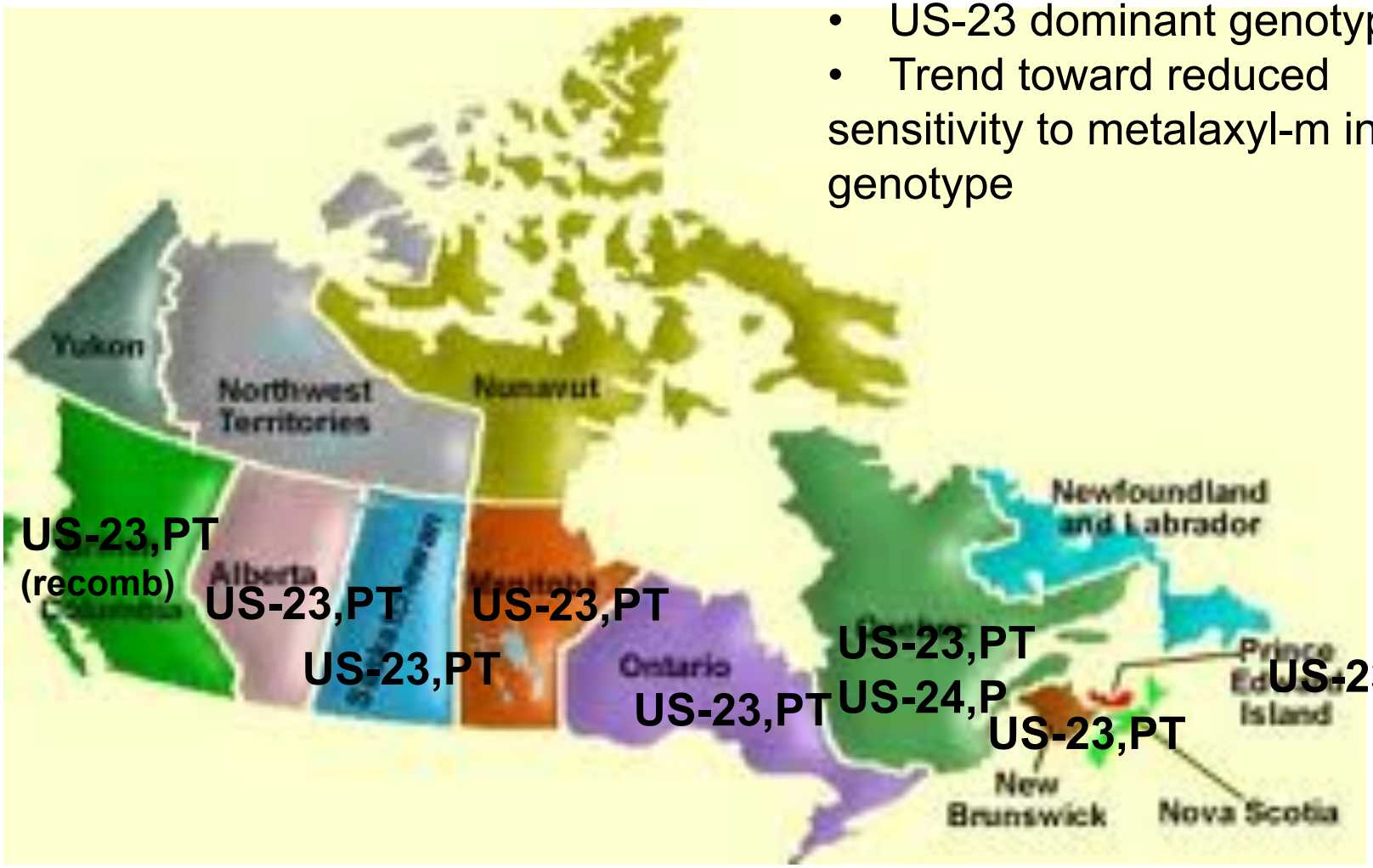


Late Blight (*Phytophthora infestans*) 2012 Canadian Survey



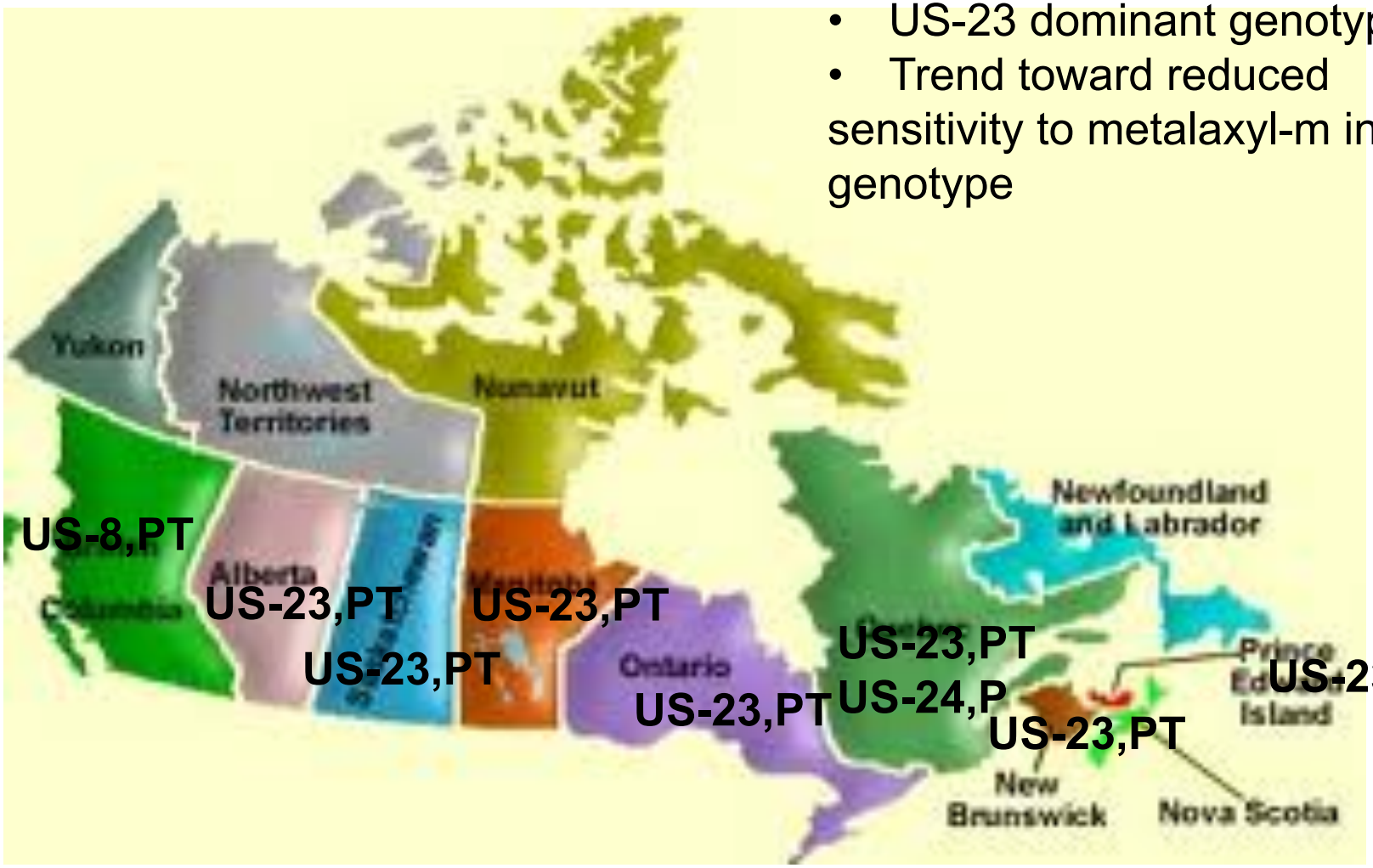
Late Blight (*Phytophthora infestans*) 2013 and 2014 Canadian Surveys

- US-23 dominant genotype
- Trend toward reduced sensitivity to metalaxyl-m in this genotype



Late Blight (*Phytophthora infestans*) 2015 and 2016 Canadian Surveys

- US-23 dominant genotype
- Trend toward reduced sensitivity to metalaxyl-m in this genotype



Late Blight (*Phytophthora infestans*)
Origin of New Genotypes in Recent Years

US-23,PT **US-24,P**

US-25,T

A1 + A2 =

Late Blight (*Phytophthora infestans*) Origin of New Genotypes in Recent Years

Late Blight (*Phytophthora infestans*)
What are the characteristics of the new strains?

2012 Field Trial – Dr. Robert Coffin

- Late blight resistant tomato varieties
  Mountain Magic (Ph2 + Ph3), Defiant (Ph2 + Ph3), Plum Regal (Ph3)
- Late blight susceptible tomato varieties
  Scotia, Brandywine, Oxheart, Monster

2013 Late Blight – Host/Genotype Interactions
Greenhouse Trials
Anne MacPhail and Marleen Clark

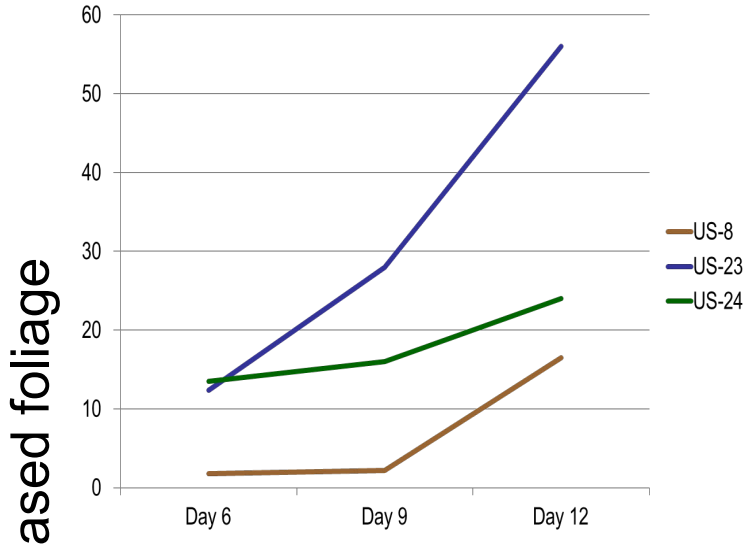
Hosts
- Potato
- Tomato
- Pepper
- Petunia

Pathogen *Phytophthora infestans* (US-8, US-23 and US-24)

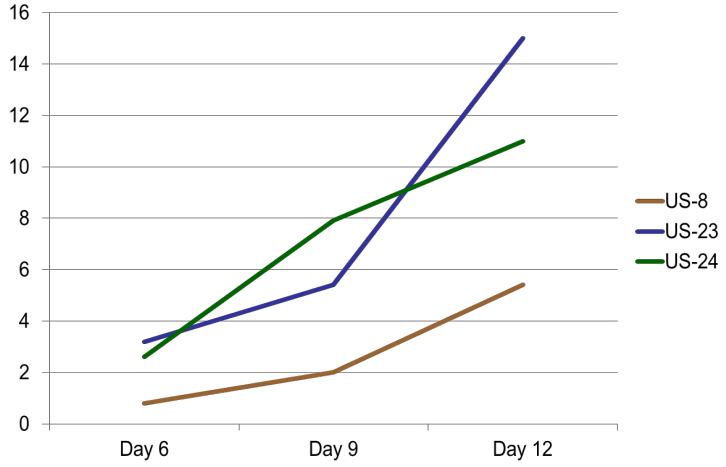
Rating
- % tissue diseased
- sporulation (0-3 scale)

2013 Late Blight – Host/Genotype Interactions
Greenhouse Trials

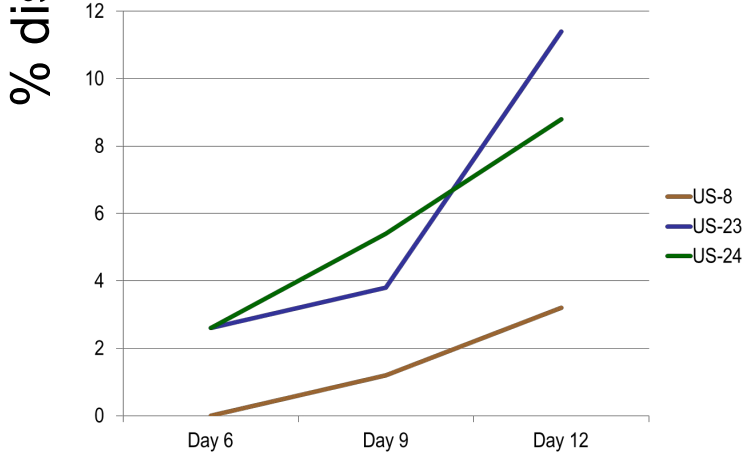
2013 Late Blight – Genotype Aggressiveness
Tomato



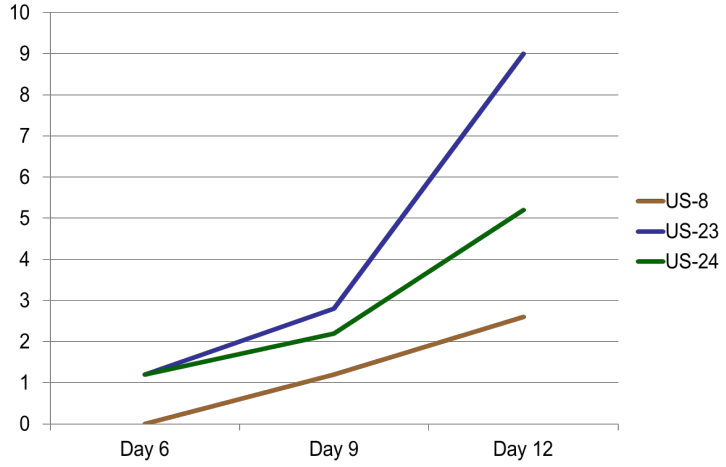
Scotia



Plum Regal



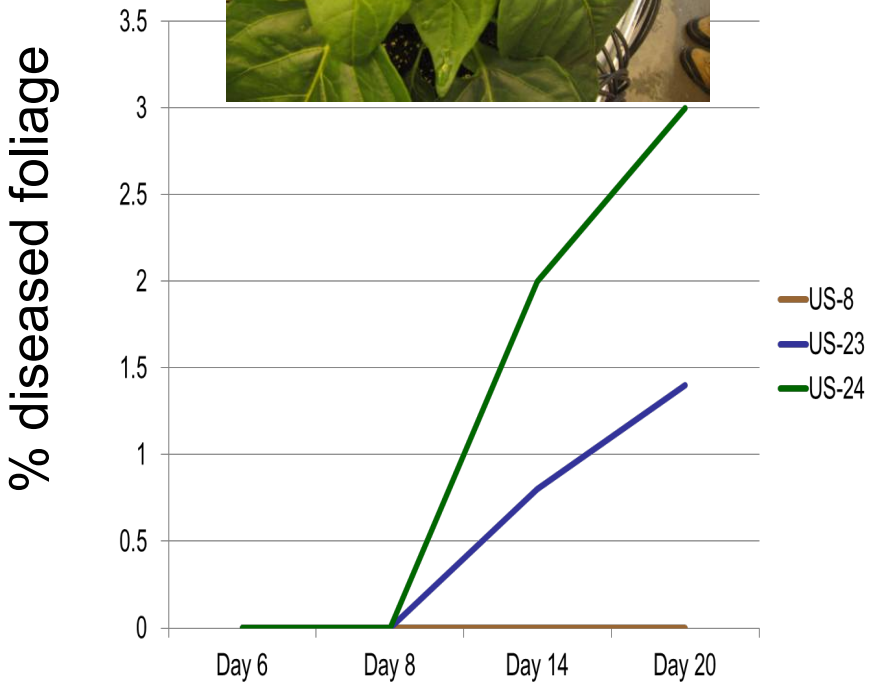
Defiant

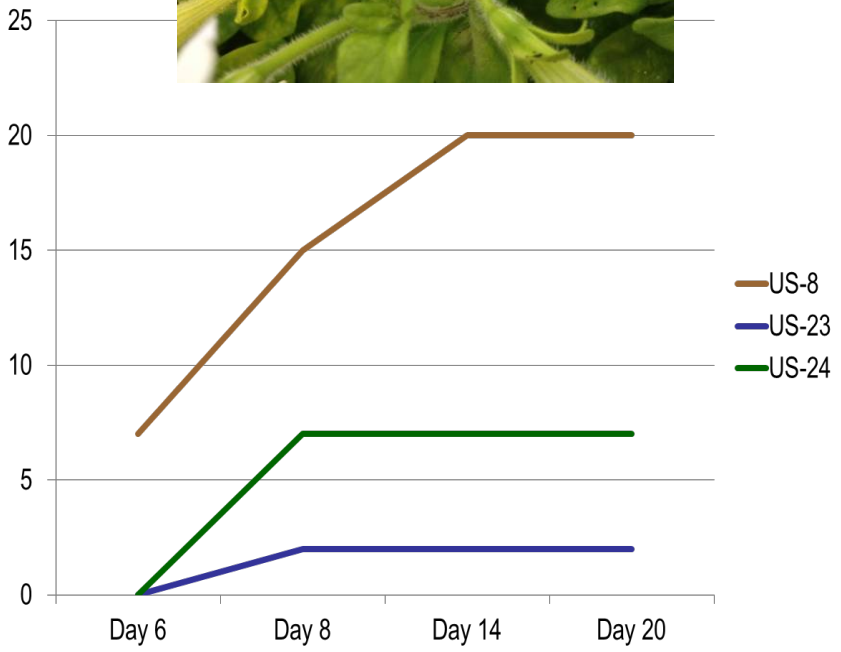


Mountain Magic

Days after inoculation

2013 Late Blight – Genotype Aggressiveness
Pepper and Petunia



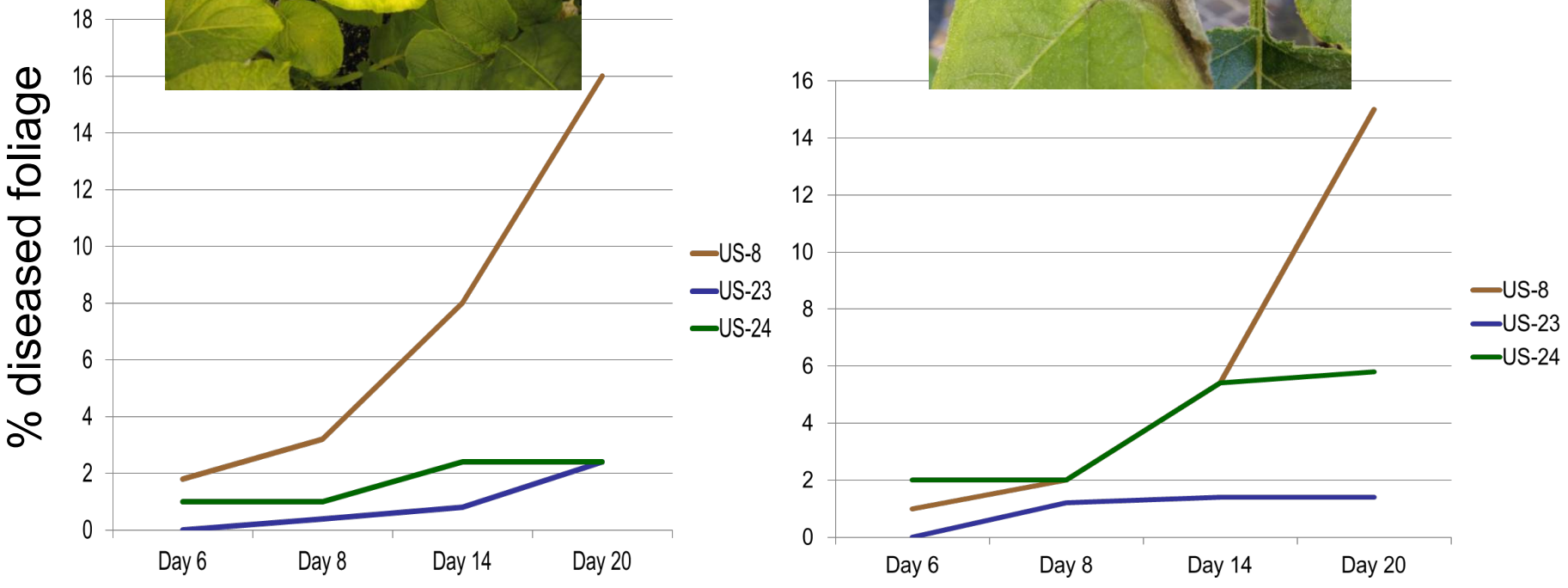


New Ace

Purple Wave

Days after inoculation

2013 Late Blight – Genotype Aggressiveness
Potato



Russet Burbank

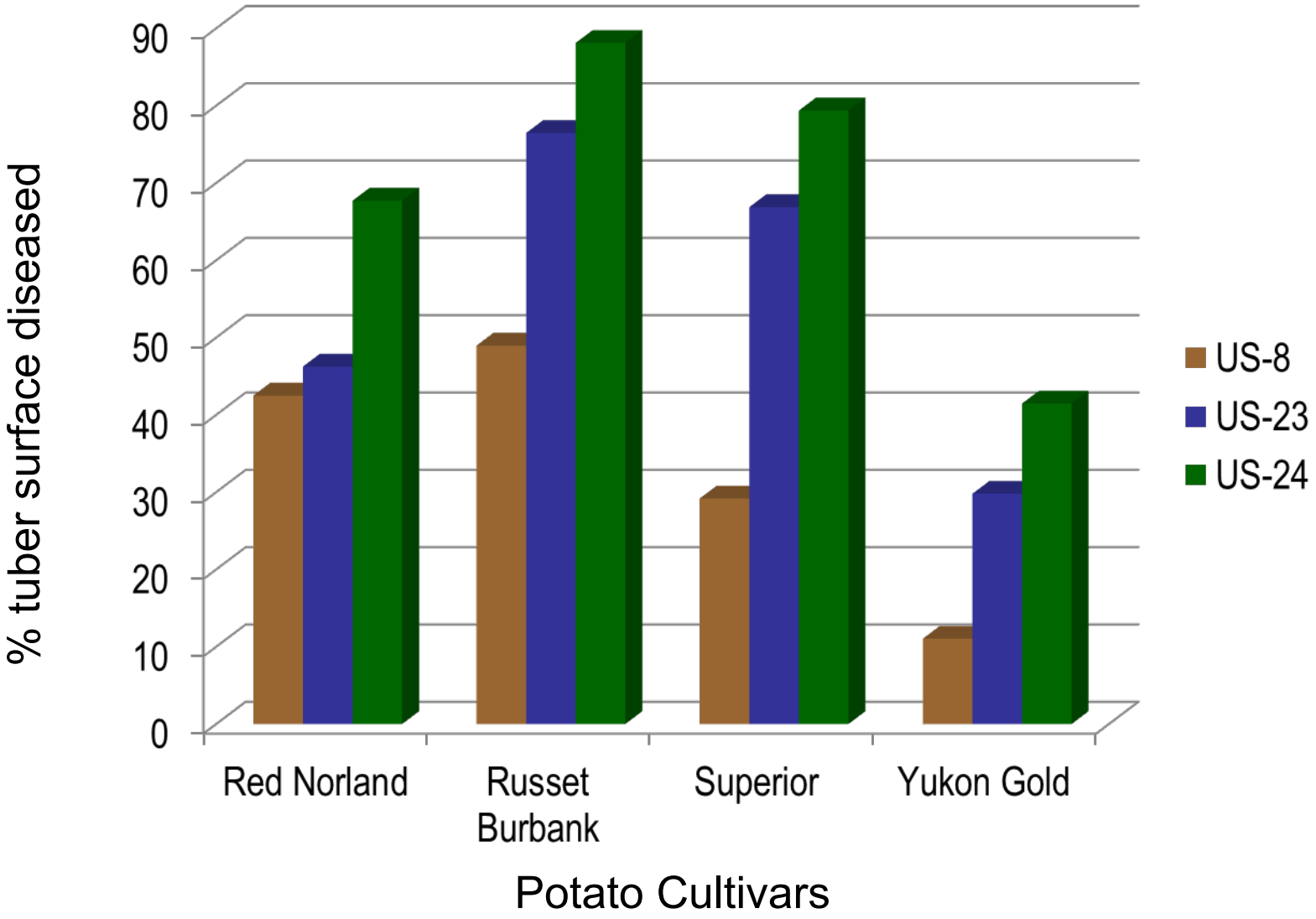
Superior

Days after inoculation

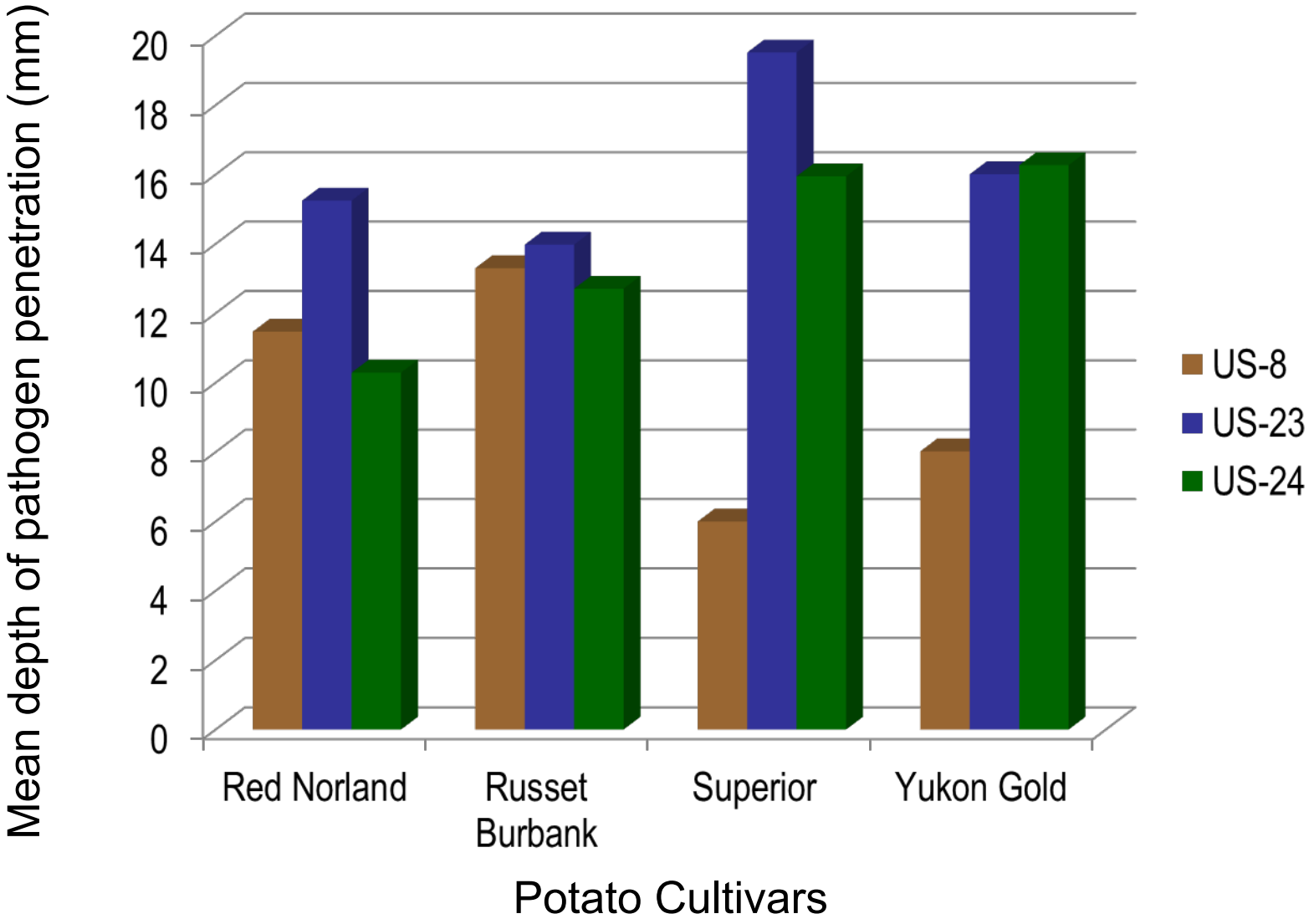
Potato cultivar inoculation trials: US-8, US-23, US-24

Anne MacPhail and Marleen Clark

2013 Late Blight – Genotype Aggressiveness
Potato Tuber Inoculations



2013 Late Blight – Genotype Aggressiveness
Potato Tuber Inoculations



Late Blight (*Phytophthora infestans)*

Summary Comments

- Genotypes vary in host preference and aggressiveness
- US-8 was most aggressive on potato foliage and less so on tomato foliage; conversely, US-23 was most aggressive on tomato foliage and less so on potato foliage; US-24 provided intermediate responses on both hosts
- Some genotypes could produce sporulating lesions on pepper and petunia
- All genotypes were very aggressive on potato tubers
- US-23 now predominant genotype in Canada, but each year, pockets of other genotypes occur, including recombinants
- Tomato varieties with genes for late blight resistance effectively suppress disease development (Mountain Magic, Defiant, Mountain Merit, Jasper, etc.)
- Epidemiology and disease management has been significantly altered following recent strain displacement wave

P. infestans - DISEASE MANAGEMENT

Manage Late Blight in Tomatoes!

- Look for disease in transplants (industry and home-owner awareness)
- Manage the disease in tomatoes grown in home gardens
  - destroy and bag diseased plants
  - grow resistant varieties!
  - awareness of issue in general public

P. infestans - DISEASE MANAGEMENT

Aggressive Home-Gardener Outreach Program

- industry meetings with Garden Centre staff
- meetings with garden clubs
- distribution of free LB-resistant tomato seed
- local and national newspapers, radio and television programs
- posters and brochures
- starting to see results! (no or minimal late blight in PEI, AB in the past 2 years)

Acknowledgments

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P347-CHC-Activity 1-3: Characterization and tracking of strains of the potato blight pathogen in Canada
L01 - AgriInnovation Program – Industry-led Research and Development

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Participating Potato and Tomato Growers

Provincial Government Reps & Diagnostic Clinics

Industry Reps

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Thank you !

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Canada