Best Management Practices Workshop for Nurseries: Steam Sanitation and Disease Identification

Diseases and Pests

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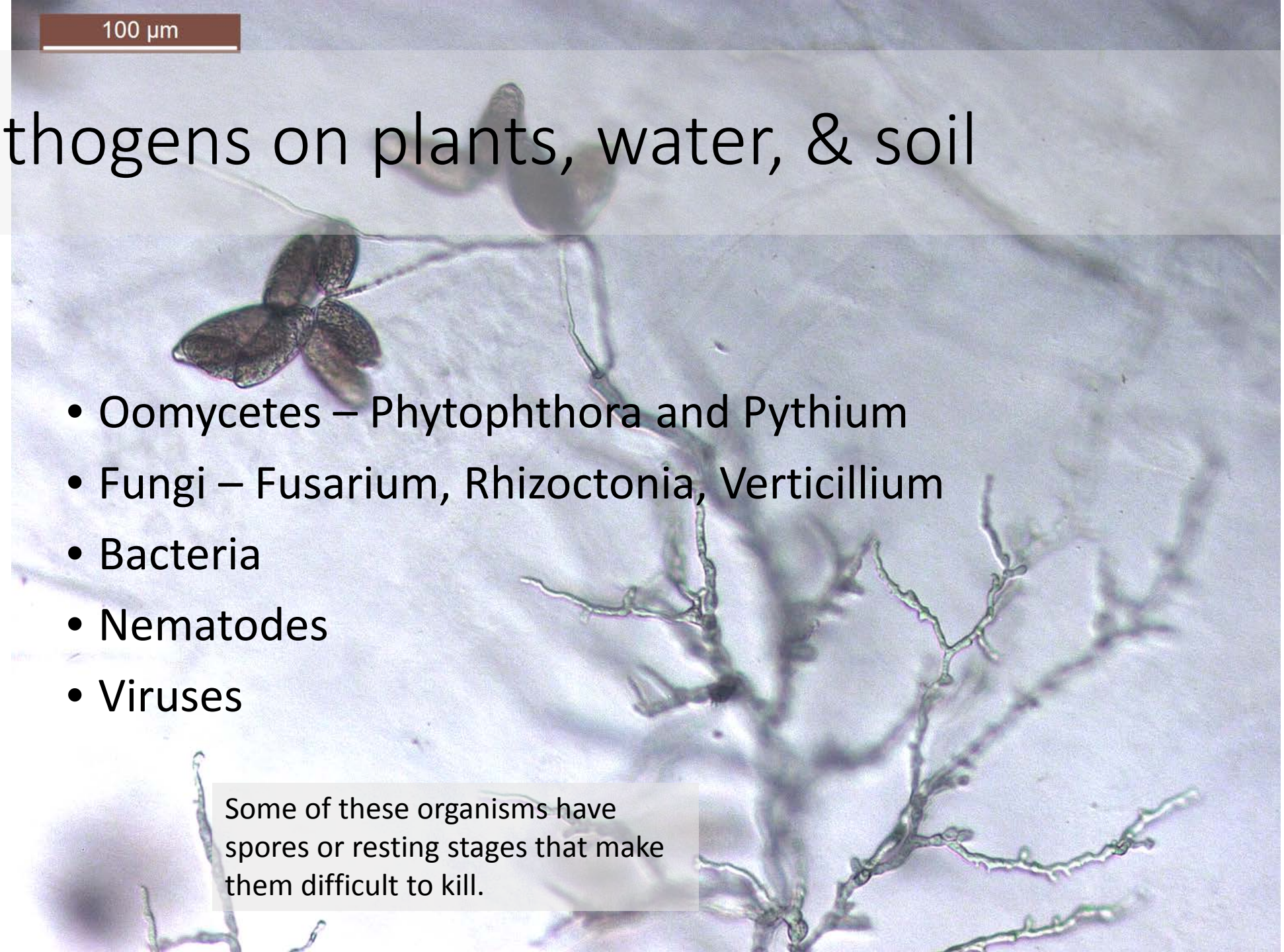


Pathogens on plants, water, & soil

- Oomycetes – Phytophthora and Pythium
- Fungi – Fusarium, Rhizoctonia, Verticillium
- Bacteria
- Nematodes
- Viruses

Some of these organisms have spores or resting stages that make them difficult to kill.

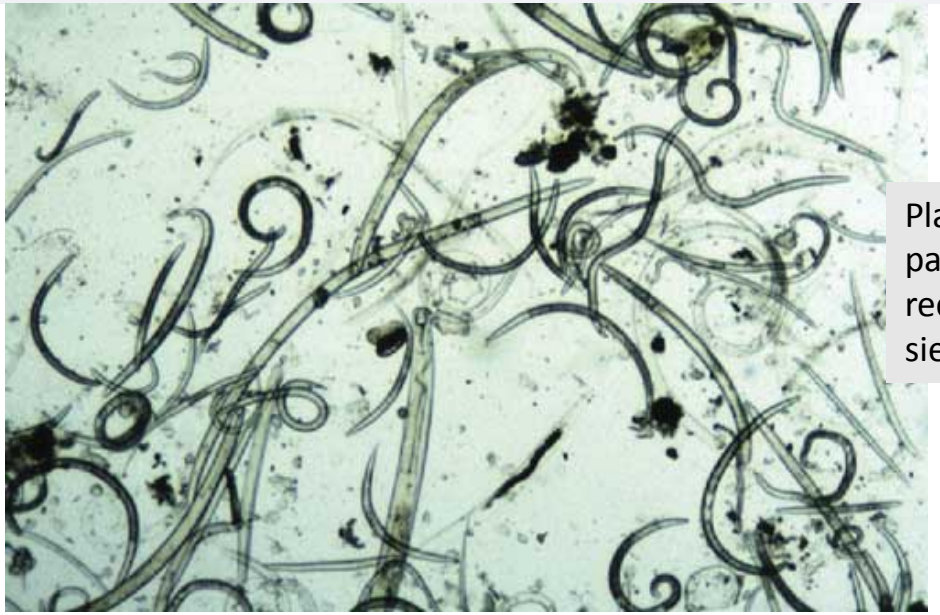
Moisture is important for survival and spread of many plant diseases

Phytophthora root rot

Bacterial leaf spot

Diseases that thrive in wet soils

Swimming zoospores of *P. ramorum*



Plant-parasitic and non-parasitic nematodes recovered from soil by sieving. (Greg Tylka)

- Oomycetes or “water molds”
- Certain fungi
- Bacteria
- Nematodes

Fungus gnats

Found in wet soil environments

Feed on algae and fungi.

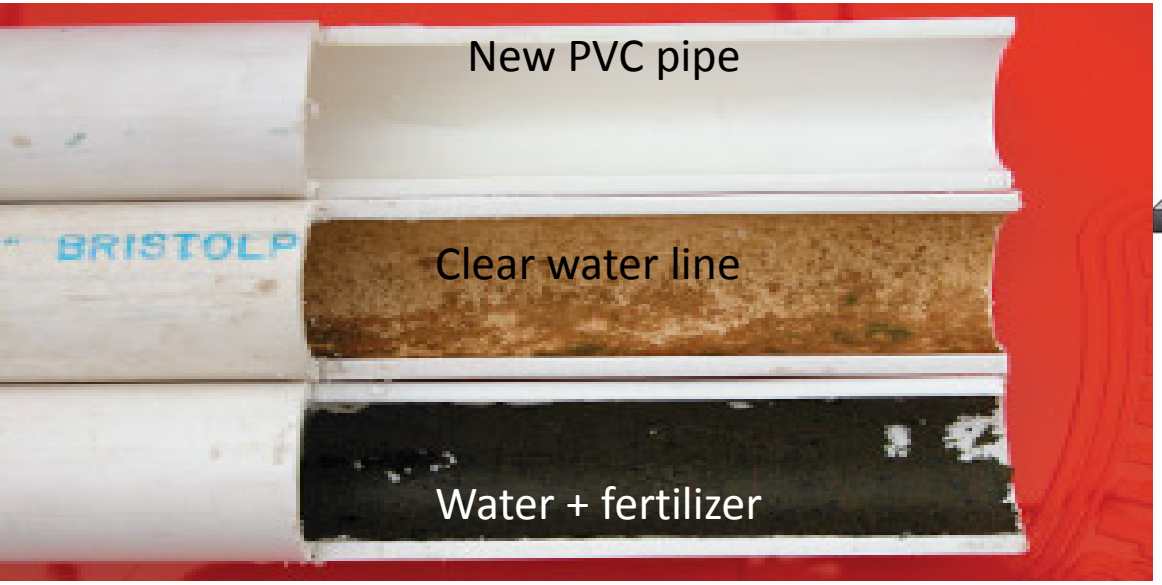
Larvae feed on plant roots.

Adults can spread plant diseases by moving from plant to plant.

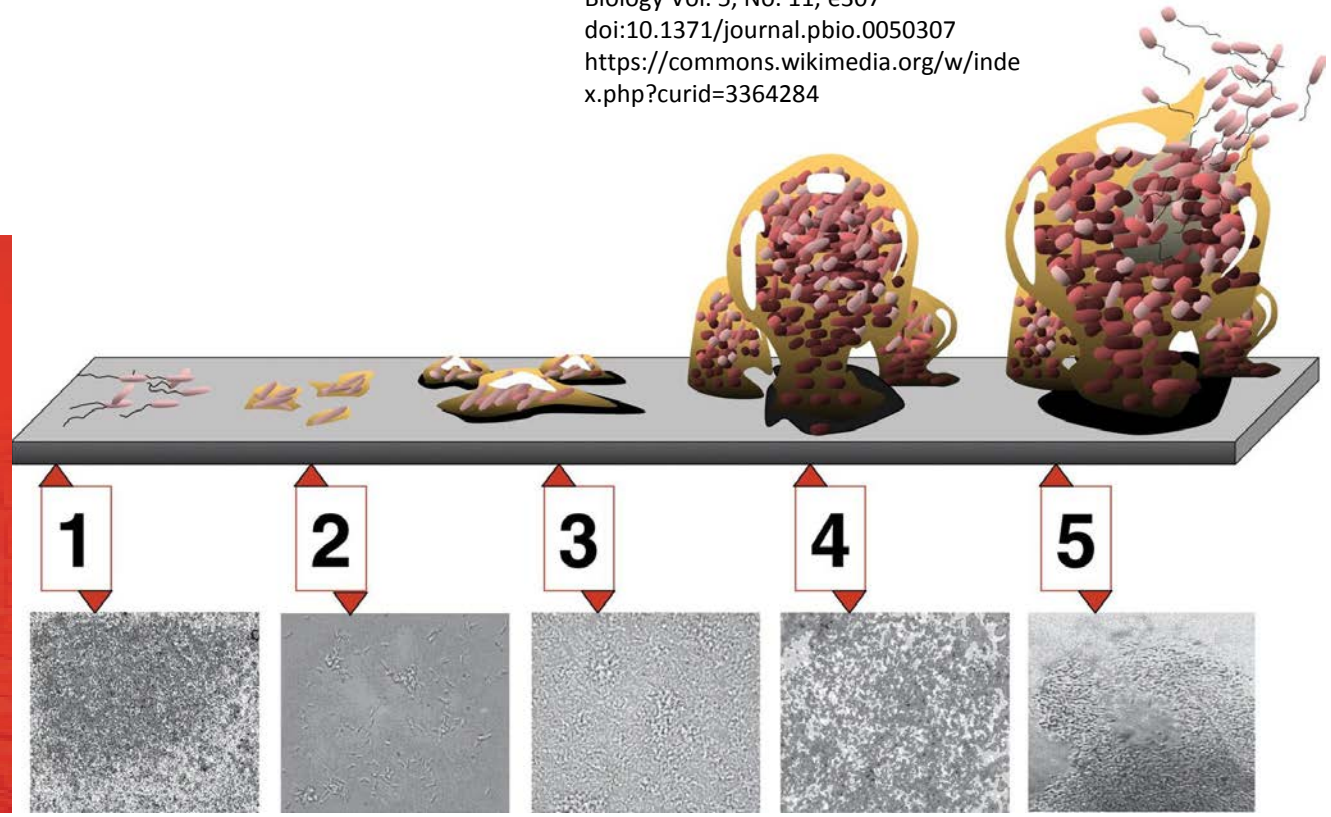
Whitney Cranshaw, Colorado State University, Bugwood.org

Greenhouse algae and biofilms

- Can harbor waterborne pests and pathogens
- Fouling and clogging



Stages in biofilm formation. By D. Davis - From: Looking for Chinks in the Armor of Bacterial Biofilms Monroe D PLoS Biology Vol. 5, No. 11, e307 doi:10.1371/journal.pbio.0050307 https://commons.wikimedia.org/w/index.php?curid=3364284



Animal vectors for *Phytophthora*

Fig. 5. Germinated sporangia of Phytophthora ramorum in snail frass. Bar = 55 µm.

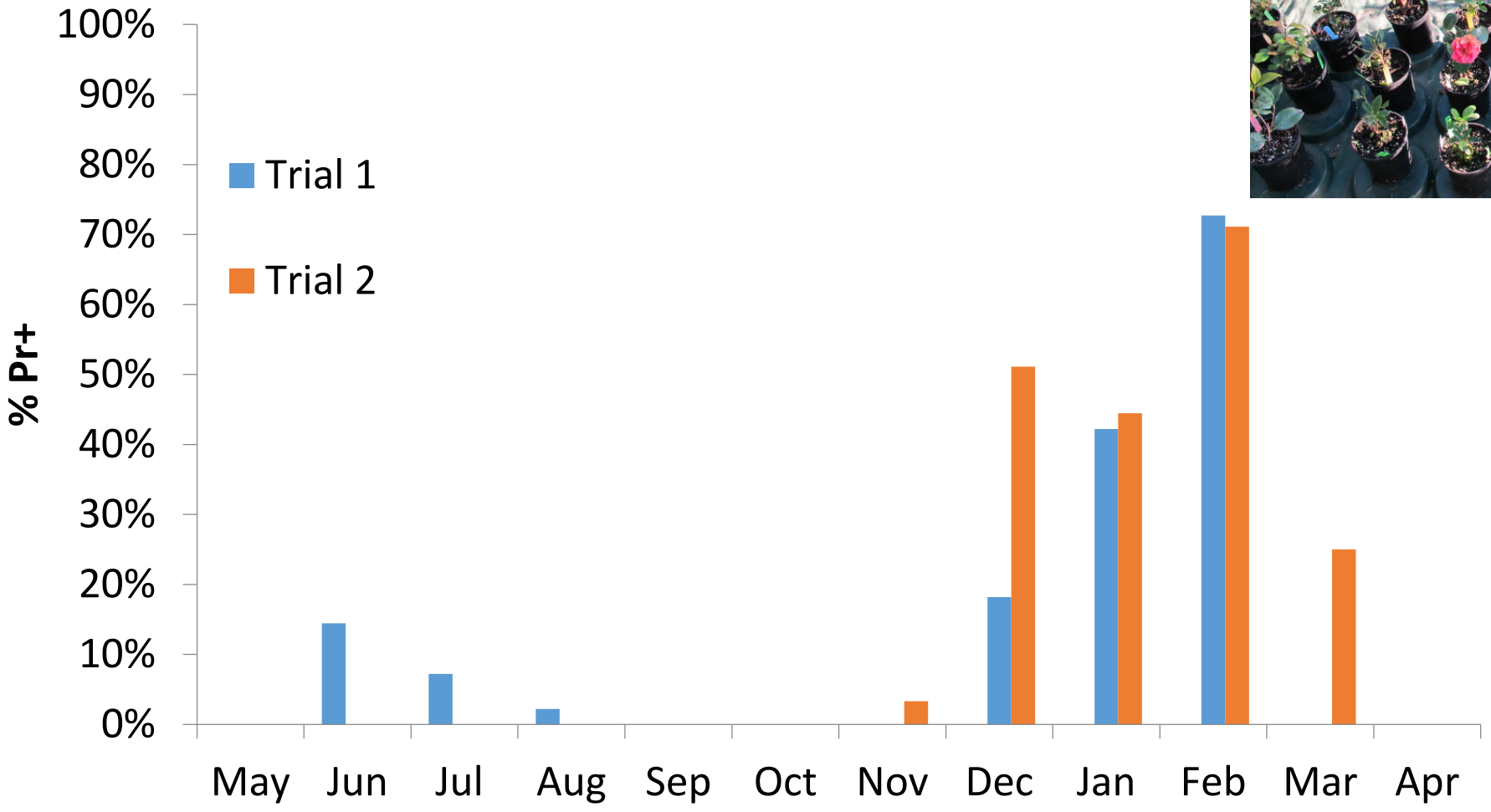
Snails – chlamydospores and sporangia

Shore fly larvae – chlamydospores
Shore fly adults – none

Fungus gnat larvae – chlamydospores
Fungus gnat adults - none

Hyder, N., Coffey, M. D., and Stanghellini, M. E. 2009. Viability of oomycete propagules following ingestion and excretion by fungus gnats, shore flies, and snails. Plant Dis. 93:720-726.

Diseases (*Phytophthora*) build up in overwintering plants, soil, and media/cull piles.



Heat treatment

Pre-planting

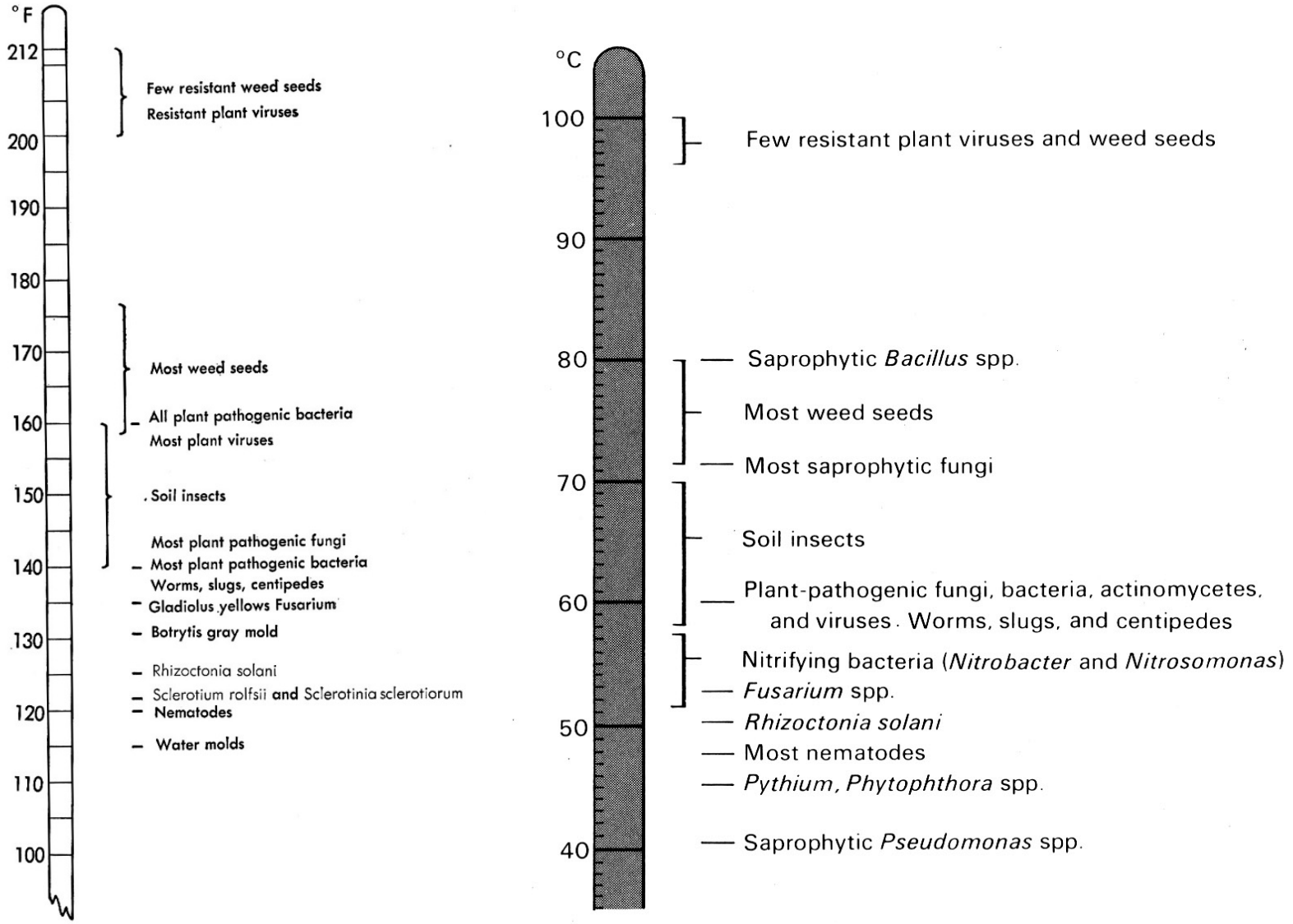
Preventative treatments for soil, pots, media

Steam, solarization, hot water dip

Post-harvest

The pest must be more susceptible to heat than the commodity

Hot water dip, kiln or oven-drying



Temperatures necessary to kill various groups of soil organisms

Heat-sensitive organisms

Organisms that do not have thick-walled resting stage.

Killed at < 60 C (140 F)

Pseudomonas spp.

Fusarium, Rhizoctonia

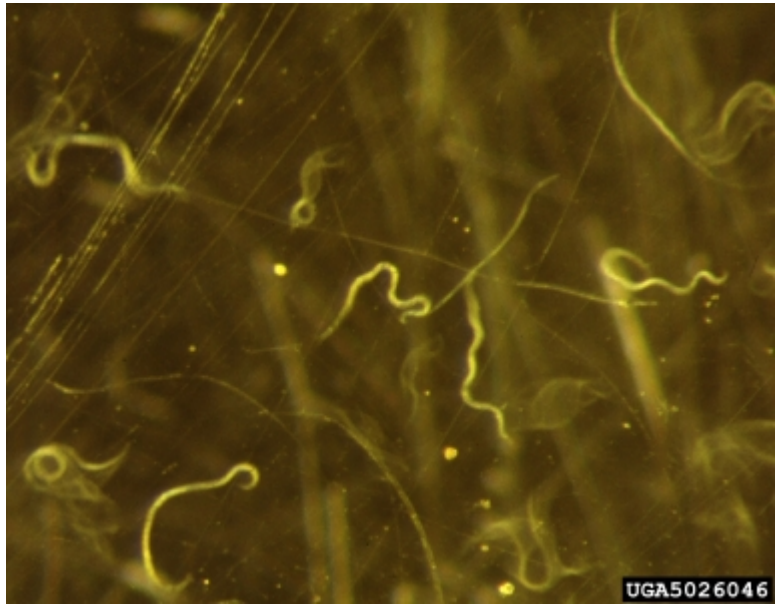
Some *Phytophthora, Pythium*

Most nematodes
Snails and slugs

Fusarium rot on Cyclamen

Foliar nematodes

Can survive desiccation but are destroyed by temperatures > 50C (122 F)



Moderately heat resistant organisms

Killed between 50 – 70 C

(122 F – 158 F)

Most plant pathogenic fungi

Some *Phytophthora* and *Pythium* spp.

Bacteria

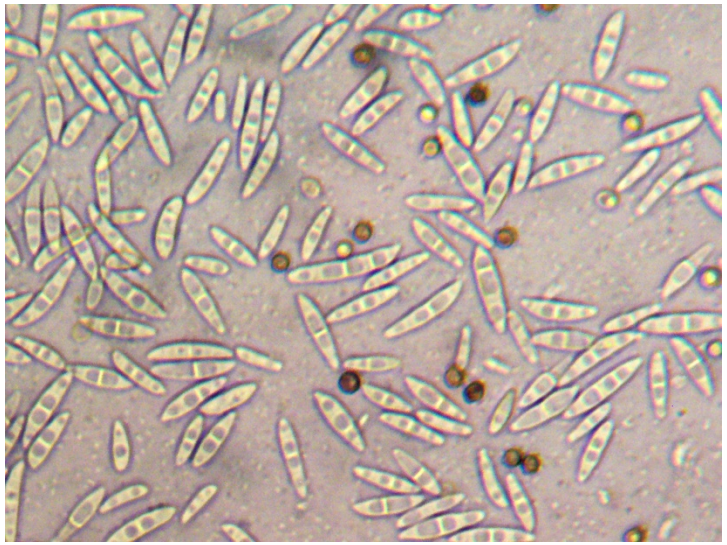
Worms, centipedes

Viruses

Insects

Botrytis

Phytophthora



Fusarium

Many pathogens produce resistant “resting spores” that can survive in soil.

Chlamydospores in infected foliage are a source of *Phytophthora* inoculum in soil

Heat-resistant organisms

“The Good Guys”

Killed between 70-100 C (158 – 212 F)

Bacillus subtilis

Most saprophytic fungi – *Trichoderma*

Most weed seeds

Certain *Bacillus* spp. (endospore formers such as *B. subtilis*)

Heat resistant viruses

Biofilms

Trichoderma