



Emerging threat of ring nematode in Ontario's Fruit Crop Production: What we know so far

Brock
University

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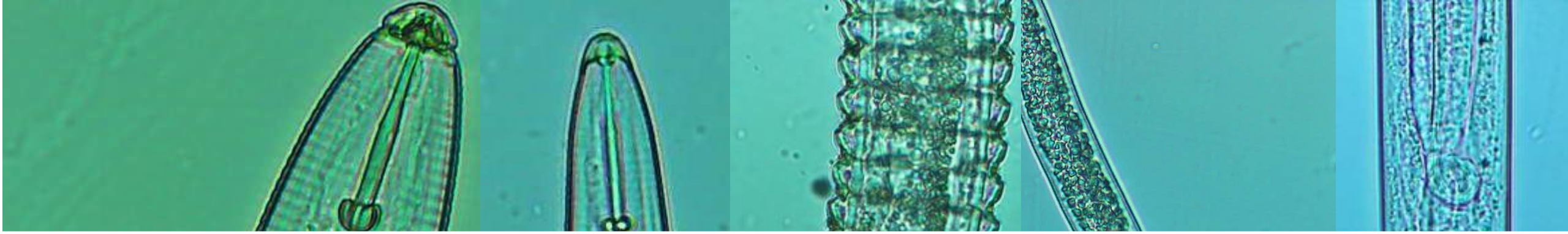
Canada
Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada



INTRODUCTION

- Ontario contributed 27.7% of Canada's total fruit production in 2021.
- Ontario's total farm gate value: \$225 m.
- High-value fruit crops: apples, peaches, plums, cherries, nectarines, etc.
- Production hampered by several factors e.g. **plant parasitic nematodes**

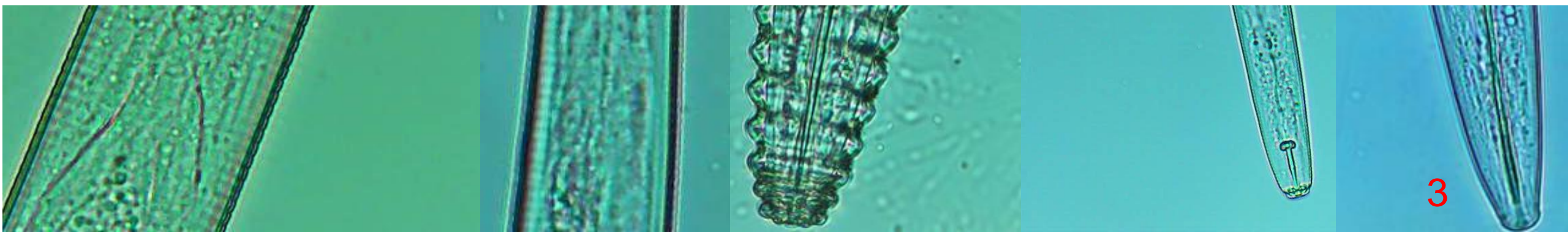




INTRODUCTION

- Plant parasitic nematodes cause considerable economic losses in fruit crops.
- Cause damage by feeding on roots and predisposing plants to secondary infection.
- Global impact of nematodes on crop yields, estimated at **\$80 billion annually**.

Jones et al 2013



INTRODUCTION

- Ring nematodes (*Mesocriconema*) pose a significant threat to crop production.
- Other names: *Criconemoides*, *Criconemella*
- Distributed globally, North America: 1511 species.

Powers et al., 2021, Wouts, 2006

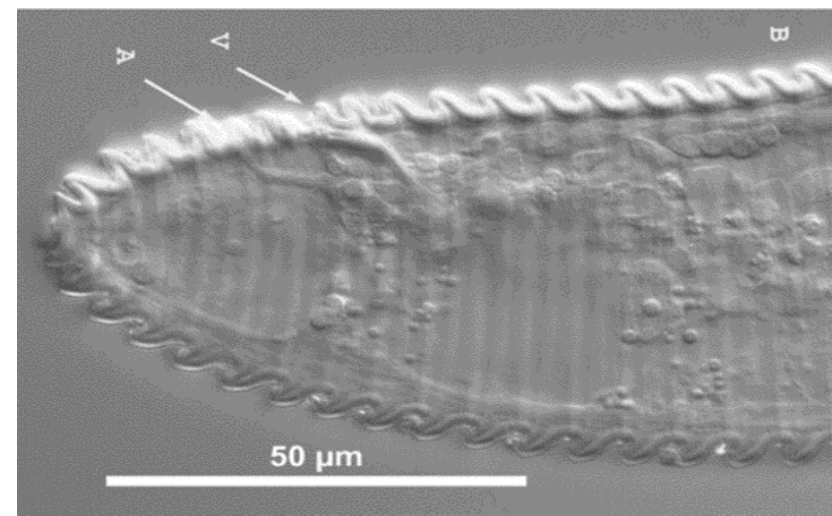
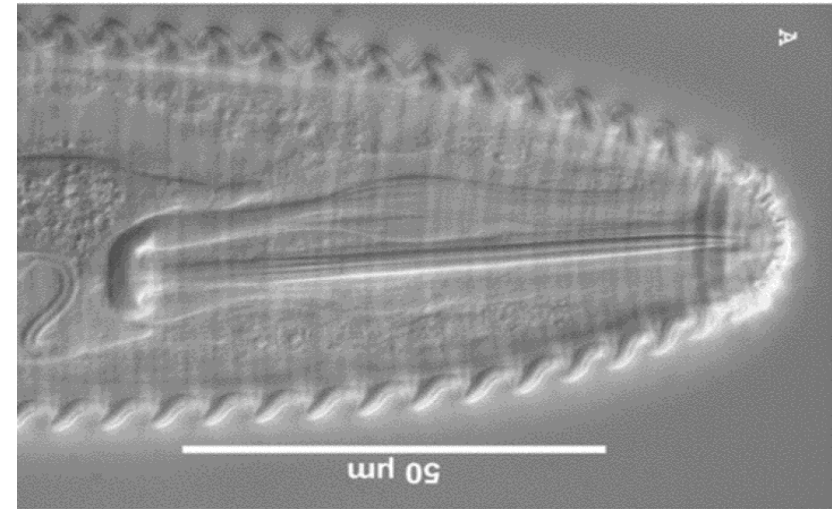


Survival Strategies

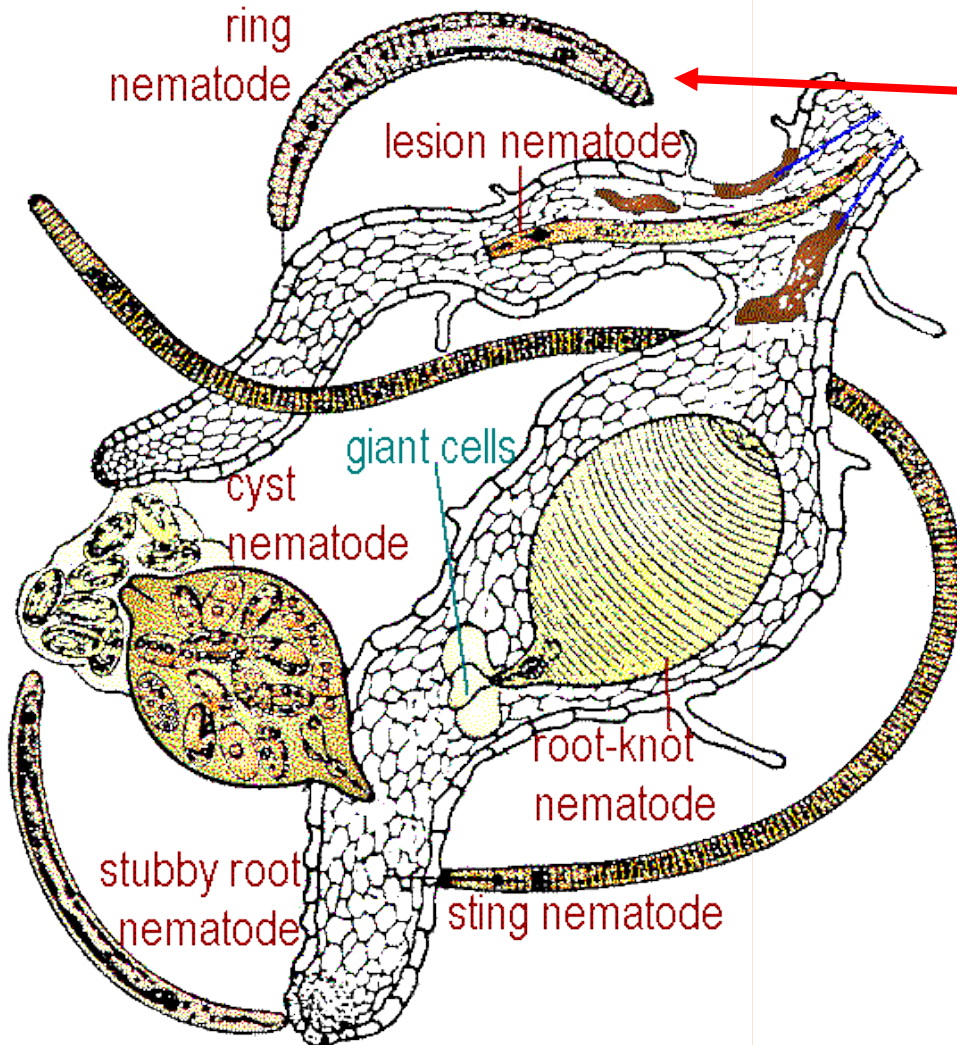
- Poorly dispersed
- Lack survival strategies
- Preferred natural environments
- Indicators for biogeographical analysis

INTRODUCTION

- Adapted to disturbed environments e.g. *Mesocriconema xenoplax*.
- Feed on wide range on agricultural crops
- Preferred host: perennial crops such as orchards
- Second most important nematodes in orchards in BC



INTRODUCTION



USDA, 2020

- Pierce root cells from the soil outside of the plant.
- Feeding can reduce 85% of root biomass.
- Estimated to reduce 58% of vine growth in British Columbia.
- Yield reduction occurs when populations reach 6-8 rings / g of soil.



- Makes *Prunus* trees more susceptible to peach tree short life (PTSL).
- Predisposes *Prunus* spp. to bacterial canker.



Management

- Restriction of most nematicides.
- Wide host range limits crop rotation.
- Rootstocks in BC did not exhibit any resistance.

Why this research



Reports of the Tree Fruit Decline (TFD) disease in Canada

- TFD can affect 50% of newly established trees
- Cause 10% mortality of orchards annually.



Preliminary studies shows that viruses and nematodes may contribute to TFD.



No studies on the relationship between ring nematode and orchards production in Ontario.

Objective

Conducted a systematic study in various fruit orchards in Ontario to **assess the frequency and distribution of *Mesocriconema xenoplax***, aiming to inform critical management decisions.

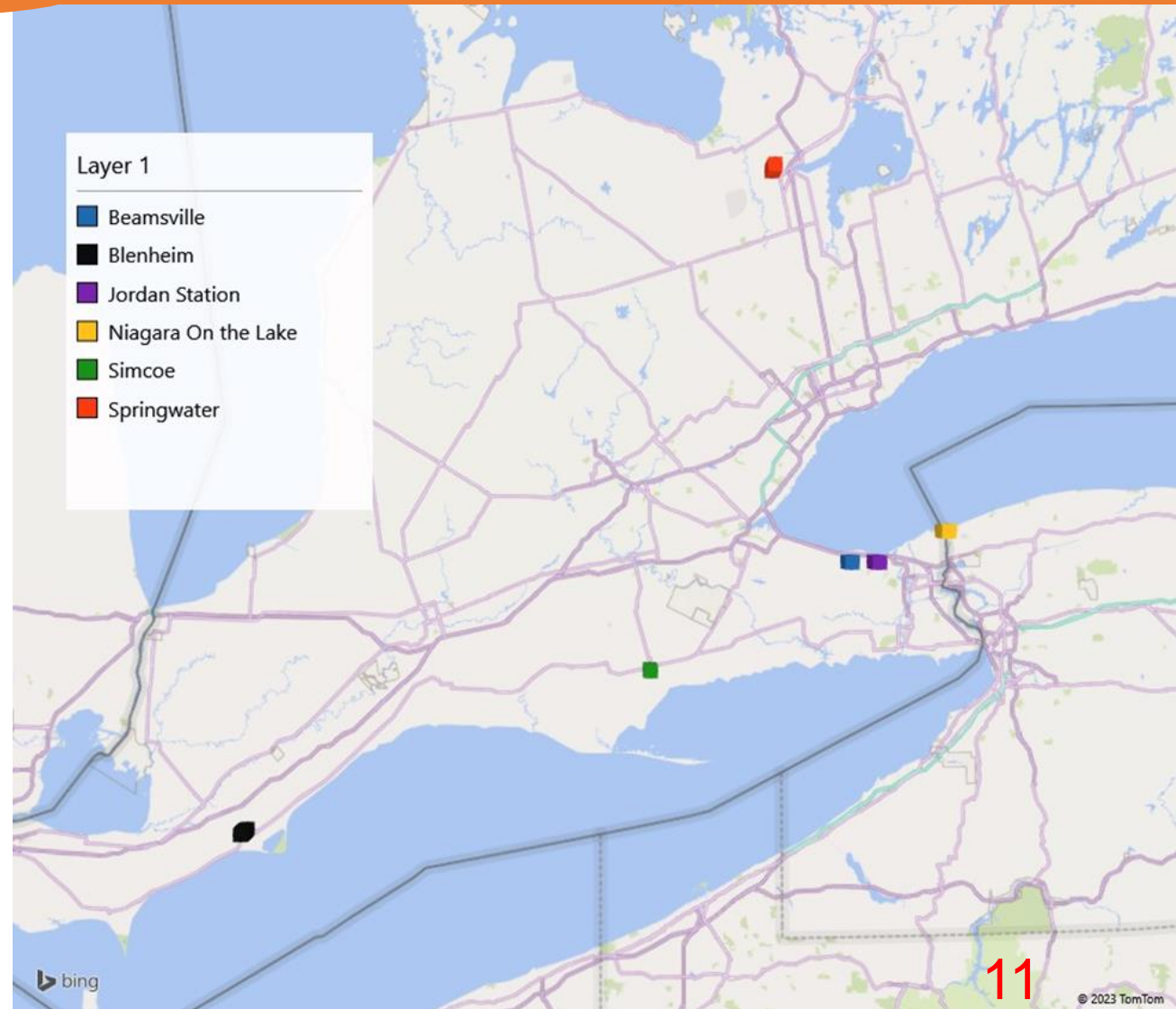
Materials and Methods

Soil sample collection locations

- ❑ Six different locations

Study crops

- ❑ Apples
- ❑ Peaches
- ❑ Apricots
- ❑ Plums
- ❑ Sweet cherries



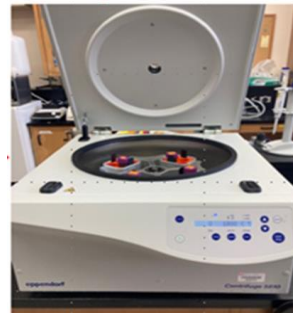
Materials and Methods

Soil sampling



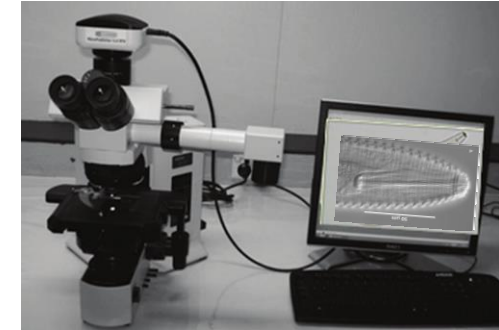
Soil probes: 20 cores
at 20m² area.

Nematodes extraction

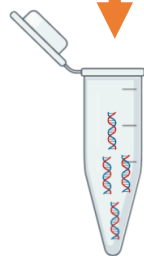


Centrifugation: 100g soil

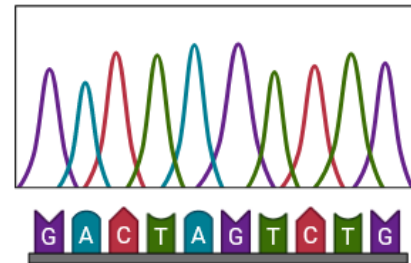
Morphological identification



Count total number and id



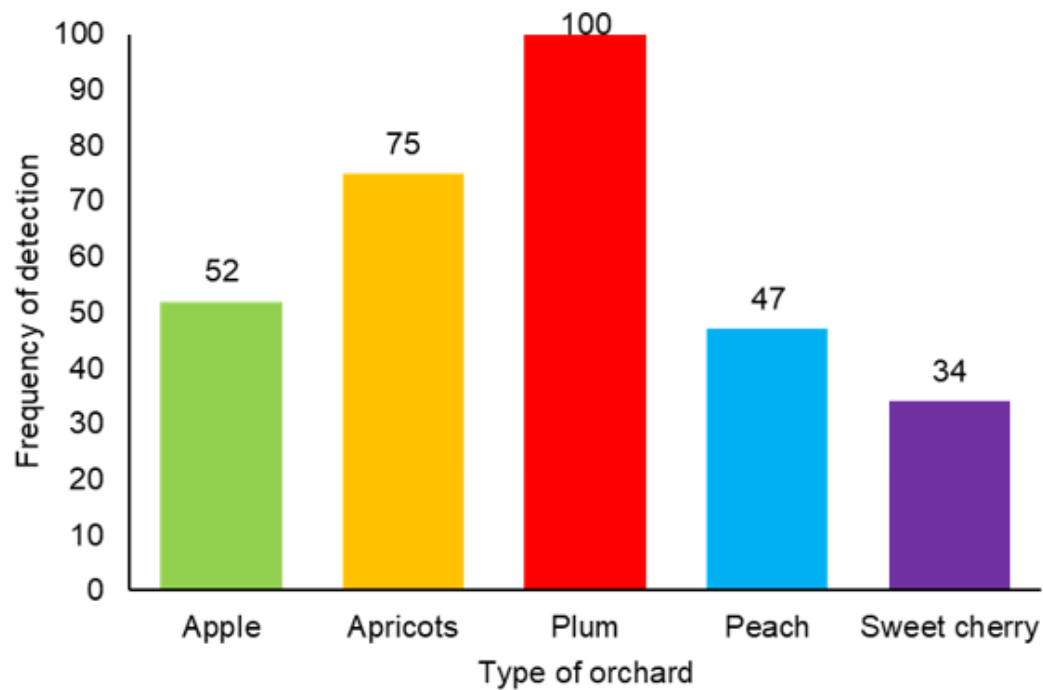
DNA extraction



Molecular identification

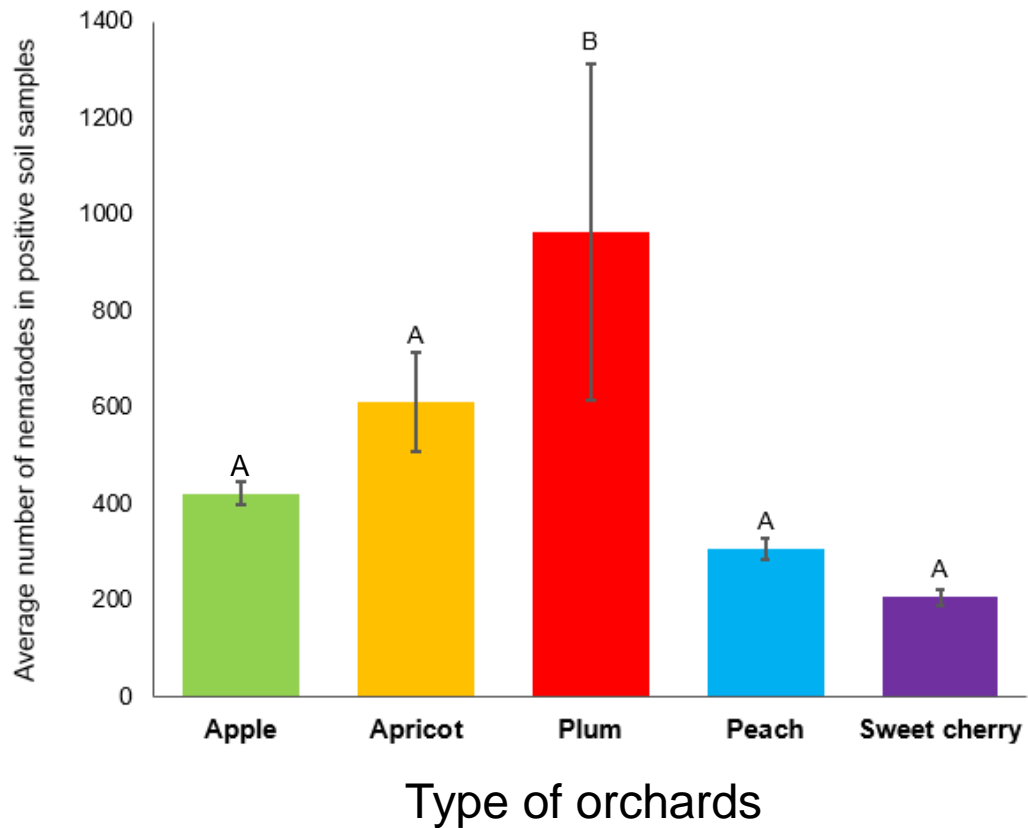
RESULTS AND DISCUSSION

The frequency of detection (%) *M. xenoplax* in orchards in Ontario



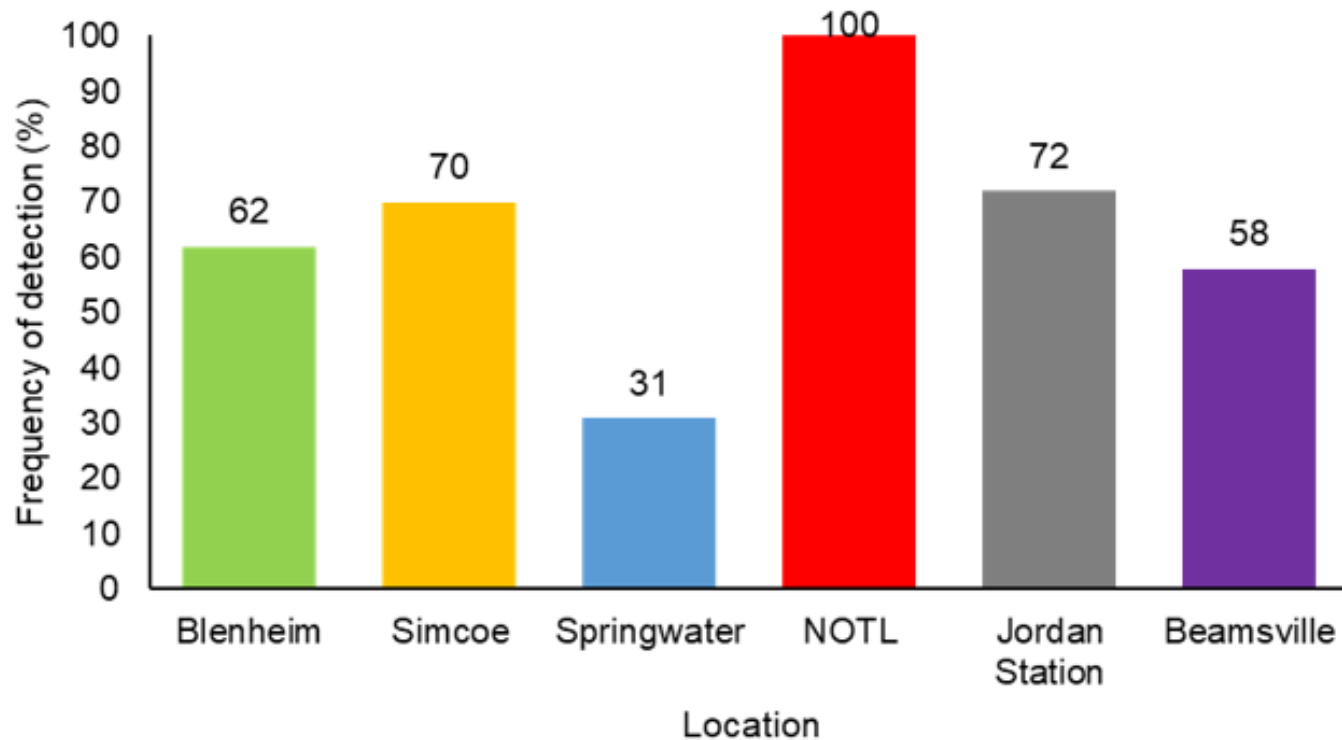
- High incidence of *M. xenoplax* in apricots and plums orchards.
- Apple: 52% detection in ON, compared to 51% in British Columbia orchards.
- Sweet cherry had the lowest number of samples with *M. xenoplax* (79% in BC).

Prevalence of *Mesocriconema xenoplax* in orchards in Ontario



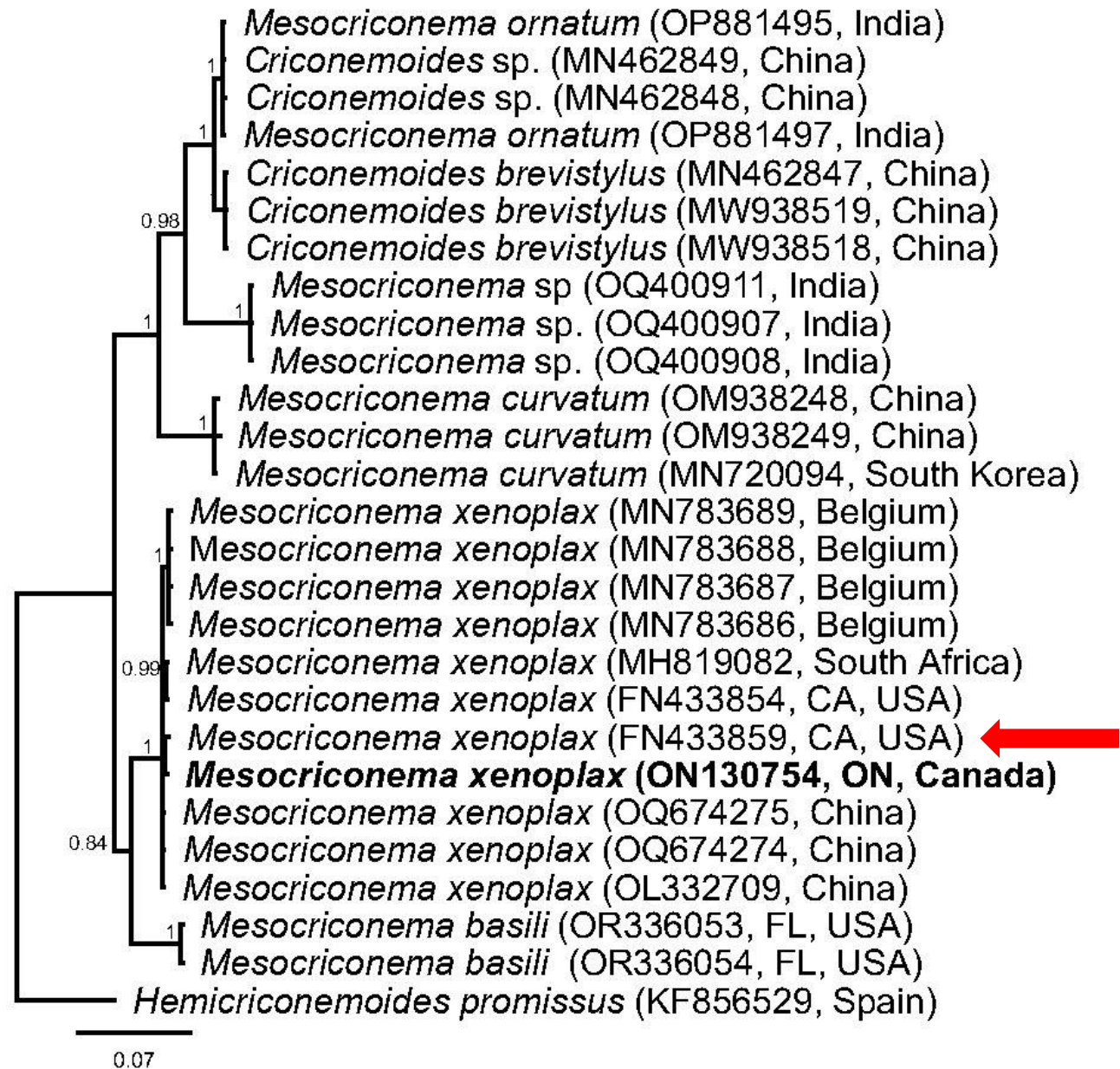
- Plum had the highest number of *M. xenoplax* (965 rings /Kg of soil).
- Apricot had the second highest (612 rings /Kg of soil).
- Sweet cherry recorded the least population (207/kg rings / kg of soil).

The frequency of detecting *M. xenoplax* at study locations



- All sample fields in NOTL had *M. xenoplax*.
- All locations except Springwater had more than 50% of orchards testing positive for *M. xenoplax*.

Phylogenetic analysis




% identity with US population: 99.86

The study resulted in the first report of ring on Apricots in Ontario

Disease Note

Diseases Caused by Nematodes

First Report of *Mesocriconema xenoplax* from Apricots (*Prunus armeniaca*) in Ontario, Canada

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Conclusion and Future Recommendations

- High prevalence and frequency of occurrence of *Mesocriconema xenoplax* in Ontario's orchards could significantly impact fruit production .
 - The detection of *M. xenoplax* in all soil samples from Niagara-on-the-Lake requires urgent attention from growers and all stakeholders.
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- Need to determine whether aggressive populations exists.
 - Assessment of rootstocks / self-rooted orchards resistance against *M. xenoplax*.



THANK YOU

