GLOBAL NEMATOLOGY

ADVISORY BOARD MEETING
OCTOBER 25, 2019

THE TEAM

- Louise-Marie Dandurand (University of Idaho)
- Benjamin Mimee (Agriculture AgriFood Canada)
- Vivian Blok and John Jones (James Hutton Institute)
- Dee Denver (Oregon State University)
- Eric Greiner (INRA France)
- Xiaohong Wang and Inga Zasada (USDA-ARS)

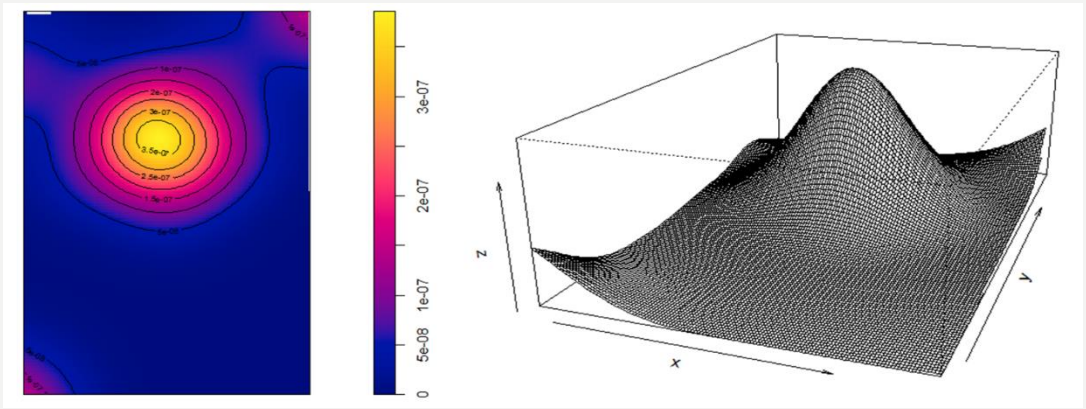
RISK ASSESSMENT

- Potential for invasion and spread
- Spatial analysis and interpolation of invasion for Idaho
- Predicted yield impact
- Genetic diversity of Idaho population
- Global characterization of *Globodera*
- Diagnostic marker development

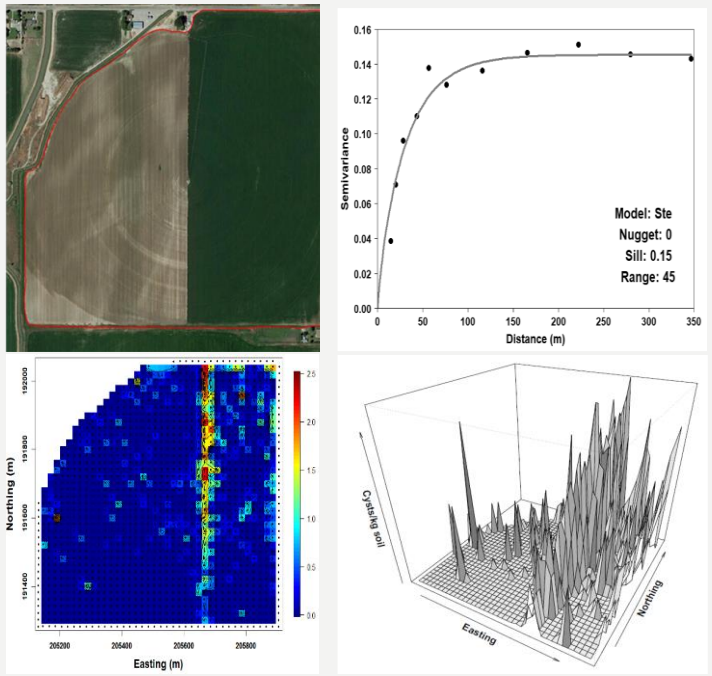
RISK MANAGEMENT

- New and improved genomes
- Increased knowledge of virulence factors
- Novel sources of resistance
- Phenotyping for *Globodera* resistance

INVASION AND SPREAD OF *G. PALLIDA* IN IDAHO



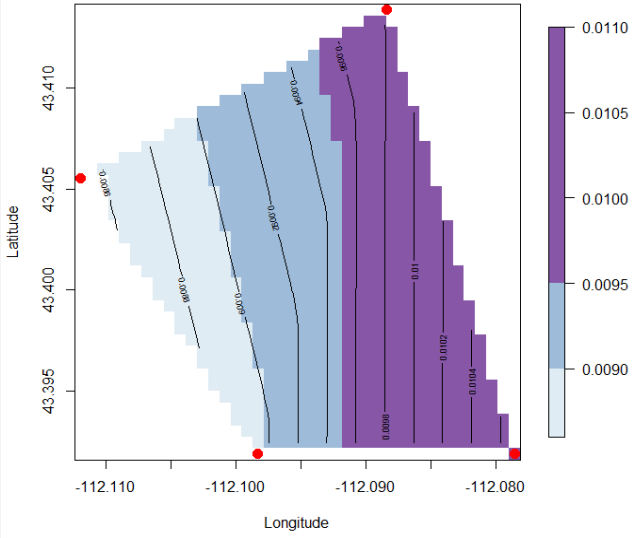
Region



Field

- The infestation in Idaho is highly aggregated and spatially-clustered
- Contagion effect scenario (cysts from one field infested others)
- Spread by equipment contaminated by infested soil

GLOBODERA PALLIDA INTRODUCTION IN IDAHO WAS A SINGULAR EVENT



Max Fst = 0.12

Max Fst = 0.30

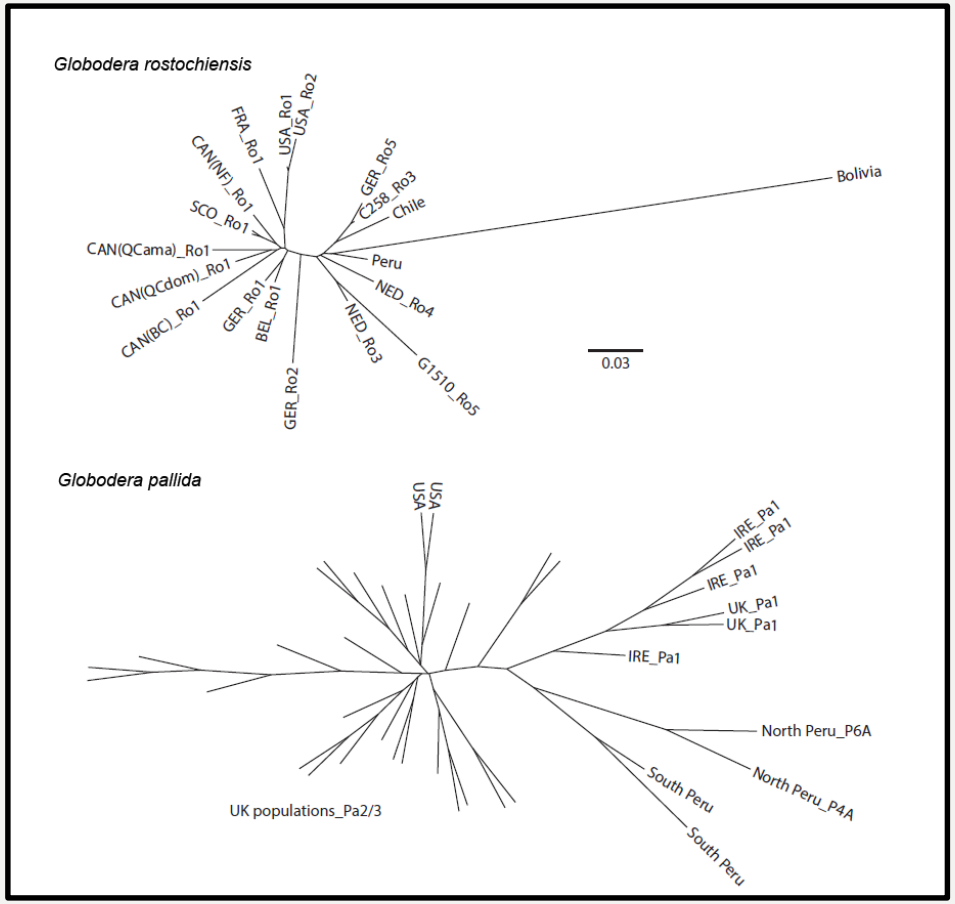
Spatial Analysis

Genetic Analysis

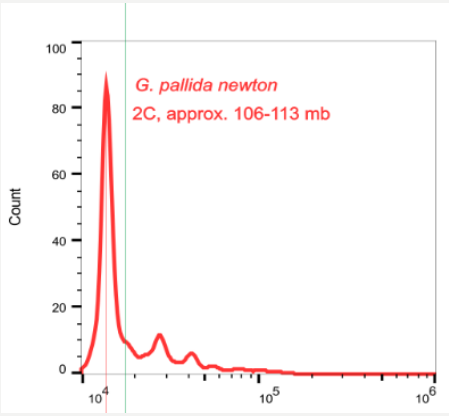
- Low genetic diversity among Idaho *G. pallida* populations; uniform distribution
- Genetic diversity in populations from Scotland is higher than from Idaho

DIVERSITY AND CHARACTERIZATION OF *GLOBODERA* GLOBALLY

- Phylogenetic links between populations
- Confirmed the routes of introduction
- Markers for new introductions from South America
- Markers for pathotypes



NEW AND IMPROVED GENOMES OF *GLOBODERA* SPP.



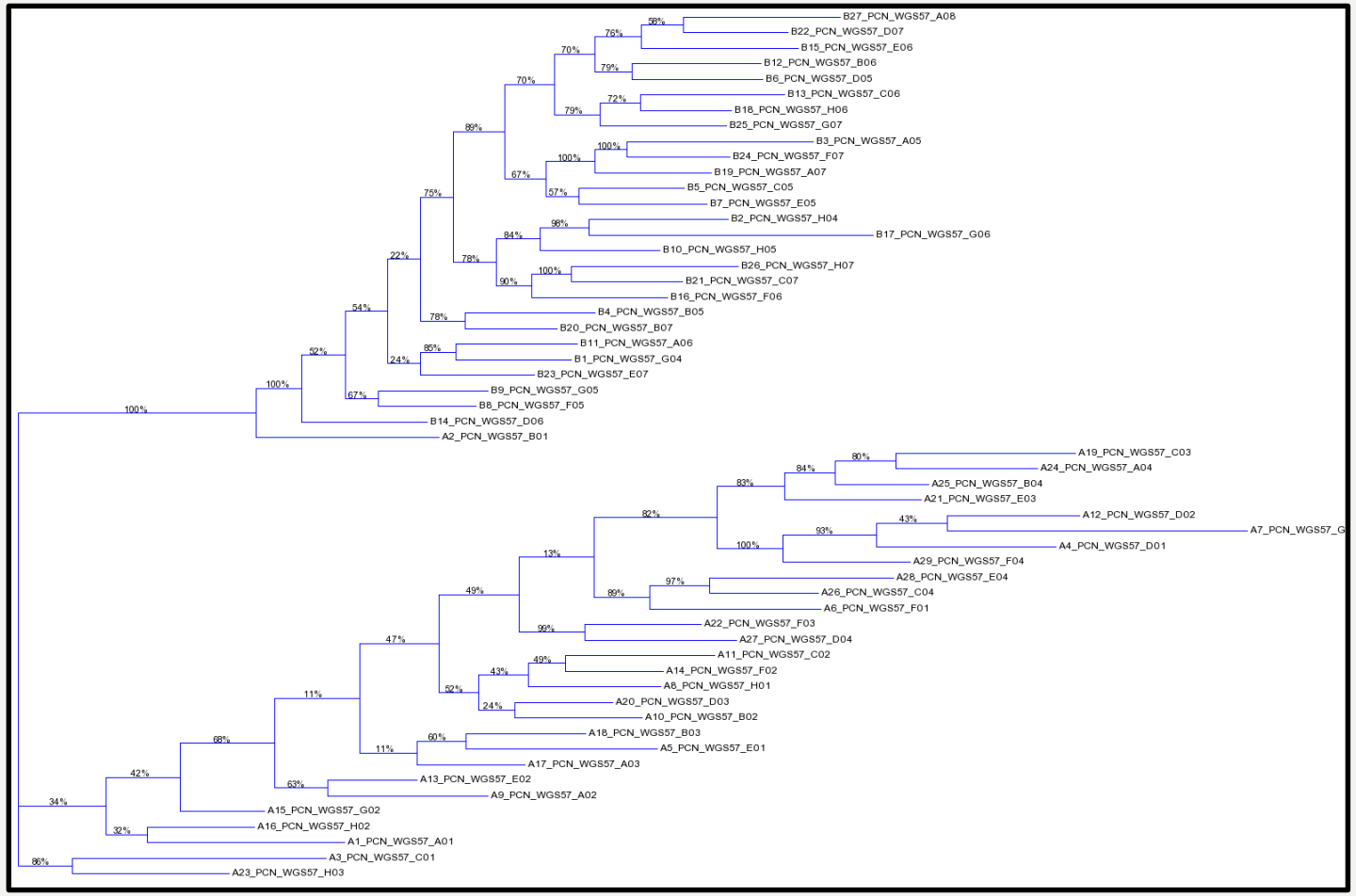
	Published *G. pallida*	New *G. pallida*
Size (Mb)	124.6	119.6
Scaffolds (n)	6,873	163
Scaffold N50 (bp)	121,687	2,251,599
Longest scaffold (bp)	600,076	8,303,766
GC (%)	37	37
Ns (bp)	21,024,229	1,245,593
BUSCO (%)	74 (CEGMA)	94
Predicted genes (n)	16,000	19,088

- ~ 1,250 gene models manually annotated by Jamboree participants
- Retrained annotation contains 16,292 coding regions (Gp = 16,403; Gr=14,308)

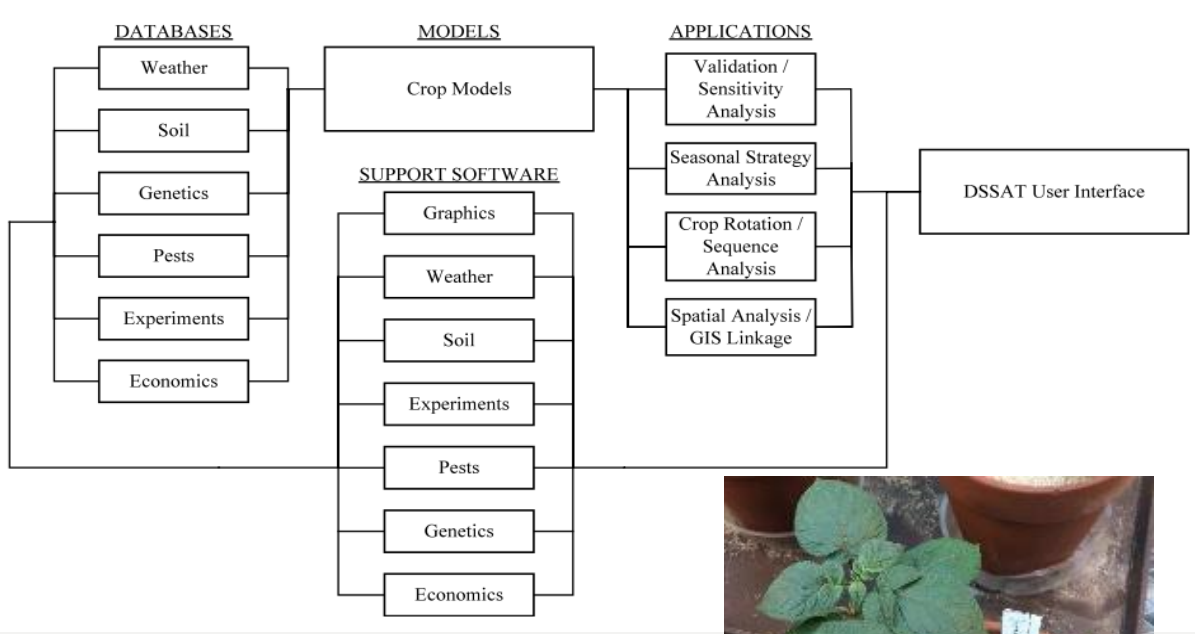
Globodera pallida

Globodera ellingtonae

DIAGNOSTIC MARKER DEVELOPMENT FOR *G. ROSTOCHIENSIS* PATHOTYPES



DECISION SUPPORT SYSTEM FOR AGROTECHNOLOGY TRANSFER - DSSAT



- *Globodera pallida* decreased potato yield:
  - Pi = 10 eggs/g soil – 15%
  - Pi = 20 eggs/g soil – 28%
  - Pi = 40 eggs/g soil – 44%
  - Pi = 80 eggs/g soil – **87%**
- DSSAT potato growth model applied to PCN impact predicts **significant potato yield reduction** in heavily infested fields

EVALUATED > 1,000 GENOTYPES FOR *GLOBODERA* SPP. RESISTANCE

Western x Eden population

Potato varieties

Wild *Solanum* spp.

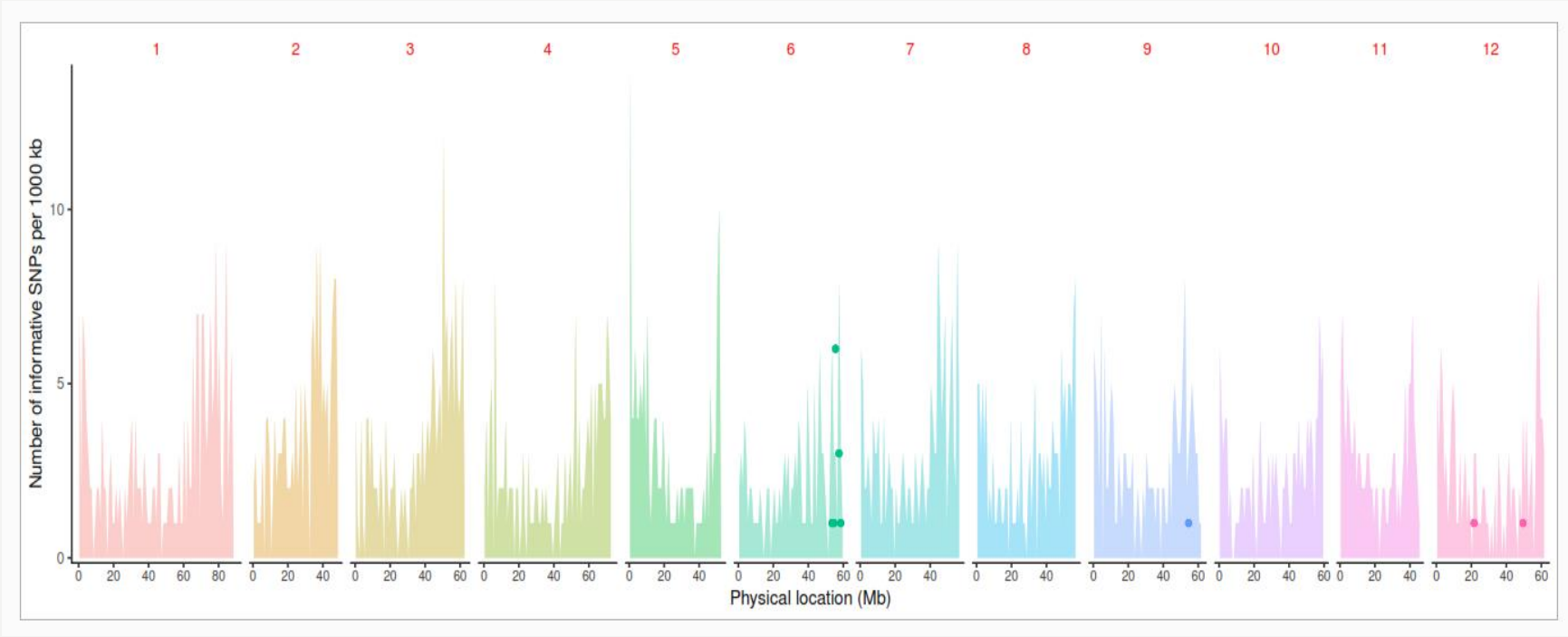
Novel sources of resistance

G. pallida

G. rostochiensis

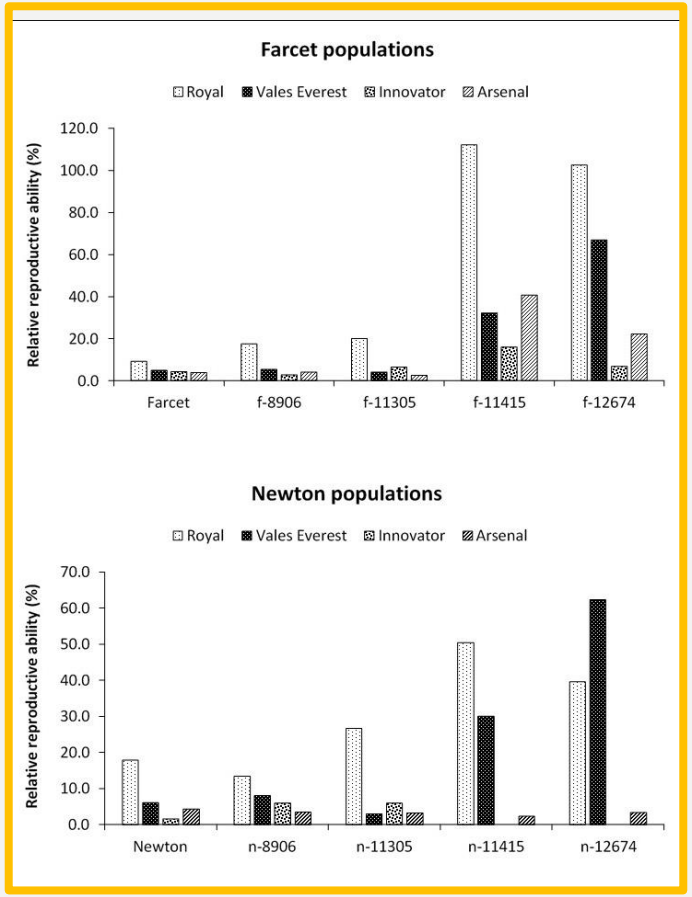
G. ellingtonae

NOVEL SOURCE OF RESISTANCE IN *SOLANUM SPEGAZZINII*



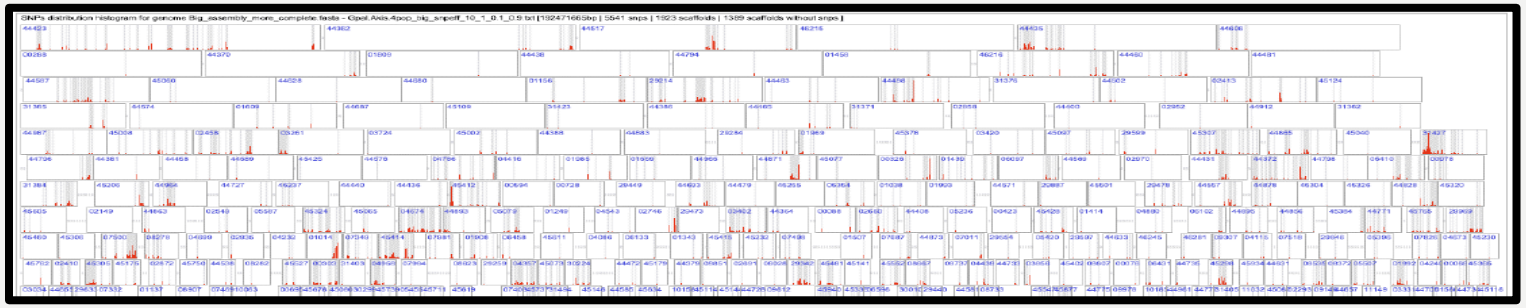
Resistant to *G. pallida* and *G. rostochiensis*

INCREASED KNOWLEDGE OF *G. PALLIDA* VIRULENCE FACTORS

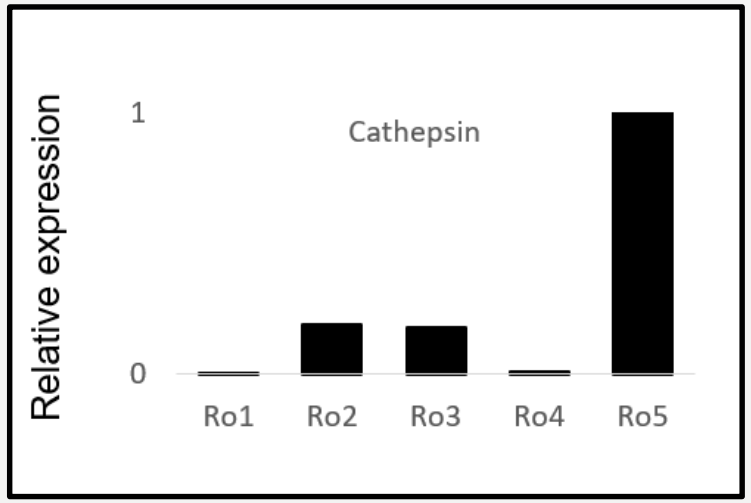


G. pallida exposed to varieties with partial resistance may break 'Innovator' resistance

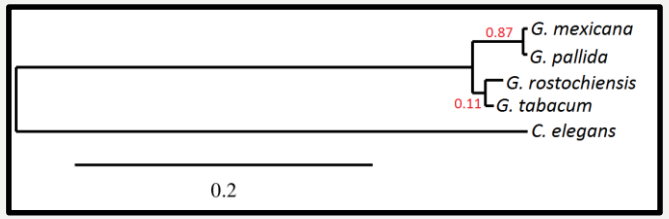
Genome regions showing variation identified and virulence candidates identified



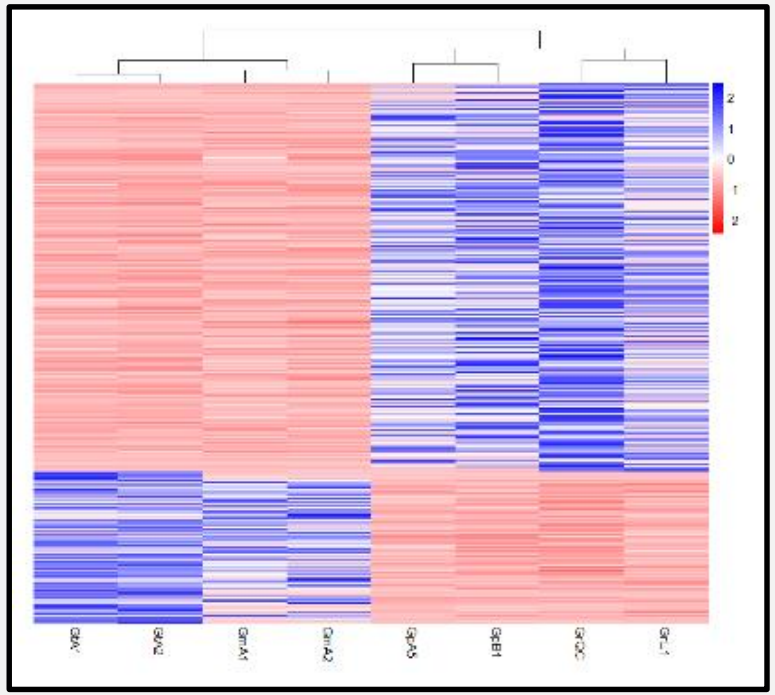
TRANSCRIPTOMIC INSIGHTS INTO *GLOBODERA* BIOLOGY



Gene expression between *Gr* pathotypes



Genes involved in host specificity



Analysis of survival and hatching transcriptomes

OTHER OUTCOMES

- 4 post-doctoral scholars included in research efforts
- 5 graduate students trained
- ~ 20 publications
- 4 GLOBAL Nematology symposia at national/international meetings
- > 40 presentation given to stakeholders and scientific communities

FUTURE??

- How do we keep this productive collaboration alive?
- Continued need to share resources and methodologies to more rapidly advance science
- Continued cross laboratory training of students