Development of Harmonized Clubroot Maps

Y. Aigu, S.E. Strelkov, B. Ziesman, D. Froese, S.F. Hwang and M. Harding

April 30th, 2020
Objectives

Work conducted as part of **CARP Project** No. 2018.20

Funded by **Alberta Canola**, **SaskCanola**, and the **Manitoba Canola Growers**

**Three main objectives:**

- Examine the feasibility of a harmonized clubroot map
- Determine what such a map would look like
- Communicate results with stakeholders, including the Clubroot Steering Committee
Well established in Canada by the early 20th century

Isolated reports from home and market gardens in Alberta and Manitoba starting from 1920s

Observed for the first time on the Canadian canola crop in 1997 in Quebec (Morasse et al. 1997)

- Alberta
  First infested fields identified in 2003
  3353 fields with confirmed clubroot symptoms as of 2019

- Saskatchewan
  First infested fields identified in 2008
  60 fields with confirmed clubroot symptoms as of 2019

- Manitoba
  First infested field identified in 2009
  35 fields with confirmed clubroot symptoms as of 2019

> 98% of the harvested hectares of Canadian canola
Each province has its rationale for presenting the data

- Number of infested fields with clubroot symptoms
  - Number of infested fields with clubroot symptoms
  - Infested fields without symptoms
- Maximum quantity of spores per gram of soil
Confirmed clubroot infested fields by symptom observation

Collection of the data over a **large number of fields** should **NOT** be:

- Prohibitively expensive
- Labor intensive
- Time consuming

Increasingly important consideration as the extent and intensity of the **epidemic grows**

- **X** Resting spore detection
- **X** Resting spore quantification
- **✓** Confirmed clubroot infested fields by symptom observation
- Any clubroot specific spot in the field?
- Check canola roots at the main entrance
This project was started using **ArcGIS**

Switched to use:

* More *customizable* software
* *Non-proprietary* and *free*

Three type of maps were created:

**Static maps**

* Made for paper publication
* ggplot2 package
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**Animated maps**
- Made for slide presentation
- ggplot2 and ganimate packages
Animated maps

Clubroot case in Alberta by county
Year: 2005

Clubroot case in Alberta
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- **Animated maps**
  - Made for slide presentation
  - **ggplot2** and **ganimate** packages

- **Interactive maps**
  - Made for website
  - **Leaflet** package
There is no technical limitation to create a harmonized map.

The main limitation becomes the inability of different parties to share data.

The occurrence of clubroot in Alberta and Saskatchewan.
Next steps

1. **Continue to improve the maps:**
   - Add supplementary information (Pathotype, Resistance breaking isolate ...)
   - Develop more interactive map (increase the number of selectable data)

2. **Combine clubroot data with complementary data:**
   - Crop rotation for each field (2009 – 2018)
   - Meteorological or pedological data

3. **Modeling using the clubroot data:**
   - Infested field area
   - Minimum convex polygon (MCP)
Acknowledgements

Victor Manolii, University of Alberta

Agricultural Fieldmen, County and Municipal Staff

Funders:

Canola Growers via the Canola Agronomic Research Program (CARP) administered by the Canola Council of Canada