Canadian Food Inspection Agency | Agence canadienne d'inspection des aliments

Canadian Food Inspection Agency

Our vision:
To excel as a science-based regulator, trusted and respected by Canadians and the international community.

Our mission:
Dedicated to safeguarding food, animals and plants, which enhances the health and well-being of Canada's people, environment and economy.

Research Progress on Potato Zebra Chip Disease

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Canada

Graft-transmission of Lso

Lso Infected Tomato/Potato

Graft to Potato

Atlantic, Jemseg	4 Weeks
Shepody	4 Weeks
Frontier Russet	3 Weeks
Russet Norkotah	4 Weeks
Red Pontiac	4 Weeks

CK-

1. All potato varieties tested were susceptible
2. Symptom appeared 4 weeks after graft-transmission
3. Tubers generated had typical Zebra chip symptoms
4. Re-grafting from disease potato plant produced the disease.
5. PCR positive.

Greenhouse-grown latently infected tomato

1. Two tomato varieties tested showed high tolerance to Lso
2. Some foliar symptoms appeared in some plants 4 weeks after graft-transmission
3. PCR positive.
4. Re-grafting from PCR+ tomato plant to potato plant caused ZC disease.

ZC Infected Tomato/Potato

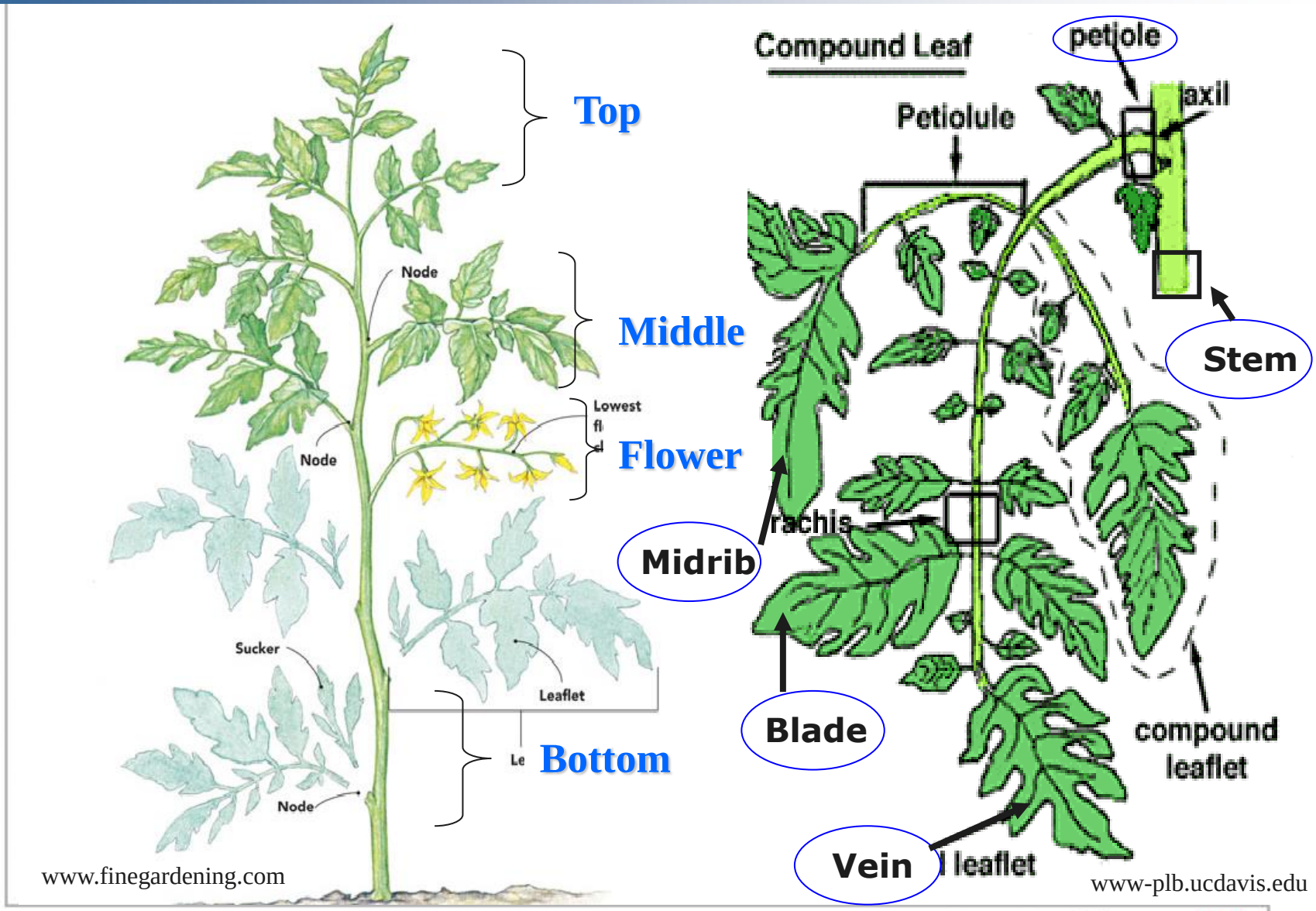
Graft to Tomato

- **Roma**
- **Moneymaker**

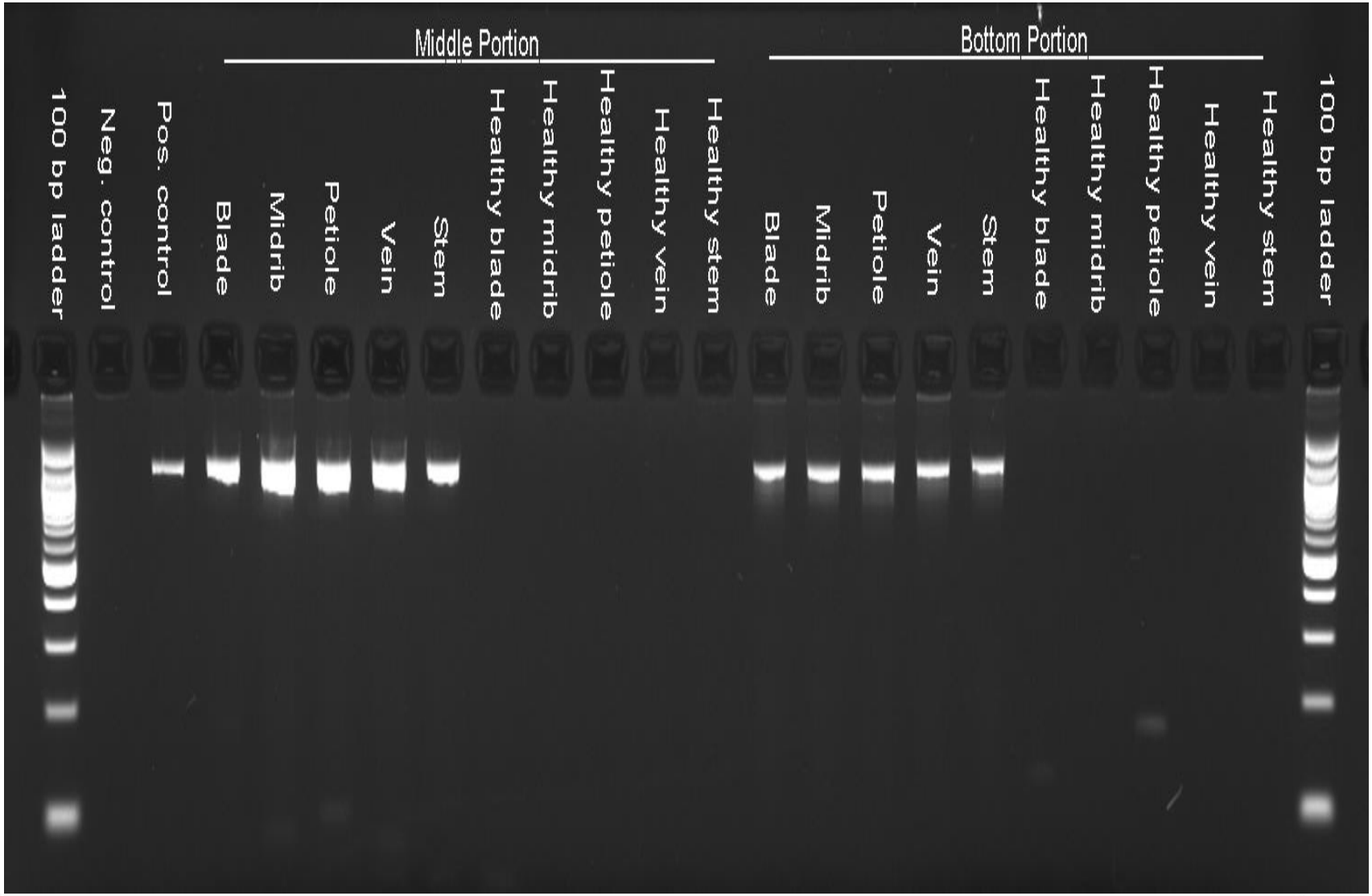
Healthy Tomato

Latently Infected Tomato

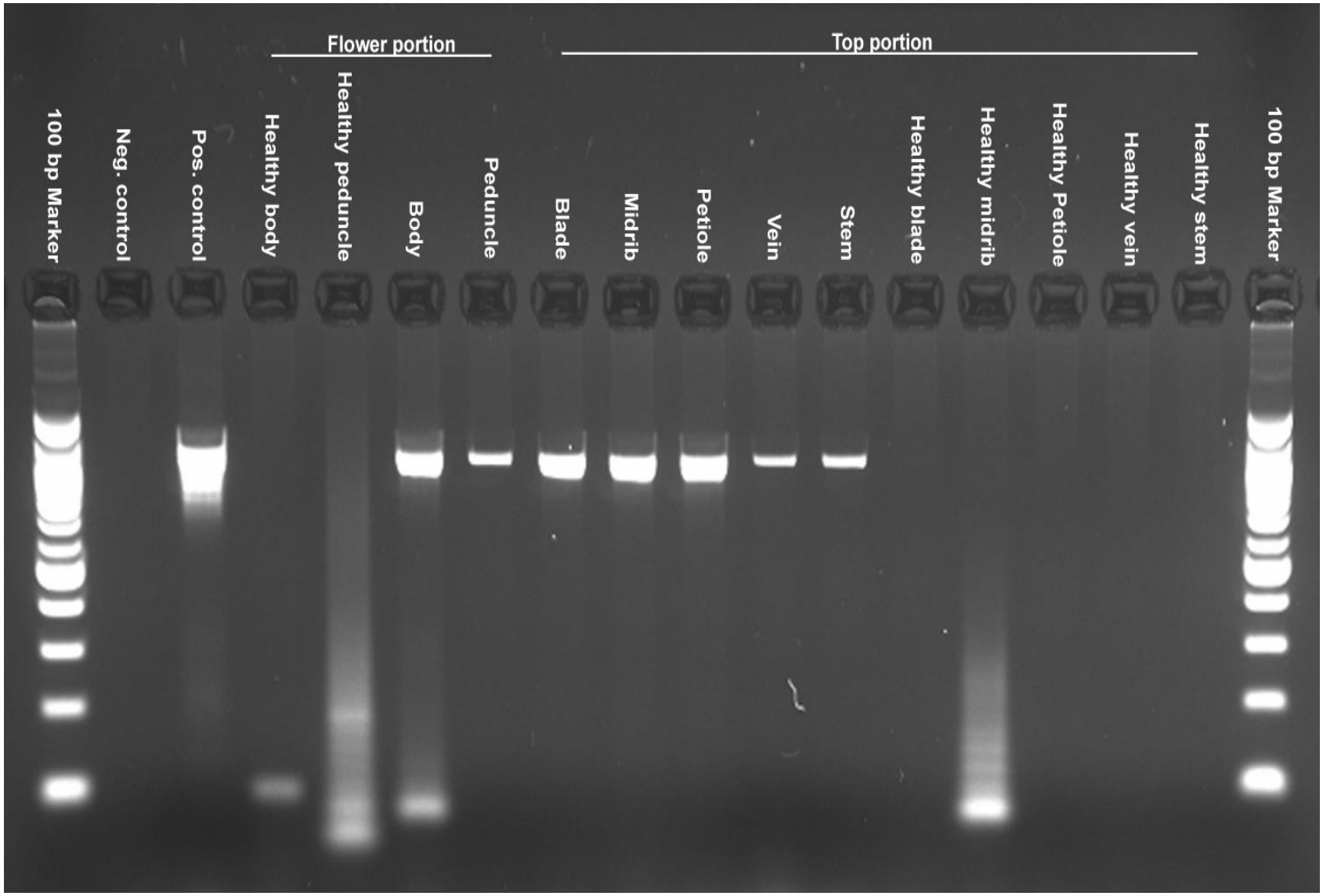
Monitoring Lso in latently infected tomato



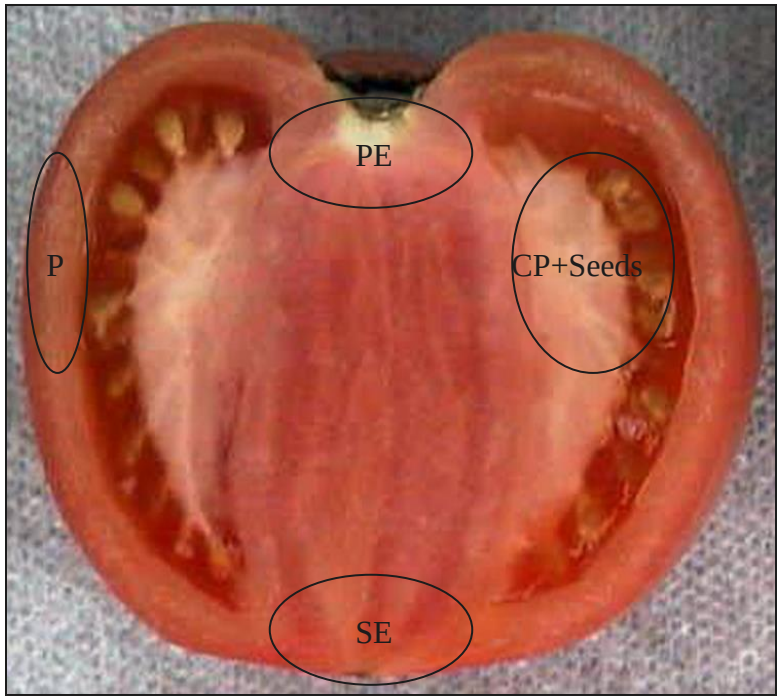
Monitoring Lso in latently infected tomato



Monitoring Lso in latently infected tomato

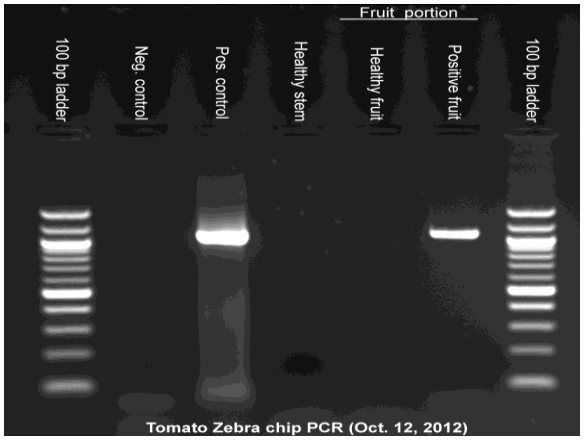


Lso in tomato fruits and seeds

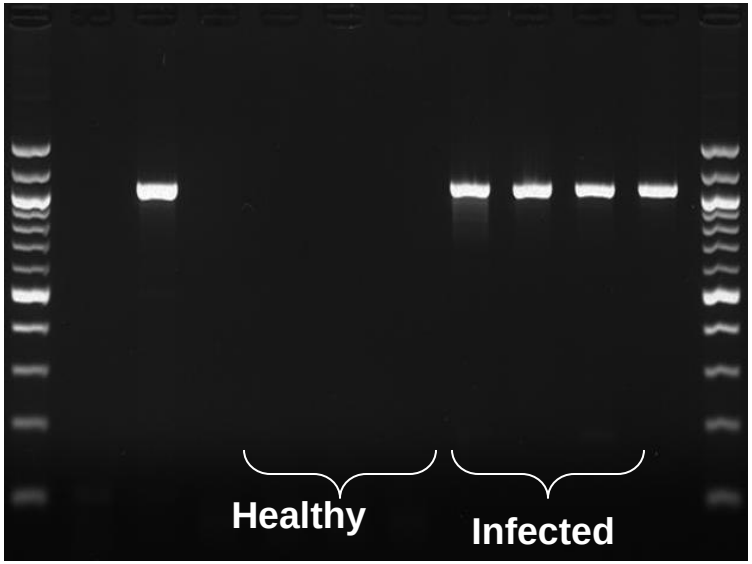


Section of tomato fruit portions used for PCR assays. PE, Peduncle end; P, Pericarp; SE, Style end; and CPS, Columella placena with seeds.

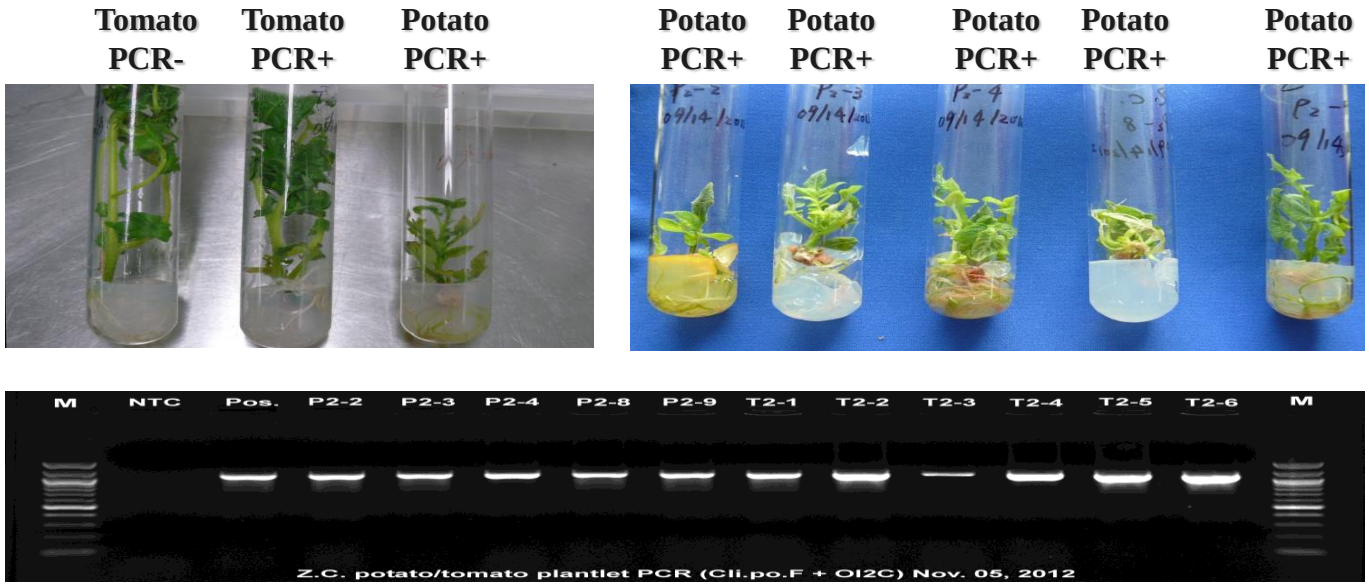
Plants grown out of harvested seeds did not harbor detectable ZC pathogens



M N$^-$ P$^+$ PE SE P CPS PE SE P CPS M

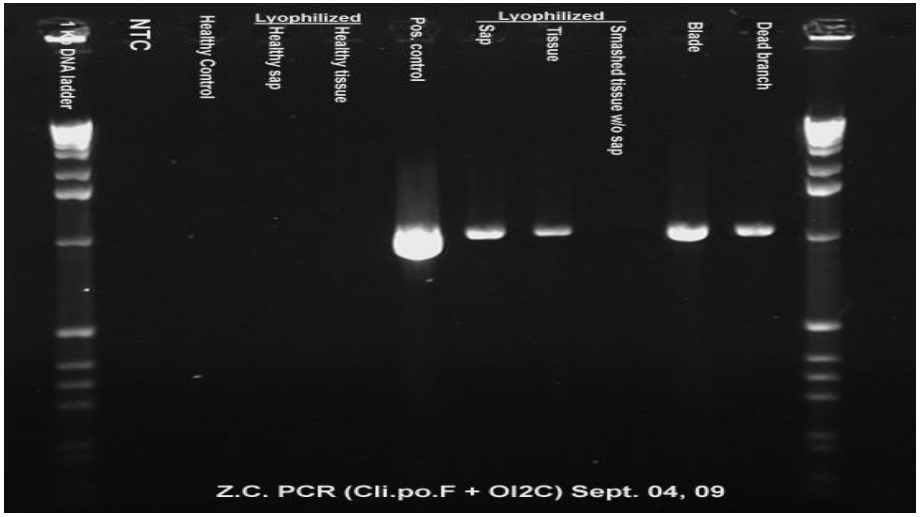


Tissue culture regeneration of tomato and potato plantlets



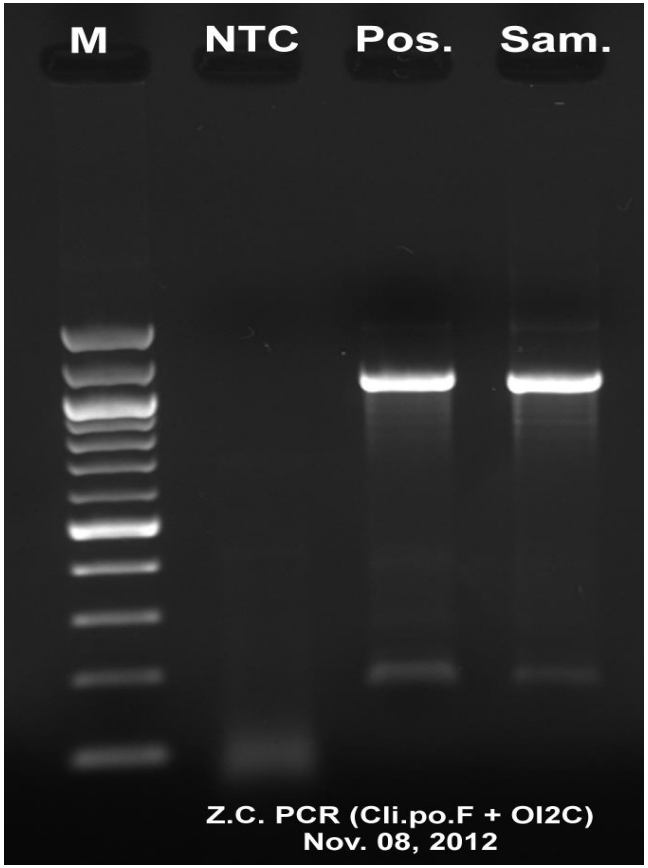
- Tomato plantlet grew, with no visible symptom, at similar rate to the negative control
- Potato plantlet grew, but at a rather slower rate, accompanied with a red pigment in the root.
- Potato plantlet usually stop growing after 5-6 subcultures and dies.

Preservation of latently infected tomato material by lyophilization



- Lyophilized vascular tissues of a latently infected tomato plant stored at RT for more than 4 years while tested positive in PCR.
- Tissue from stems, petioles and midribs were better than leaf blade tissue for long term preservation as positive control material.
- Lyophilized leaf blade tissue stored at room temperature (~25ºC) remained positive in the PCR assay for only a 6 month period
- Attempts to transmit Lso from lyophilized tomato stem and petiole materials to tomato and potato plants were unsuccessful.

Detection of Lso in imported commercial tomato seedling



An imported commercial greenhouse tomato seedling tested positive using Lso specific PCR assay

Brief summary with unanswered questions

1. Two varieties of tomato plant tested showed high tolerance to ‘Ca. L. solanacearum’, and can be potentially latent carriers of Lso, which is systemically present in tomato plant including flower and fruits. Plants grown out of harvested seeds did not harbor detectable ZC pathogens
2. Two latently infected tomato plants survived 4-5 years without showing visible symptom in greenhouse conditions
3. Varieties of potato demonstrated different symptoms after graft-transmitted from the latently infected tomato plants. Progeny tubers generated showed typical ZC symptoms.
4. Could field/greenhouse tomato be a carrier contributing to ZC disease spread in North America and/or elsewhere?
5. Are there any other natural carriers of ‘Ca. L. solanacearum’ in agricutural plants, e.g. eggplant or pepper?
6. Potato zebra chip disease is currently not present in Canada.

Acknowledgement

Dr. Solke H. De Boer
Jingbai Nie
Heidi Arsenault
Desmond L. Hammill

Dr. Gary Secor at North Dakota State University, and Joseph Munyaneza of USDA provided original ZC diseased samples

Dr. Shannon Shan at Pest Diagnostic Clinic of University of Guelph provided DNA isolated from a commercial tomato Seedling

Thank you!