

Disease ID & Management

Tri-State Greenhouse IPM
Workshops
January 2015

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Diagnosis



Steps for Diagnosis

- **Host characteristics**
- **Distribution of symptoms**
- **Rate of symptom development**
- **Look at neighboring plants**
- **Signs of the pathogen**



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Distribution of symptoms

- **Whole plant**
- **Where on the plant**
- **Uniform vs. non-uniform**
- **Grouped / scattered plants**



check for healthy roots



Not good

Distribution of symptoms

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- **Where on the plant**
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Distribution of symptoms

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- Where on a plant
- Uniform vs. non-uniform
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Steps for Diagnosis

- Host characteristics
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- **Rate of symptom development**
- Look at neighboring plants
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Steps for Diagnosis

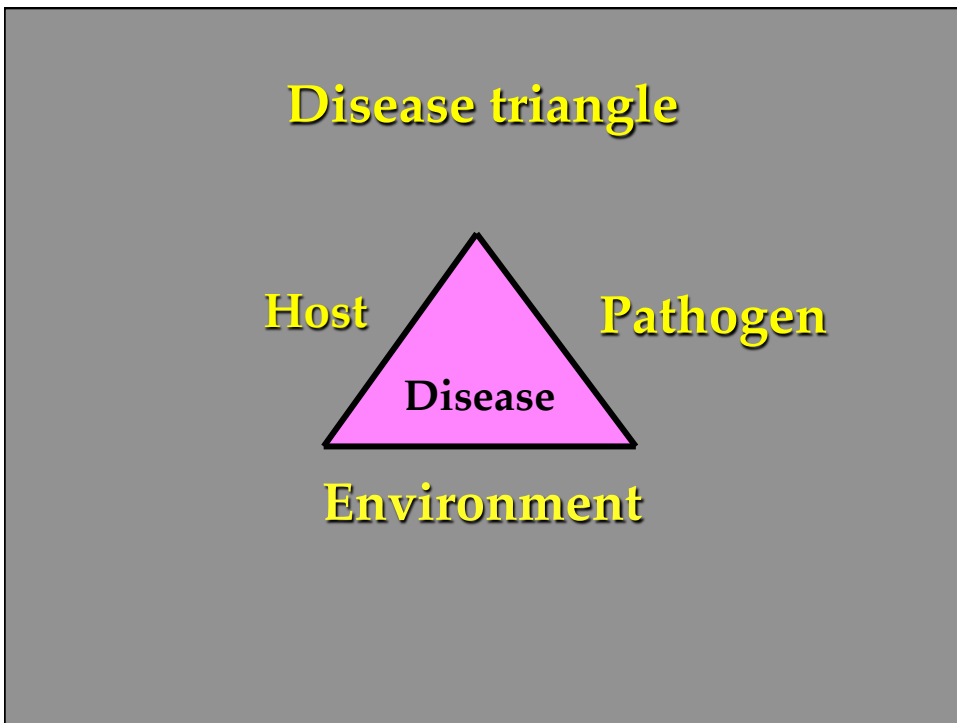
- Host characteristics
- Distribution of symptoms
- Rate of symptom development
- **Look at neighboring plants**
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Steps for Diagnosis

- Host characteristics
- Distribution of symptoms
- Rate of symptom development
- Look at neighboring plants
- Signs of the pathogen (or agent)





Key Components of GH IPM

Prevention

- Sanitation
- Humidity control (air circulation)
- Purchasing pest-free stock
- Scouting & Diagnosis / ID
- Insect & Weed control
- pH & nutrient testing
- Watering

Biological / chemical control

Record keeping

Sanitation!

Inspect incoming material, scout

Start clean, keep it clean (debris & weeds)

Remove infected tissue, problem plants

Sanitize tools

Keep hose nozzles off the floor

Remove plant debris at end of 'season'

Work with infected plants last

Sanitation!

Inspect incoming material



A.T. Eaton photo

Sanitation!

Inspect incoming material

Start clean, keep it clean, end clean

**sanitize benches, potting areas, mats,
trays, tool, pots [?]**

irrigation system components



Sanitizing agents

10% bleach solution

**Quaternary ammonium salts:
Greenshield, Phisan**

**Hydrogen dioxide:
ZeroTol**

**Chlorine dioxide:
Kleengrow**

Always Clean Before Disinfecting! (ACBD)

Nice clean bench to start



B. Krug photo

Nice clean irrigation mat



B. Krug photo

Sanitation!

Inspect incoming material

Start clean, keep it clean, end clean

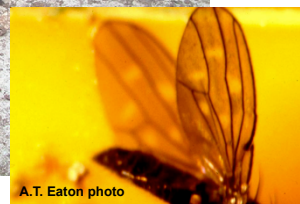
**sanitize benches, potting areas, mats,
trays, pots? irrigation system
components**

- remove plant debris, weeds & algae



**Sanitation
Needed!**

Shore fly breeding ground!



A.T. Eaton photo

Sanitize & reuse pots?

Thielaviopsis root rot is a real risk

Do not reuse pots in Thielaviopsis-prone

crops:

pansy, viola, calibrachoa, vinca, petunia

Some other crops are also at risk:

European ginger, rosemary, verbena...

Sanitation!

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Sanitation!

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Humidity management

- **vent/ heat**
 - open vents just before sunset**
 - adjust fans to low & turn up heat few degrees**
 - (heat drives out moist air)...repeat few times**
- **roll up sides ASAP in morning**
- **need vents @ ridge or gables**
- **fans (but...if air very humid & cool, may just spread disease, vent first)**



Common Diseases

Botrytis (Gray Mold)



Botrytis sporulation



Botrytis canker on basil

Botrytis (gray mold) management

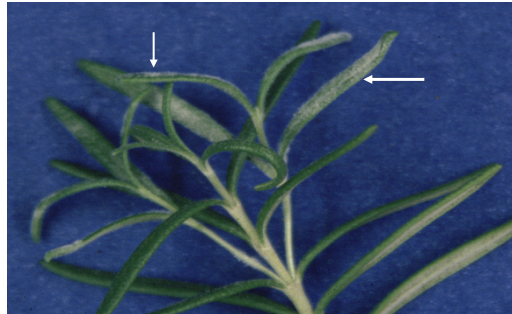
- **Heat & VENT** when humidity > 85%
- **Keep temperature above 70F** (at least 68F)
- **Increase air circulation** (spacing, fans)
- **Avoid wetting leaves** (let dry before nightfall)
- **SANITATION** (bag it!)
- **Weed control**

Powdery mildew





**Powdery mildew
on tomato**



**Powdery mildew
on rosemary**

Powdery mildew management

- (similar to Botrytis management)
- Improve air circulation/reduce humidity
Heat / vent cycles, HAF
- Water early in day
- Sanitation
(especially between crops)
- Fungicides

Downy mildew

Downy mildews

Often misdiagnosed or overlooked

Fungus related to Pythium/Phytophthora

Thrive in cool, wet weather

Relatively narrow host range

Infected leaves may brown and die

May be seed-borne

**Aster, Veronica, Rudbeckia, Buddleia,
Phlox, Potentilla, Pansy...Basil**



Downy mildew management

- **Improve air circulation/reduce humidity < 85%**
- **Avoid overhead irrigation / water early in day**
 - (especially when overcast & cool)
- **Sanitation!**
 - (remove infected plants - bag)

Root rot fungi

- **Pythium & Phytophthora**
- **Rhizoctonia**
- **Thielaviopsis**
- **Sclerotinia**

Root rots favored by:

- High soluble salts
- Wet / water-logged media
- Low / high pH
- Stressed plants
- Cool temperatures



Sources of root rot pathogens

Transplants, rooted cuttings

Contaminated benches, tools, flats

Potting media

Seeds

Contaminated hands

Dirt (or dirty) floors



General root rot symptoms

Stunting

Nutrient deficiency symptoms

Wilting

Discolored roots

Water-logged media

Damping off





Pythium / Phytophthora root rot

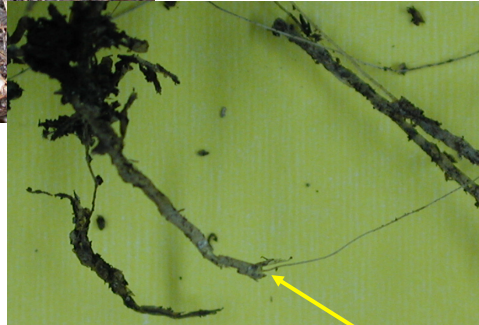
General symptoms

Roots rot from tips

Cortex sloughs off

Stem infections (black leg)

Many hosts



Pythium root rot

sloughing cortex

Thielaviopsis root rot

- **General symptoms**
- **Roots stunted, often blackened**
- **May develop quickly on recently shipped plants**
(infected as seedlings, no symptoms until plants are stressed)

Thielaviopsis

Pansy

Stunting & yellowing



M. Daughtrey photos

Thielaviopsis



Blackened areas on roots

M. Daughtrey photo

Thielaviopsis management

Reduce plant stress

Well-drained media for seedlings

Warm soil temps for plug trays

DO NOT reuse pots / trays

Avoid creating dust

(may contain long-lived 'spores')

DO NOT use soil

Management of root rots

- **Sanitation (bag it!)**
- **Don't reuse pots & flats**
- **Disinfest potting area, benches**
- **Hose ends off floor**
- **Maintain proper fertility, pH**
- **Keep stored media covered**

Viruses



INSV



Figure 4





CMV on Monkshood

Virus management

- **Certified seed**
- **Control aphids/thrips**
- **Weed control (outside too)**
- **Don't grow seed-started vegetable & bedding plants from cuttings or plugs in same house**
- **No tobacco products (TMV)**
- **SANITATION (destroy suspicious)**