## UPDATE ON GLOBODERA ELLINGTONAE

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## Potato cyst nematodes

- Globally distributed plant-parasitic nematodes
- Globodera rostochiensis = Golden nematode
- Globodera pallida = Pale cyst nematode
- Can cause up to 80% reduction in potato yield



## Potato cyst nematodes in the U.S.



## What makes potato cyst nematodes successful parasites of potato?



Some images from mactode.com

## Discovery of a new potato cyst nematode...

- <u>2008</u> three nematode samples distinct from known PCN species were found in Oregon and Idaho
  - Oregon Department of Agriculture processed samples from Powell Butte, OR – 1 to 7 cysts kg<sup>-1</sup> soil
  - In Idaho cysts were found in 2 fields (Caribou and Teton Counties, ID) for a total of 4 cysts
  - All cysts sent to USDA-ARS Nematology Laboratory for identification
- <u>2010</u> USDA-ARS and Oregon State University demonstrate that potato and tomato are hosts for this nematode
  - OSU voluntarily closes Powell Butte research facility



Map of OSU Powell Butte





## Description

 <u>2012</u> – described as a new species by Handoo et al.



## Nice pictures





# How is G. ellingtonae similar to/different from other Globodera?

## Egg hatch is similar to G. rostochiensis



250 2-week hatch in exudate After transfer to PRD 200 Juvenile hatch/cyst 150 100 50 Landsyuggies Oats D 0 Polato Vonato Kellon Massing + Water Canola







Hatch of Globodera ellingtonae in Root Exudates

#### The pallida problem

Management of pullida has proved to be more difficult than of rostochiensis for several reasons.

Eggs of *pullida* appear to hatch over a longer period of time. Consequently, granular nematicides applied at planting do not remain at toxic concentrations in the soil for long enough to give optimum control (Figure 2).





## Some potato varieties resistant to G. rostochiensis also resistant to G. ellingtonae

#### Host Status of Potato Varieties to Globodera ellingtonae



## Host status of Solanum weeds varies among Globodera

#### Host status of Solanum spp. to Globodera spp.

| Plant                                   | G. rostochiensis | G. pallida  | G. ellingtonae          |
|---|------------------|-------------|-------------------------|
| S. sarrachoides<br>(hairy)              | Resistant        | Susceptible | Susceptible             |
| S. triflorum (cutleaf)                  | Not available    | Resistant   | Susceptible             |
| S. nigrum (black)                       | Resistant        | Resistant   | Susceptible             |
| S. dulcamara<br>(bittersweet)           | Resistant        | Resistant   | Moderately<br>resistant |
| S. sysimbrifolium                       | Resistant        | Resistant   | Resistant               |
| Boydston et al. 2008; Mimee et al. 2013 |                  |             |                         |



Lax et al. (2014)

#### Poor or Non-hosts:

Alfalfa, oats, barley, artichoke, tobacco, tomatillo, eggplant, bell pepper, jalapeno

G. ellingtonae has similar temperature range for development as G. rostochiensis



# G. ellingtonae has similar temperature range for development as G. rostochiensis



## Globodera spp. are important pathogens of potato



## G. ellingtonae is not a strong pathogen of potato





- 4 years of field trials
- 'Russet Burbank' inoculated with up to 360 eggs/g soil



## Minimal impact of G. ellingtonae on yield of potato



Initial Population Density (eggs/g soil)

Comparison of percentage reduction in potato yield by G. pallida and G. rostochiensis (adapted from Trudgill and Phillips)



### Minimal impacts of G. ellingtonae on yield of potato



#### 0 eggs/g soil

#### June 24, 2015

#### 360 eggs/g soil



#### July 8, 2015



## Conclusions

- Biological data supports the morphological and molecular conclusion that G. ellingtonae is a distinct species from G. pallida and G. rostochiensis
- G. ellingtonae appears to be more closely related/similar to G. rostochiensis
- In Oregon, G. ellingtonae caused minimal damage to potato
  this nematode is not regulated

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