Evaluating Potential Trap Crops for Control of *Globodera pallida*

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Introduction

- *Globodera pallida* (PCN) found in Idaho in 2006[2]
- Goals are containment and eradication[2]
- In Idaho, growers cannot grow potato on infested acreage until PCN is eradicated/fields undergo extensive deregulation process
- Hatch must be triggered by a hatching stimulus from host plants or trap crops[4]
- PCN trap crop must be a nonhost but still induce hatch

Figure from Contina et al. 2020. *Red points show PCN-infested potato acreage in Idaho. Green points show non-infested acreage.*

Potential Trap Crops of Interest:

- *Solanum aethiopicum* (Ethiopian eggplant)
- *Solanum douglasii* (greenspot nightshade)
- *Solanum macrocarpon* (African eggplant)
- *Solanum quitoense* (naranjilla)
- *Solanum retroflexum* (wonderberry)
- *Solanum sisymbriifolium* (litchi tomato)
- *Chenopodium quinoa*

Sources Cited

[1] Contina, J. B., Dandurand, L. M., & Knudsen, G. R. (2020). A Spatiotemporal Analysis and Dispersal Patterns of the Potato Cyst Nematode Globodera pallida in Idaho. *Phytopathology*, *110*(2), 379-392.
[2] Dandurand, L. M., Zasada, I. A., Wang, X., Mimee, B., De Jong, W., Novy, R., ... & Kuhl, J. C. (2019). Current status of potato cyst nematodes in North America. *Annual review of phytopathology*, *57*, 117-133.
[4] Franco, J., Main, G., & Oros, R. (1999). Investigation-Research: Trap Crops as a Component for the Integrated Management of Globodera spp.(Potato Cyst Nematodes) in Bolivia. *Nematropica*, 51-60.
[4] Jones, J. (2017). The Fascinating Biology of Potato Cyst Nematodes. Globodera Alliance Newsletter.

Objectives

1. Evaluate potential of other species with commercial potential as trap crops.
2. Quinoa has shown potential as a trap crop, inducing PCN hatch.[3] Compare trap crop efficacy with litchi tomato.

Methods

Trap Crop Evaluation:

Host assay: Trap crops and susceptible potato controls were inoculated with PCN and grown for 12 weeks. Cysts were extracted from soil and counted.

Hatch Assay: Root exudates were collected from each crop for hatching assays. Hatched juveniles were enumerated after two weeks to determine hatch (%).

In Field Comparison of Litchi Tomato & Quinoa:

1. Litchi tomato, quinoa, or barley (non-trap crop) were grown in infested soil under field conditions for 12 weeks.
2. Remaining encysted eggs were counted. Hatch and egg viability were assessed.
3. Ability of cysts to reproduce subsequent to trap crop exposure was assessed on the susceptible potato variety "Russet Burbank'

Conclusions

- Of the species tested, both *S. retroflexum* and *S. quitoense* were effective trap crops.
- In the field, litchi tomato and quinoa reduced viable PCN eggs more than barley. PCN reproduction in potato was significantly reduced by both litchi tomato and quinoa compared to barley
- While less effective than litchi tomato, quinoa also reduced PCN, making it a valuable trap crop while providing an economic benefit to the grower.

Results

Trap Crop Evaluation

- None of the solanaceous species investigated as potential trap crops were found to be hosts of PCN

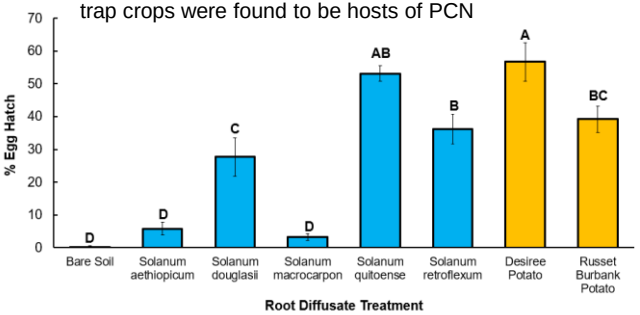

Figure 1. Solanaceous trap crop PCN hatch. Average % PCN egg hatch 2 weeks after exposure to the trap crop root exudates.

*Different letters indicate significant difference as determined by least squares means separation

In Field Comparison of Litchi Tomato & Quinoa

- After 12 weeks of growth in the field, encysted eggs were reduced 41% by quinoa and 62% by litchi tomato, compared with the barley control
- Litchi tomato also significantly reduced egg viability compared to quinoa and barley
- After growing susceptible potato following trap crop exposure, quinoa plots showed 40% less reproduction than barley plots, while litchi tomato plots had 97% less reproduction than barley plots