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Canada



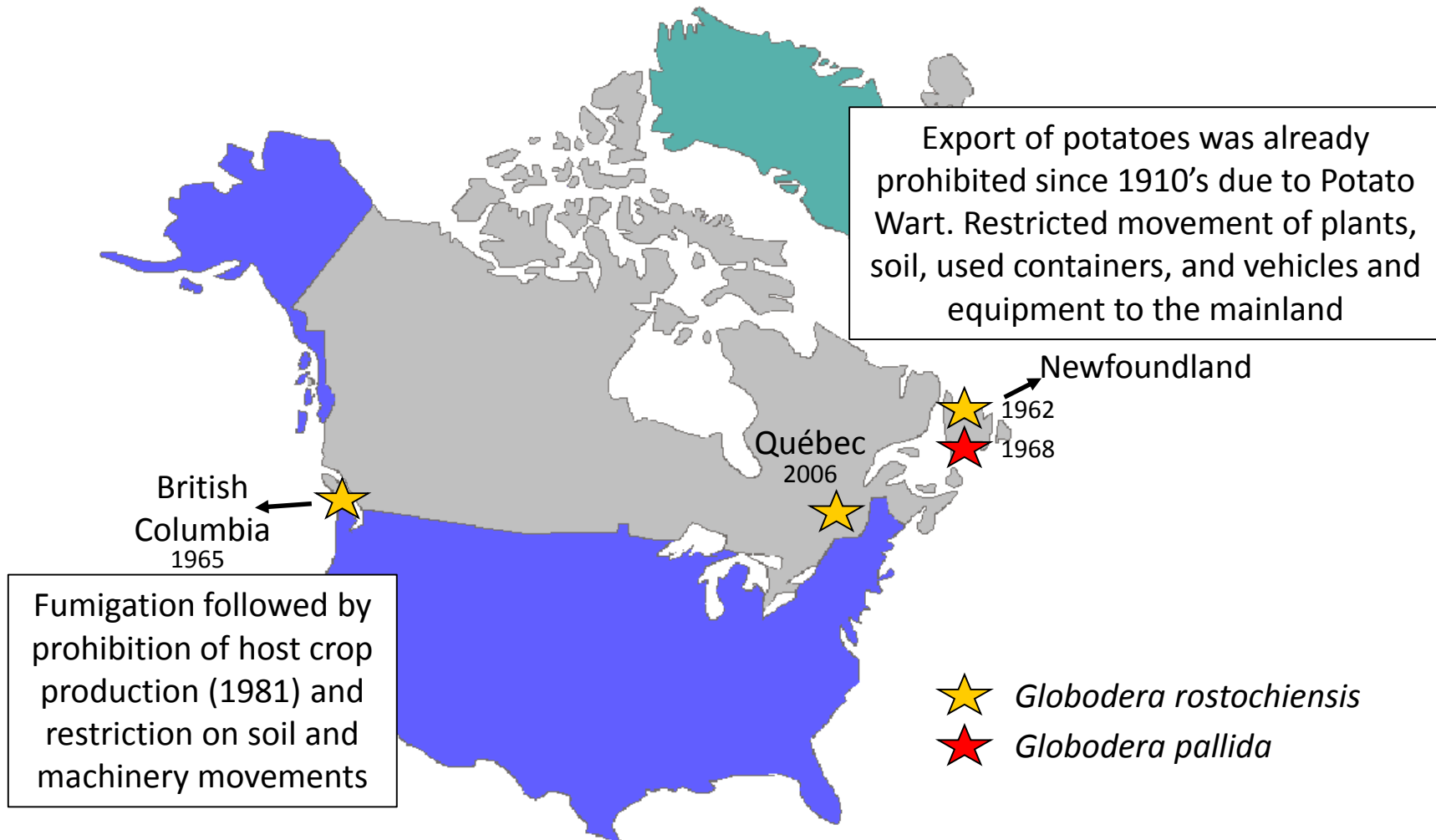
Potato Cyst Nematodes in Canada

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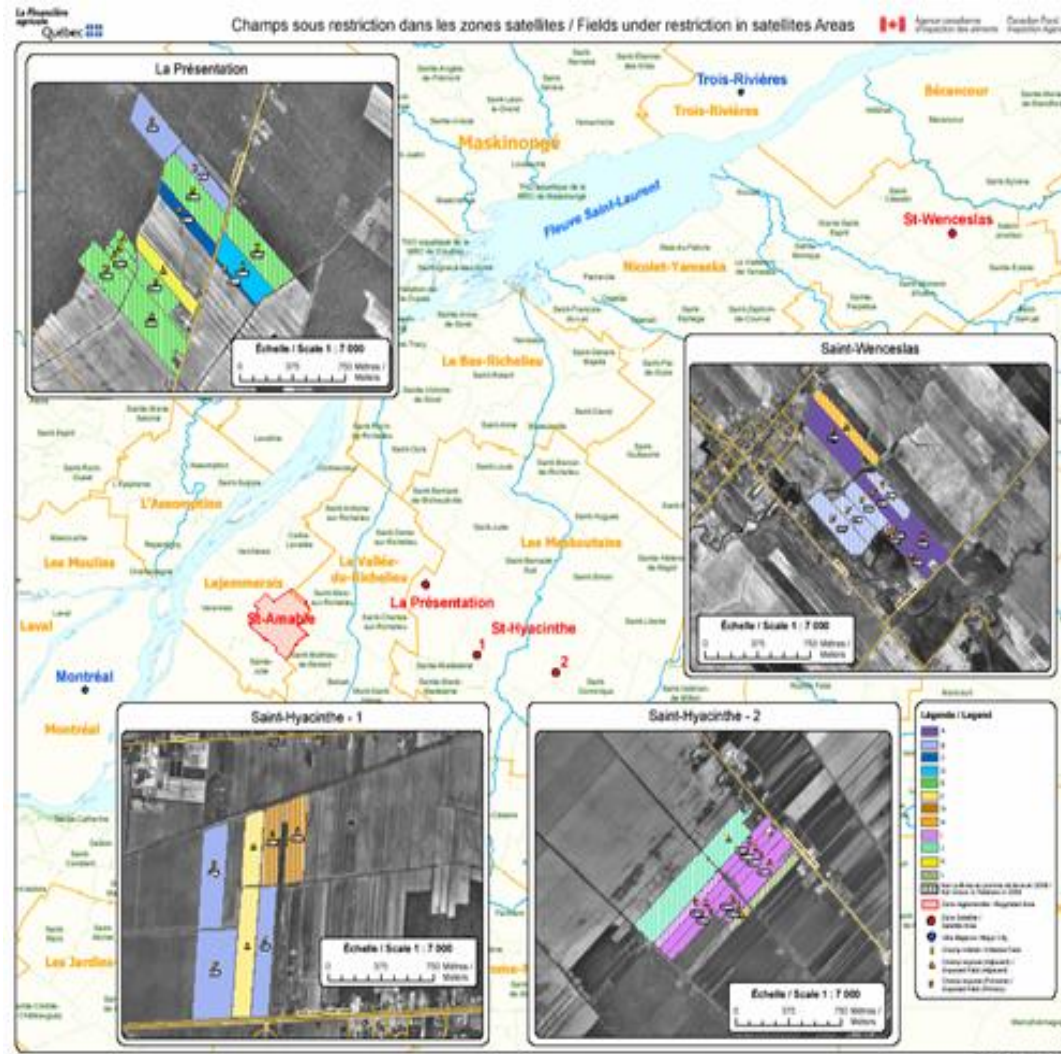


PCN in Canada



Golden nematode in Quebec, Canada

- Regulated pest with quarantine status
- Town of St-Amable
- Four satellite sites
- Overall Quebec regulated acreage : 4750 hectares - 12,000 acres
- Pathotype = Ro1



Regulation of the golden nematode in Quebec, Canada

Canadian Food Inspection Agency (CFIA)

- Prevent the spread
- Eradicate or suppress and maintain PCN populations at low levels
- Establish the conditions for host crop production in regulated areas

Prohibitions or restrictions of movement of regulated articles

including: golden nematode; soil; plants or parts thereof, unless they are cleaned and free of soil; manure; potato plants or parts thereof; tomato and eggplant plants or parts thereof, other than their fruits; machinery, implements and vehicles



Golden nematode in Quebec, Canada

- No fumigation (proximity of residential area; high water table)
- Based on a “live with” philosophy
- Resistant cultivars and rotations with non-host are mandatory
- Tubers and other root vegetables need to be washed before packaging
- Equipment exiting an infested field need to be washed



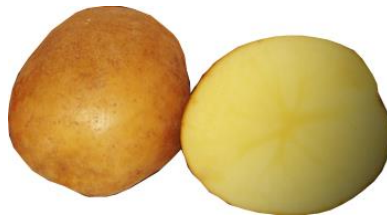
Potato cultivation inside the regulated area in Quebec, Canada

- Cultivars must be resistant to *G. rostochiensis* pathotype Ro1
- in rotation with 2 years of non-host crops (corn, cereals...)

Examples of varieties grown, all for table use:



Red Maria (NY129)



Keuka Gold



Reba



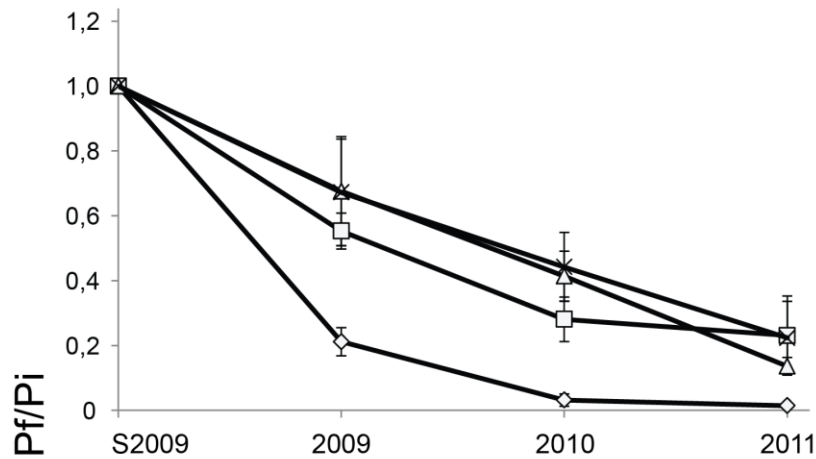
Lehigh (NY126)



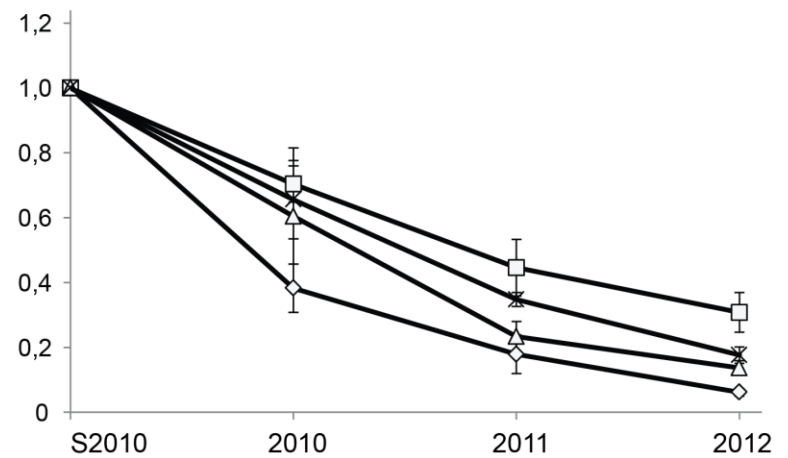
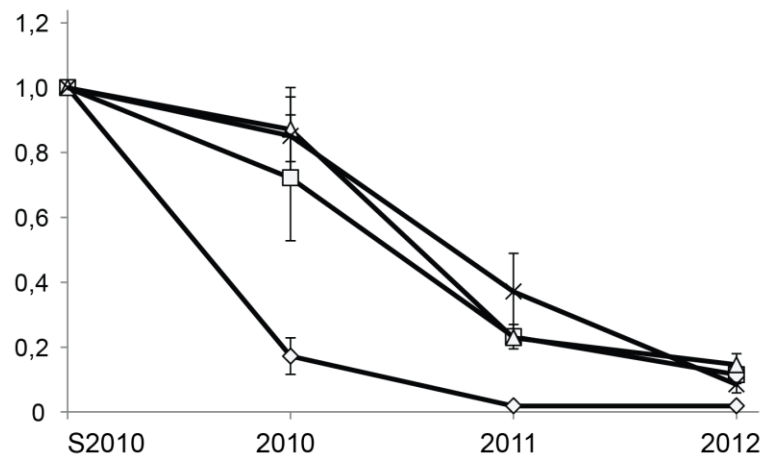
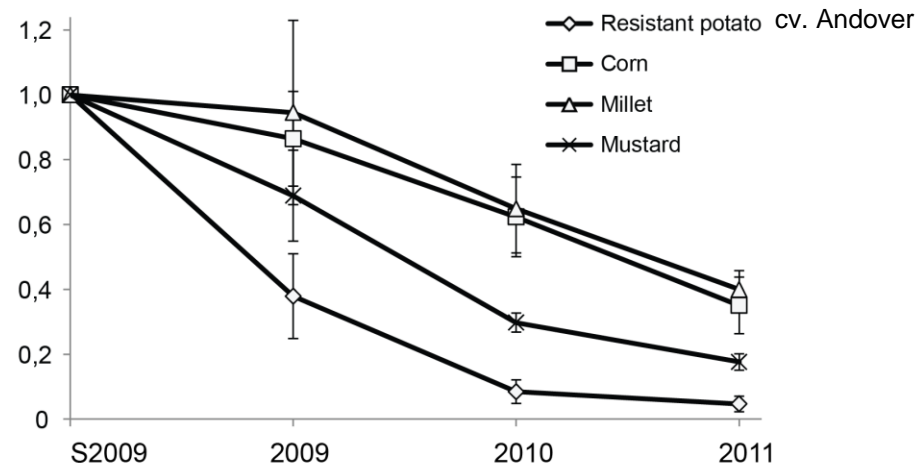
Sifra

G. rostochiensis population reduction following non-host crops or resistant potato

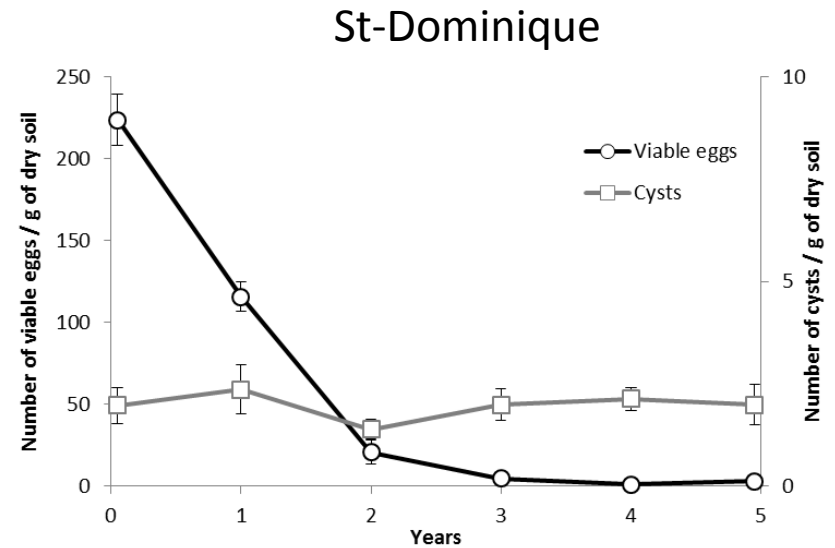
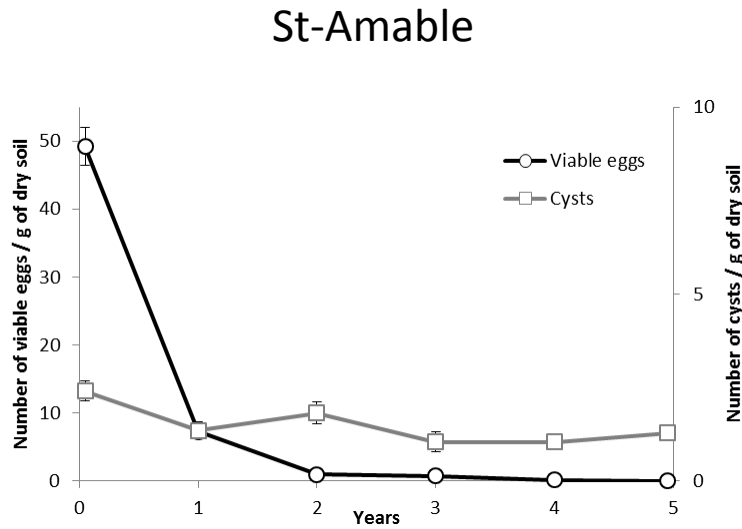
St-Amable



St-Dominique



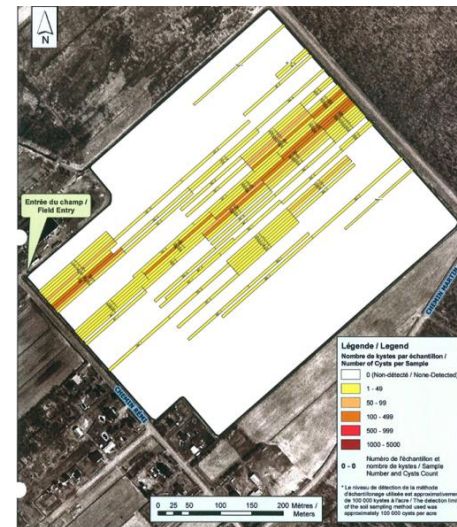
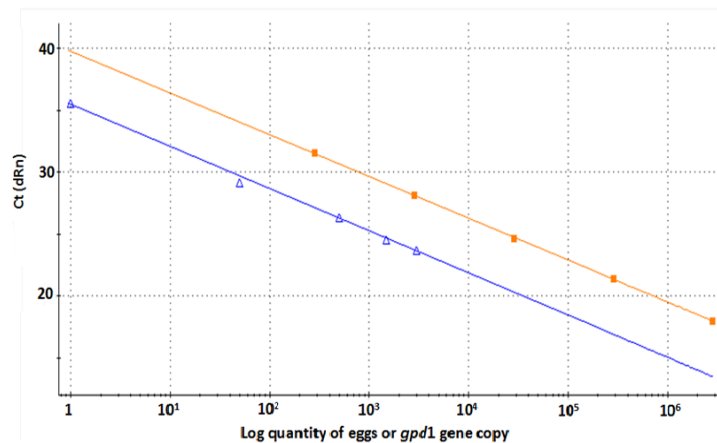
Number of cysts and viable eggs in plots maintained in resistant potato (2008-2012)



Cyst number is not a good indicator of population density

Development of a RT-qPCR assay for the evaluation of egg viability

- Staining or visual evaluation of viability are subjective, imprecise and time-consuming
- mRNA has a rapid turnover after cell death preventing false positive
- RT-qPCR results are expressed as a number of viable eggs by g of soil.
- Good results with *G. rostochiensis*, *G. pallida* and *G. ellingtonae*.



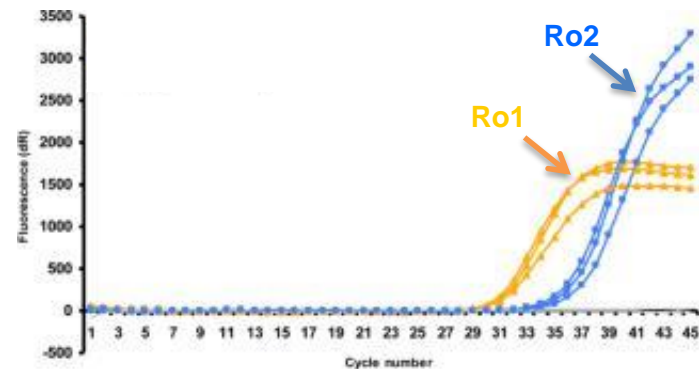
Risk assessment of *G. rostochiensis* in Quebec, Canada

To date, good management with resistant varieties (H1) but need to prevent:

- population shift toward a more virulent pathotype
- new introductions (new genotype, new species, new pathotype)

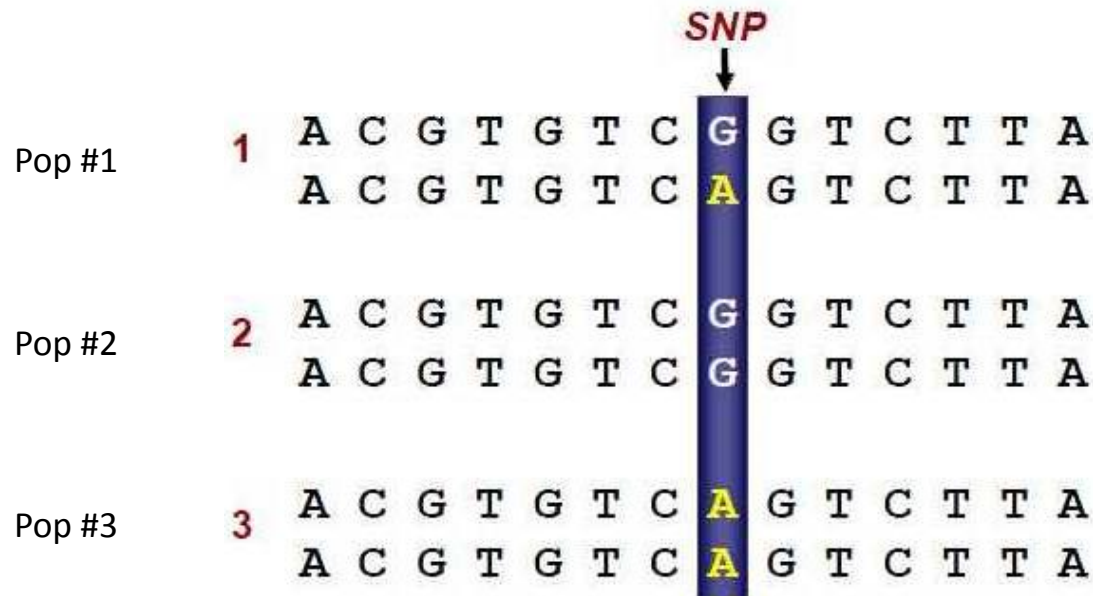
Development of tools for:

- the rapid comparison of population genetics (same pop or not?)
- genome wide association studies (which genes explain pathotype?)
- rapid molecular diagnostic assay for pathotype determination

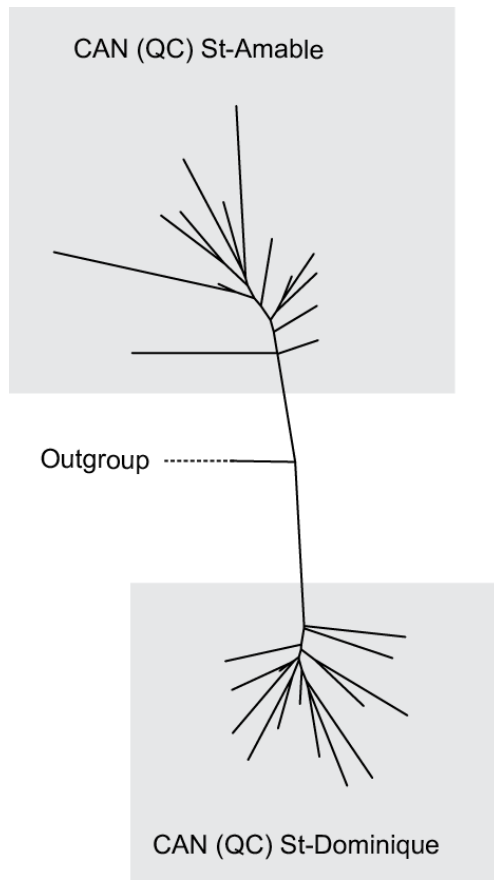


A new method for studying population genetics of cyst nematodes using next-generation sequencing

- Genotyping by Sequencing (GBS)
- Variation in sequences between populations are identified and compared
- Generate thousands of genetic markers (SNPs) in a few steps at low cost!

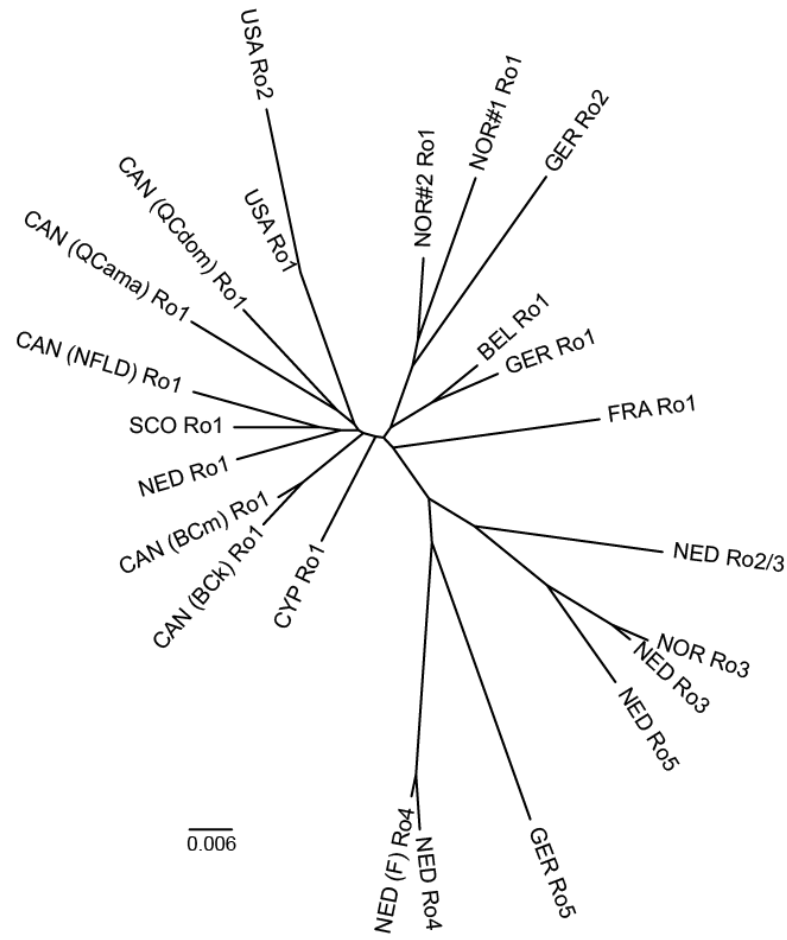


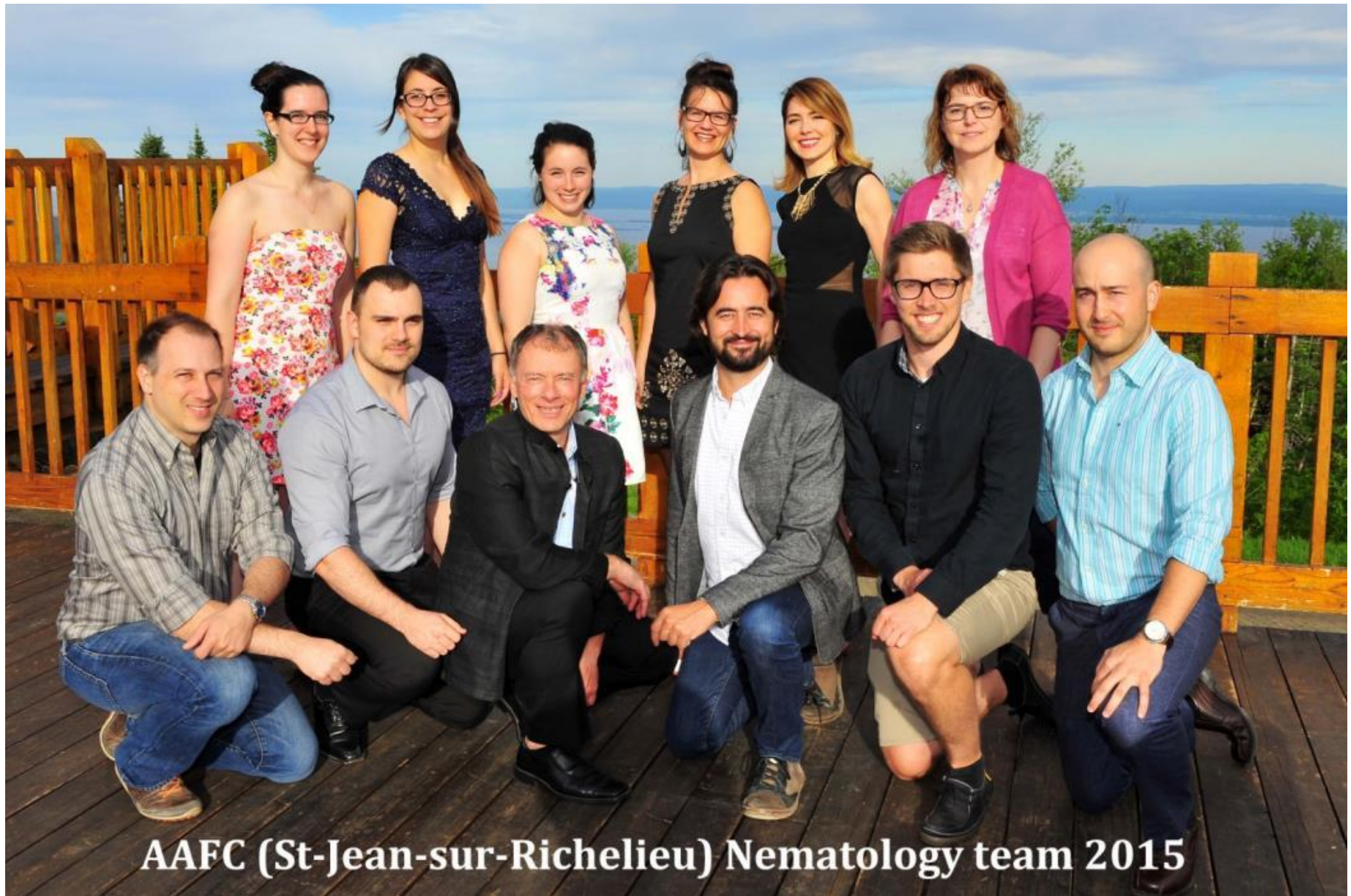
Genetic comparison of *G. rostochiensis* populations from 28 fields from two localities (50 km apart)



- Each branch is a different sample
- High diversity
- Regional structuration
- Possible to retrace the origin of a new positive field
- Useful to find source of introduction and to prevent further dispersal

What are the links between international populations and different pathotypes?





AAFC (St-Jean-sur-Richelieu) Nematology team 2015



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Thanks!

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