Systems approach to controlling nematodes in US potato production

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WHAT IS THE PROBLEM?

Meloidogyne chitwoodi damage

Root Knot Nematodes:

- Infects tubers
- Causes internal and external defects and galls
- No resistance in commercial varieties
- Broad host range

Meloidogyne chitwoodi, Columbia root knot nematode

- Crop rejected if 6% of tubers are infected
- Zero tolerance in seed and export market

Meloidogyne hapla, Northern root knot nematode

- Reduces yield and market value of tubers

Globodera pallida cysts

Potato Cyst Nematodes:

- Reduce yield by 80%
- Globally regulated pest of potato

Globodera rostochiensis, Golden nematode

- Found in New York; 5,945 infested acres
- Controlled by the H1 gene; 43 varieties

Globodera pallida, Pale cyst nematode

- Found in Idaho, 3,446 infested acres
- Annual economic impact $30 million
- No resistance in commercial varieties

CURRENT MANAGEMENT

Nematicides:

Both fumigant and non-fumigant nematicides are available

- Metam
- 1,3 dichloropropene
- Oxamyl
- Effective but expensive
- Many are being phased out or no longer available

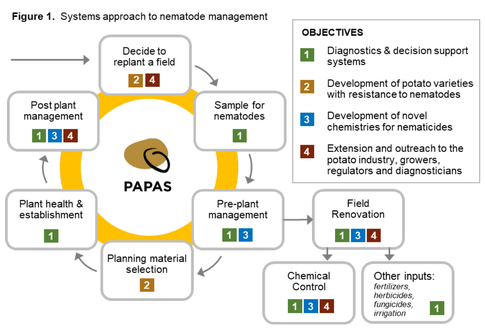
Western Russet – Susceptible

Resistance:

Cornerstone of any pest management plan

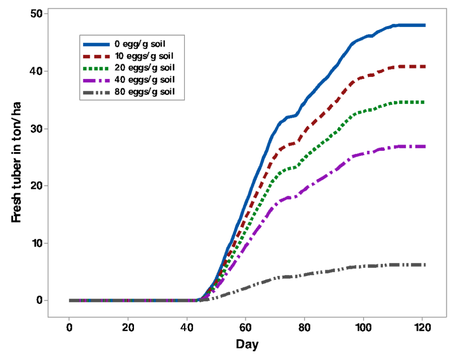
- Resistance reduces the need for inputs such as nematicides
- *H1* gene controls *G. rostochiensis*, 43 resistant varieties are available and used in rotation with a susceptible or non-host crop
- Resistance to root knot or pale cyst nematodes is unavailable in commercial varieties
- Russet-skinned potatoes are susceptible to nematodes

BENEFITS OF A SYSTEMS APPROACH



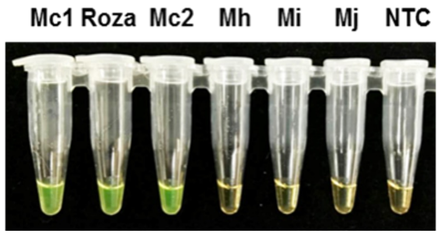
Decision making process for nematode management

- Improved diagnostics for nematode detection
- Decision support for growers for decision making process
- Reduced reliance on nematicides
- Novel chemistries that will provide a next generation of nematicides
- Novel genetic sources of resistance for variety development
- Efficient use of cultivars with a diversity of agronomic traits including nematode resistance

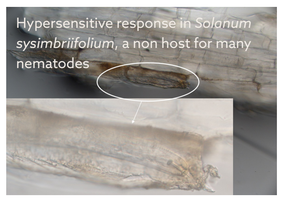


Predicted yield loss caused by *Globodera pallida* with use of Decision Support Systems for Agrotechnology Transfer (DSSAT)

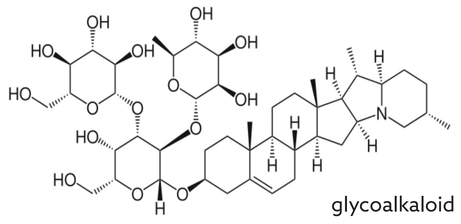
STEPS TO A SYSTEMS APPROACH



Develop improved molecular diagnostic tools for races of nematodes



Develop resistance to nematodes by using novel resistance genes



Plan for the future by identifying novel chemistries for use as nematicides

Engage the industry through extension and outreach

ACKNOWLEDGEMENTS

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