Plant Pathogens

Sky Gardens LLC

& how to deal with them -
a balanced approach
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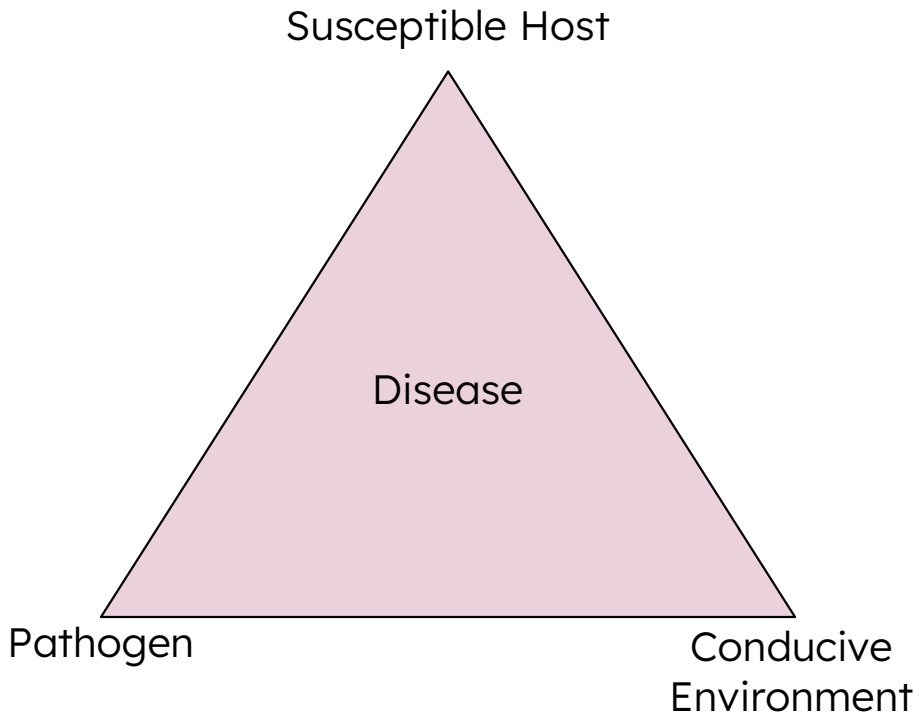
Pathogens are microscopic organisms that cause disease – including fungi, bacteria, and viruses.*



The disease triangle depicts the conditions necessary for disease to be present. If just one of these is removed, then disease cannot happen.

If one of these is mitigated, then disease is mitigated.

Disease forecasting - paying attention to environmental conditions to predict when disease will spread.

* Also Nematodes and Phytoplasmas, but those are much more uncommon.

Signs vs Symptoms

Signs are physical parts of the pathogen body, e.g. spores, fruiting bodies, or mycelium.

Symptoms are a plant's response to the pathogen, e.g. wilting, chlorosis, spots, or root sloughing.

The first step in encountering a potential disease is to take photos, make a record, and identify. Most pathogens are host-specific, so looking up the plant + the sign or symptom can be helpful in narrowing down the disease.

Sign

Sclerotia (fruiting body) on tomato
Source: University of Florida

Symptom

Thielaviopsis (root rot) of holly
Source: Virginia Cooperative Extension

Common Characteristics of Fungi

80% of plant diseases are caused by fungi and fungi-like organisms (water molds). They have some key features that can help narrow down identification - like circular or amorphous patterns & fruiting bodies often being large enough for us to see without a microscope. Spores can lie dormant in the soil for a decade or longer.

Root & Crown Rot

- Most common are *Rhizoctonia, Sclerotium*, and *Thielaviopsis*
- Can be identified by entire branches randomly dying in an otherwise healthy-looking plant.

Source: Virginia Cooperative Extension

Leaf Spots & Galls

- Easily identifiable, and very host specific
- Most common are *Cercospora, Anthracnose, Exobasidium*, and *Calonectria*

Source: Oregon State University

Water Molds

- Not true fungi, so they behave a bit differently
- Not host specific
- Most common are *Pythium, Phytophthora,* and *Downy Mildew*

Source: Michigan State University

White & Gray Mold

- Most common are *Botrytis, Powdery Mildew*, and *Sclerotinia Blight*
-Appear on above-ground parts of the plant for identification

Source: Sky Gardens

Vascular Wilts

- Most common is *Fusarium*
- Telltale discolored vascular tissue

Source: University of Maryland Extension

Common Characteristics of Bacteria

10% of plant diseases are caused by bacteria, and they have some distinct features you can use to tell them apart from fungi like angular leaf lesion patterns & gooey wetness. Plant pathogenic bacteria species tend to affect an entire genus or family of plants rather than a specific species. Spread by water splash and pruning.

Soft Rots

- *Pectobacterium carotovora*
- common on tubers & rhizomes
- no chemical control

Source: Colorado State University

Leaf Spots

- Most common are *Pseudomonas* and *Xanthomonas*
- Identify by the lack of fungal fruiting structures

Source: Sky Gardens

Fire Blight

- *Erwinia amylovora*
- Affects species in Rosaceae family
- Disinfect pruning tools between cuts, and prune at least 8 inches below infection

Source: Michigan State University

Bacterial Wilt

- *Ralstonia solanacearum*
- Infected plants are considered a bioweapon

Source: University of Maryland

Crown Galls

- *Agrobacterium tumefaciens*
- bacterium enters through wounds
- wide host range
- control with competitive bacteria

Source: University of Minnesota Extension

Common Characteristics of Viruses

Plant pathogenic viruses are a unique category because they require a live vector for transmission, they rarely lead to the death of the host, and some find the symptoms more beautiful than the healthy plant. They cannot be treated chemically; the best treatment option is to remove affected plant parts.

Roses

Source: NC Cooperative Extension

Camellias

Source: Sky Gardens

Tomatoes

Source: NC Cooperative Extension

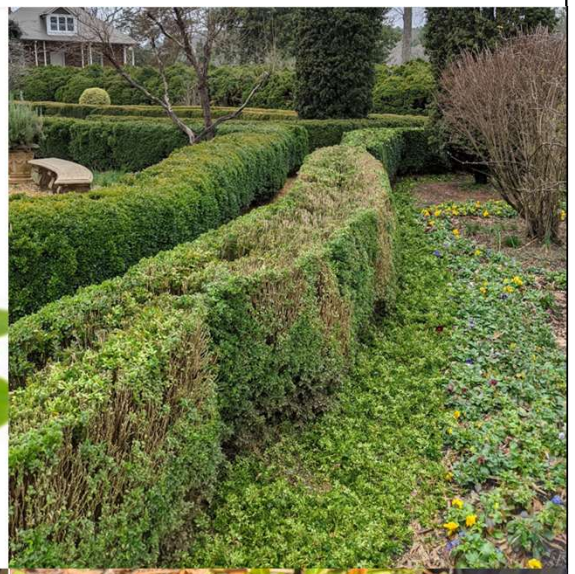
Squash

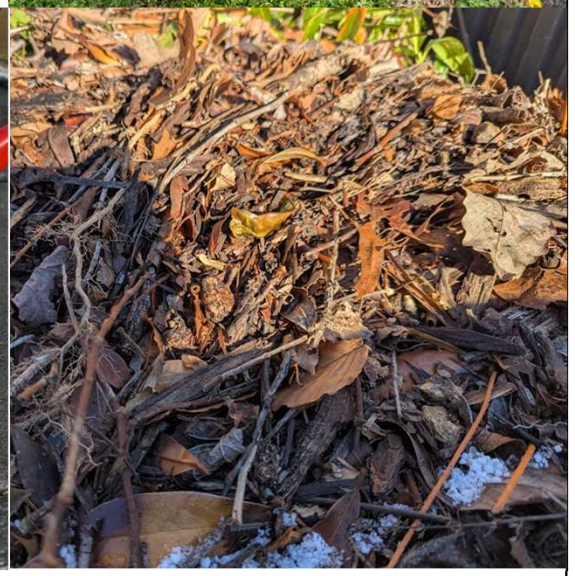
Source: University of Minnesota Extension

Methods of Control - Prevention & Sanitation

Having a prevention-first mindset is crucial to implementing pest management responsibly.

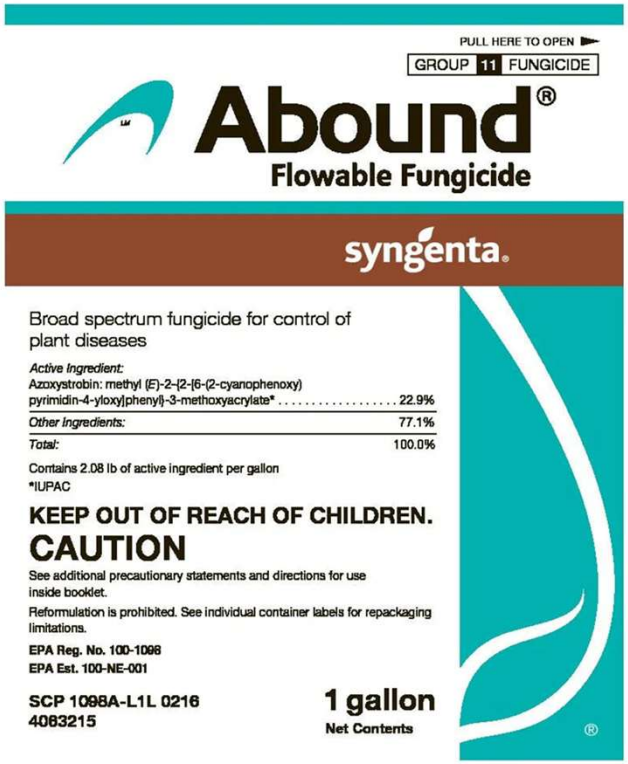
- ❑ Disease - resistant varieties
- ❑ Inspecting new plants
- ❑ Disinfecting tools
  - ❑ Alcohol soak, 70%
  - ❑ Bleach dip, 10%
  - ❑ Lysol wipes
- ❑ Disposing of plant waste
- ❑ Airing out canopies
- ❑ Reducing prolonged wetness
- ❑ Reducing plant stress





Fungicides 101

- Use as a last resort
- “Fungicides” is a misnomer
- Dead tissue does not come back to life
- Chemical labels are a legal document
- All fungicide labels have the same set of key information



FRAC Code - Identifies the Mode of Action, which is how the fungicide works

Active Ingredient - Displays the chemical name and concentration

Details for which plants are approved for this chemical’s use, which diseases the chemical can treat, and at what concentration to mix.

Fungicides 101

- Use disease forecasting to know when to apply
- Use low-risk fungicides if possible and rotate if applying more than once in a season
- Using your notes, go back to 2 weeks before the first sign of disease

Brand Name	Active Ingredient (Common name)	FRAC #	Resistance Risk (High, Med, Low)	Main Target Diseases
Subdue Maxx	Mefenoxam	4	high	*Pythium* and *Phytophthora* downy mildew
Medallion	Fludioxonil	12	low-med	*Rhizoctonia, Fusarium*
Heritage	Azoxystrobin	11	high	Powdery mildew, downy mildew, rusts
Terrazole	Etridiazole	14	low-med	*Pythium, Phytophthora*
3336	Thiophanate methyl	1	high	*Anthracnose, Fusarium, Cercospora, Rhizoctonia*
CuPRO	Copper hydroxide	M1	low	Powdery mildew, bacterial leaf spots, fire blight
Daconil Ultrex	Chlorothalonil	M5	low	*Botrytis,* rusts, fungal leaf spots
Decree	Fenhexamid	17	low-med	*Botrytis*
Segway	Cyazofamid	21	med-high	*Pythium, Phytophthora,* downy mildew
Torque	Tebuconazole	3	med-high	*Cercospora,* powdery mildew, leaf spots, flower blights, rusts

Dealing with Plant Pathogens - Review

- Step 1 - Photograph and Record
- Step 2 - Identify using extension websites, your local horticulturist, or other extension resources
- Step 3 - Form an Integrated Pest Management Plan
- Step 4 - Implement the plan at the most opportune time using disease forecasting and your record from previous years

Thank You For Your Attention!

Presented by Skyler Keeney

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I would love to be your local Horticulturist!

Email or text me for quick questions, consultations, design services, landscaping services, or my mountain-grown nursery plants.

More Detailed Information on...

- Reading fungicide labels - https://tobacco.ces.ncsu.edu/2021/04/from-the-field-agronomy-notes-vol-5-num-4/