

How Can We Improve the Efficacy of Pre-plant Soilborne Pathogen and Nematode Management Practices in Perennial Crops?

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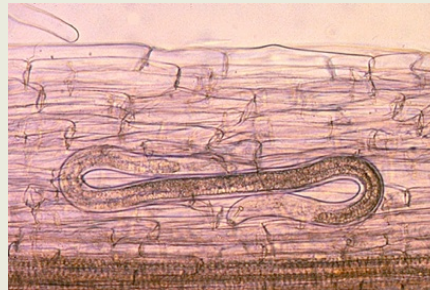
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Presentation outline

- Why should you care?
- Who are the belowground players?
- Life cycles of soilborne pathogens and nematodes
- Ideas to improve pre-plant management of soilborne pathogens and nematodes

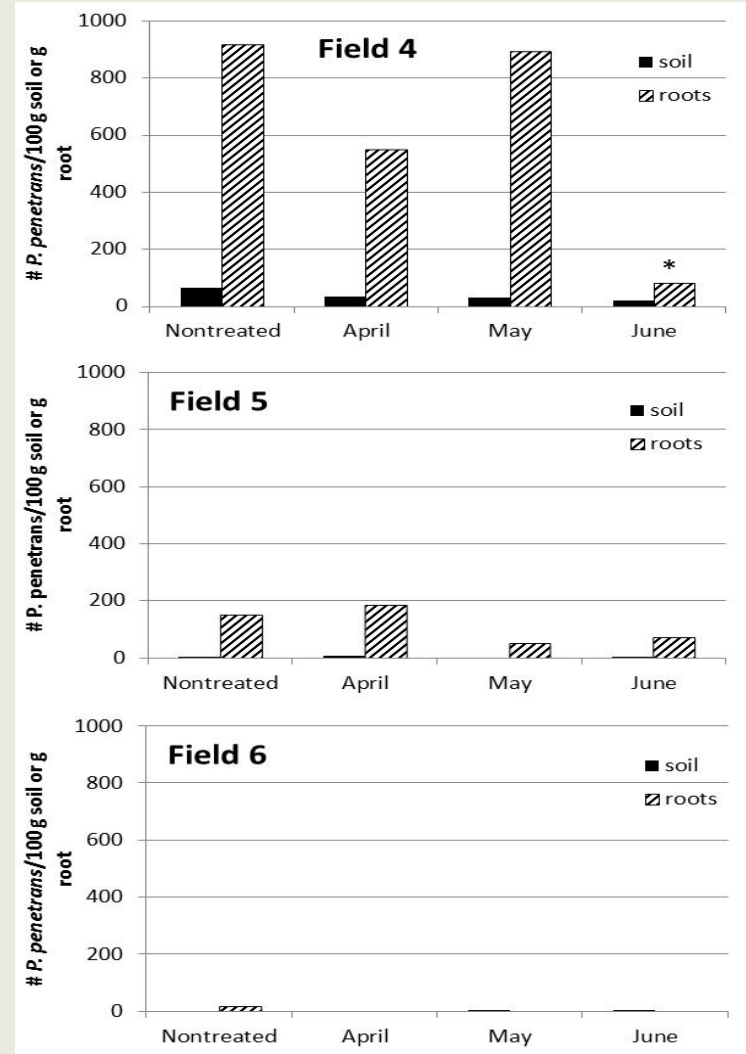


Why should you care?

1. Soilborne organisms are commonly encountered in raspberry fields and can cause significant damage
2. Pre-plant management with soil fumigation will become more cumbersome
3. Additional regulations for chloropicrin likely
4. Repeated use of post-plant fungicides can lead to resistance
5. No proven post-plant nematicides available for bearing raspberry
6. Very few varieties available with resistance

Why should you care?

We know pre-plant fumigation does not always do a good job of controlling soilborne pathogens and nematodes!!



Who are the belowground players?

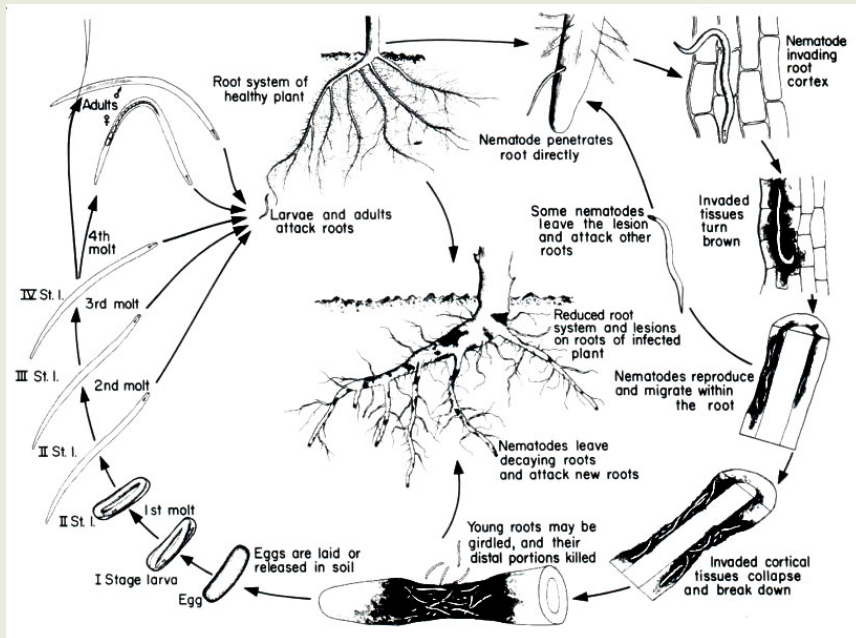
- *Phytophthora rubi* (oomycete)
- *Pratylenchus penetrans* (nematode)
- *Verticillium dahliae* (fungus)
- *Rhizoctonia fragariae* (fungus)
- *Fusarium* spp. (fungus)
- *Pythium* spp. (fungus)

Who are the belowground players?

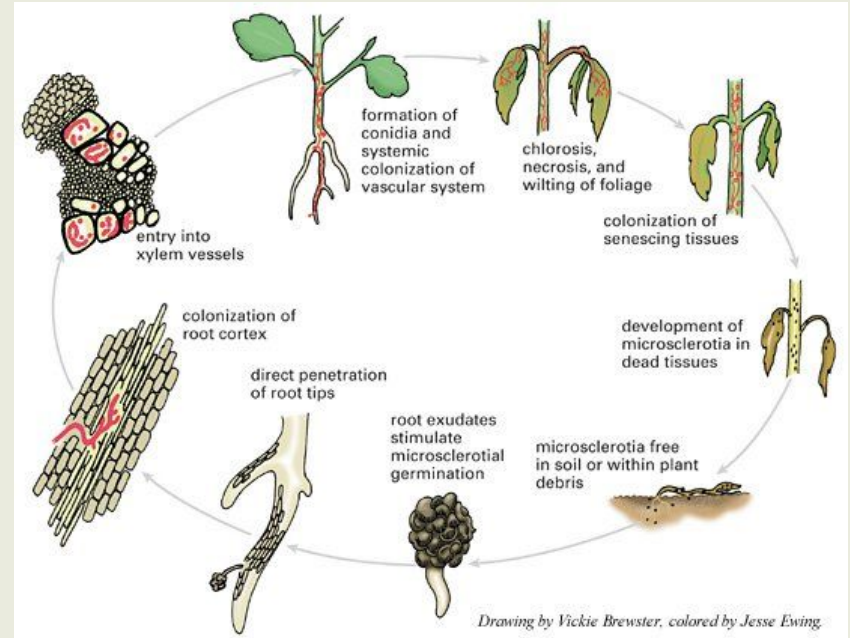
- Sabaratnam conducted a survey of soilborne pathogens of raspberry in 2005
 - Frequency of recovery: *Rhizoctonia* (14%), *Fusarium* (10%), oomycetes (4%)
- Gigot surveyed NW WA raspberries for *Phytophthora* and plant-parasitic nematodes
 - All fields samples had these organisms
 - Sites positive for *P. rubi* within a field varied from 33% to 100%
 - *P. penetrans* population densities ranged from 0 to 18,850 nematodes/g root

Life cycles

Pratylenchus penetrans

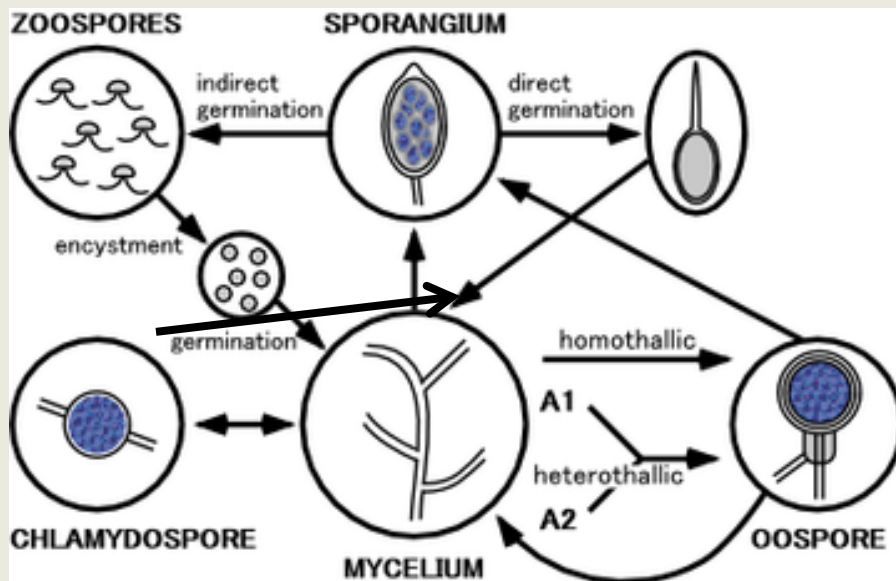


Verticillium dahliae



Life cycles

Phytophthora rubi



What do all of these life cycles have in common?

Part of the life cycle of each of these organisms is spent in roots!!

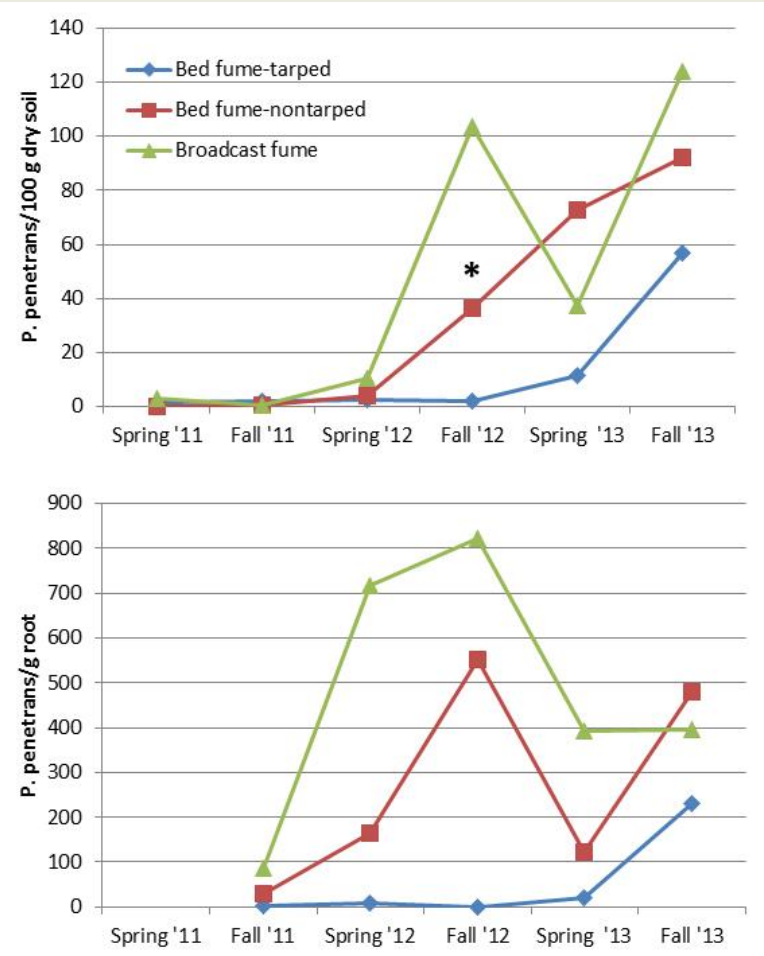
How can we improve pre-plant management of soilborne organisms?

1. Bed fumigation – to tarp or not to tarp?



How can we improve pre-plant management of soilborne organisms?

P. penetrans population dynamics



How can we improve pre-plant management of soilborne organisms?

Harvested fruit weight from bed fumigated plots as percent of fruit weight from broadcast-fumigated plots

Burlington (non-fumigated control)

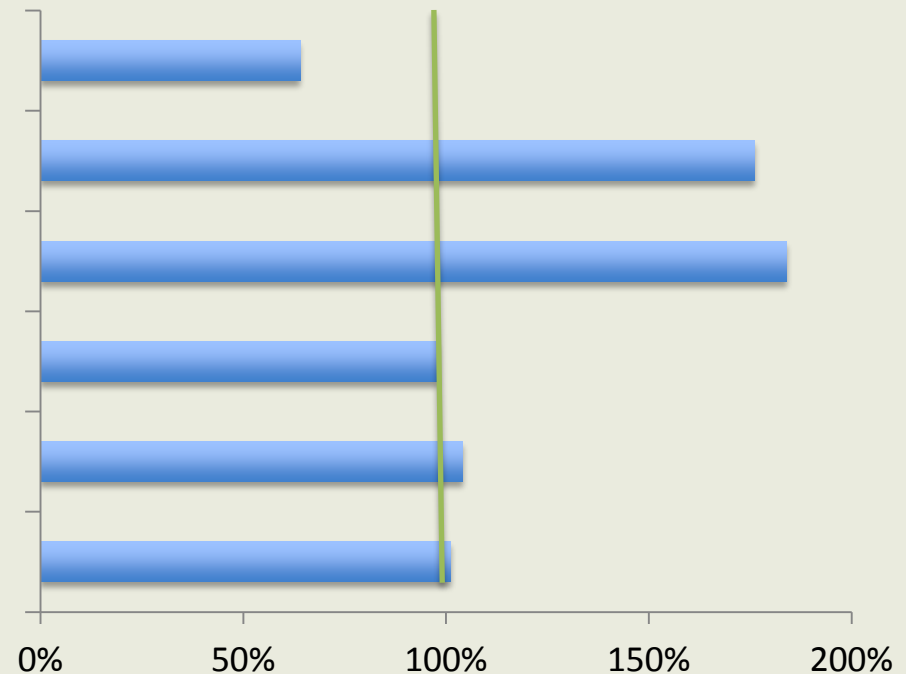
Burlington (plus cover crop)

Burlington

Lynden 3

Lynden 2

Lynden 1



How can we improve pre-plant management of soilborne organisms?

2. Rotation with cover crops

- Rotation will allow for raspberry root material to decay and expose organisms to pre-plant treatments
- If nematodes are the target good weed control should be maintained – many weeds are hosts to *P. penetrans*
- If a cover crop is used, select a crop that won't support the survival of target pathogens and nematodes – many of these organisms have wide host ranges

How can we improve pre-plant management of soilborne organisms?

2. Rotation with cover crops

- Potential candidate cover crops
 - Saia oats
 - Brassica spp.
 - Fescue 'Max-Q'
 - Rye 'Wheeler'
- More information on viable cover crops for soilborne pest suppression in PNW raspberry needs to be generated

How can we improve pre-plant management of soilborne organisms?

3. Root removal

Telone labels state:

“Plant residue that is present must not interfere with the application or soil seal. Non-decomposed plant material may harbor pests that will not be controlled by fumigation” (Dow AgroSciences, 2011)

How can we improve pre-plant management of soilborne organisms?

3. Root removal

- A large amount of root material remains in a field after the removal of a planting
- An inadequate amount of time passes between removal of a planting and fumigation to allow for migration/exposure of pathogens in root material to fumigants
- Root material in soil can also serve as “chimneys” for soil fumigants

How can we improve pre-plant management of soilborne organisms?

3. Root removal

- Is this a viable option for raspberry growers?
 - Cost?
 - What to do with material removed from a field?
 - How to most effectively remove root material?
 - Does this effort result in a reduction in soilborne pathogen and nematode inoculum?
 - Are raspberry growers interested in this idea?

Conclusions

- Broadcast fumigation does not provide long-term suppression of soilborne pathogens and nematodes
- Bed fumigation is as effective at reducing populations of *P. penetrans* and provides equivalent yields as broadcast fumigation
- Utilizing a tarp in bed fumigation will increase efficacy
- Other options exist – but are these economically viable alternatives for raspberry growers?