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

R. Wick, UMass
Diseases that thrive in wet soils

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

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

• Can harbor waterborne pests and pathogens
• Fouling and clogging
Animal vectors for *Phytophthora*

Snails – chlamydospores and sporangia

Shore fly larvae – chlamydospores
Shore fly adults – none

Fungus gnat larvae – chlamydospores
Fungus gnat adults - none

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

- Few resistant plant viruses and weed seeds
- Saprophytic Bacillus spp.
- Most weed seeds
- Most saprophytic fungi
- Soil insects
- Plant-pathogenic fungi, bacteria, actinomycetes, and viruses. Worms, slugs, and centipedes
- Nitrifying bacteria (Nitrobacter and Nitrosomonas)
- Fusarium spp.
- Rhizoctonia solani
- Most nematodes
- Pythium, Phytophthora spp.
- Saprophytic Pseudomonas spp.
Heat-sensitive organisms

Killed at < 60 °C (140 °F)

*Pseudomonas* spp.

*Fusarium, Rhizoctonia*

Some *Phytophthora, Pythium*

Most nematodes

Snails and slugs

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Organisms that do not have thick-walled resting stage.

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
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

Killed between 70-100 C (158 – 212 F)

Most saprophytic fungi – *Trichoderma*

Most weed seeds

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

Heat resistant viruses

Biofilms

“The Good Guys”

*Bacillus subtilis*

*Trichoderma*