

ECO-FRIENDLY MANAGEMENT OF PLANT DISEASES



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Focus on managing plant diseases using environmentally friendly methods

- *Minimal impact* on the environment.
- *Minimal impact* on the user.



OBJECTIVE:

- Provide the tools that will allow you to responsibly manage diseases of ornamentals in the landscape.



DISEASE

- Any condition in a plant that interferes with normal growth and development.

Dynamic
Continuous



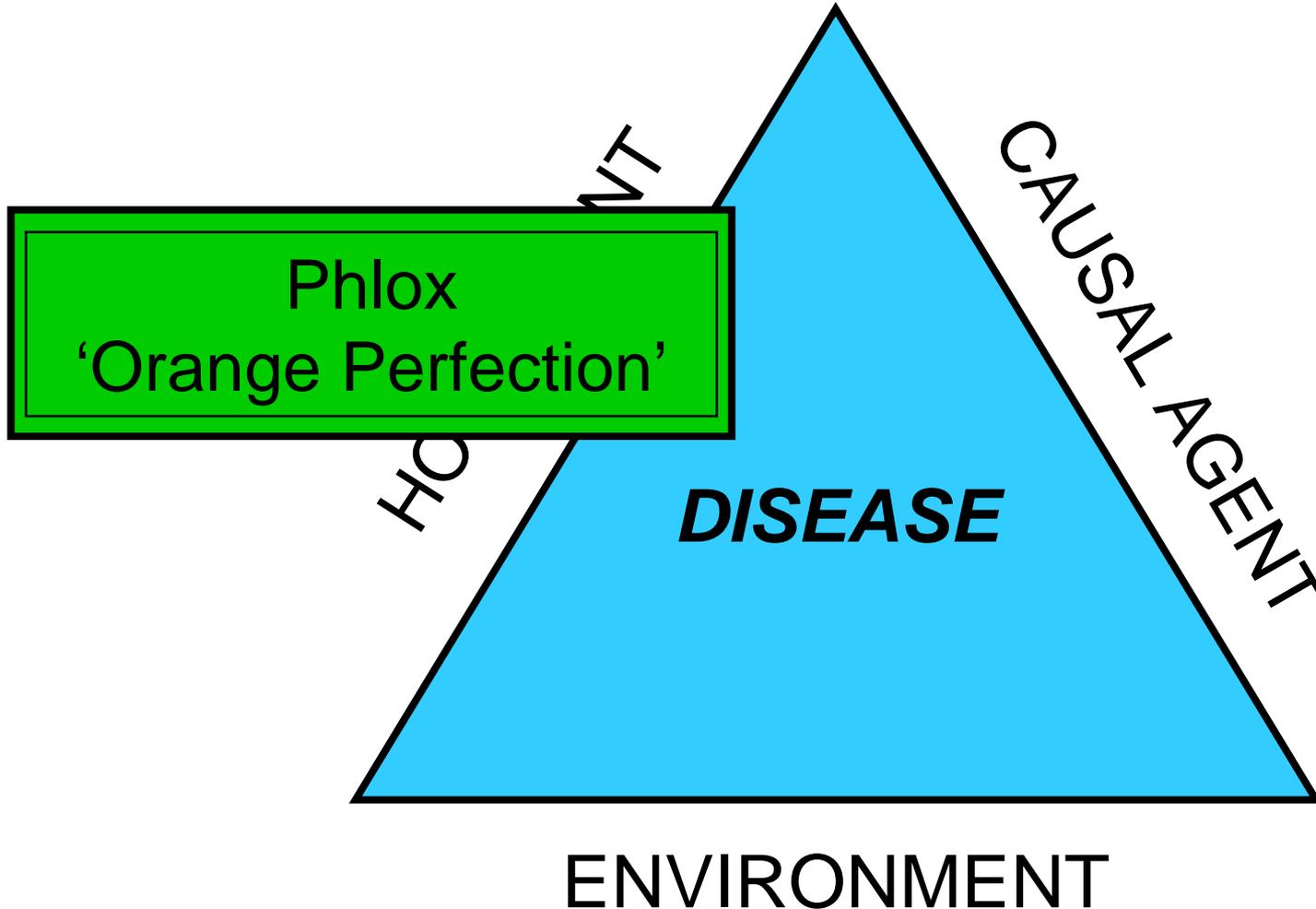
INJURY

- A onetime occurrence or irritation that results in plant damage.

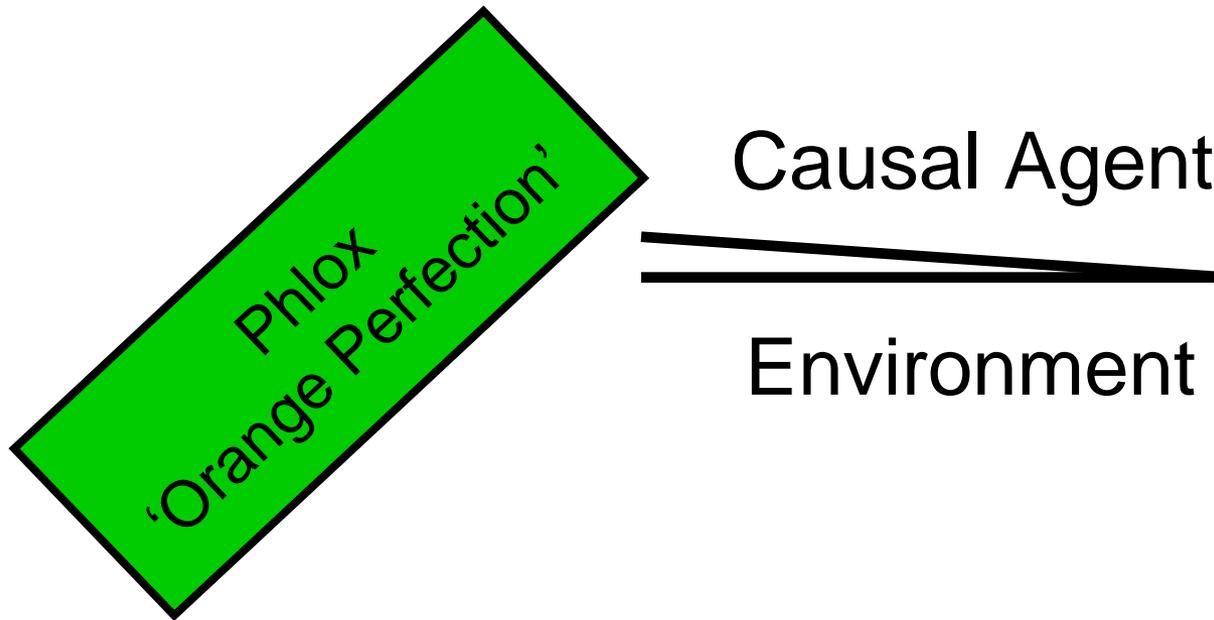
Lightning
Frost



DISEASE TRIANGLE



DISEASE TRIANGLE



PLANT HEALTH PROBLEMS

I. ABIOTIC (non-living agents)-

1. Cultural
2. Environmental

II. BIOTIC (living agents)-

1. Fungi and Fungus-like Organisms
2. Bacteria
3. Viruses and Viroids
4. Phytoplasmas
5. Nematodes



DISEASE PREVENTION AND MANAGEMENT:

- Accurate Disease Diagnosis
- Plant Health Management Plan



DISEASE DIAGNOSIS



ACCURATE DIAGNOSIS:

- Need for Control
- Type of Control



Need help?

Contact your local diagnostic lab.



PLANT DISEASE INFORMATION OFFICE

- How to contact us.
- How to collect, prepare, and submit a sample for diagnosis or identification.
- Sample submission form.

www.ct.gov/caes/pdio

203.974.8601

Toll-Free: 877.855.2237



DISEASE MANAGEMENT =
PROGRAM FOR MANAGING
PLANT HEALTH

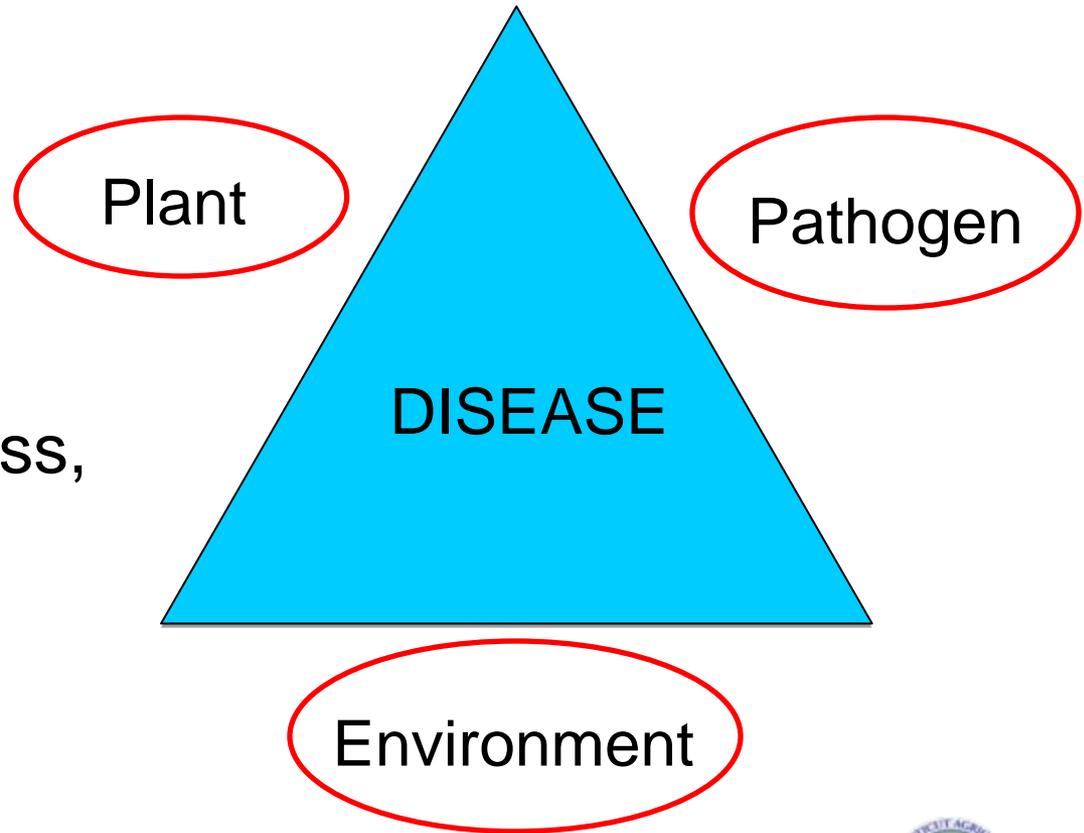
or

*INTEGRATED PLANT
HEALTH MANAGEMENT*



Integrated Plant Health Management

- Pathogen
 - Sanitation
 - Fungicides
- Plant
 - Resistant cultivars
 - Optimize health
- Environment
 - Reduce leaf wetness, RH
 - Establish hostile microbial flora on plant surface- (biopesticides)



DISEASE MANAGEMENT

- The goal of disease management is not to completely eliminate diseases but **to manage them such that they remain at acceptable levels.**
- We don't have ZERO tolerance for disease in the landscape or home garden.



PLANT HEALTH MANAGEMENT PROGRAM:

1. Culture
2. Sanitation
3. Resistance
4. Biological
5. Chemical



Prevention!



1. CULTURE

- Maintain plant vigor.
 - Plant and site selection.
 - Planting practices and spacing.
 - Plant nutrition.
 - Manage water.



Plant and Site Selection

- “The right plant for the right site.”
- Hardiness.
- Avoid mechanical injuries and soil compaction.



The right plant for the right site!



The wrong plant for the wrong site!



Planting Practices

- Adequate spacing for light, good air circulation, and drying.
- Correct preparation of the planting hole and root ball.



Correctly Prepare Rootball for Planting



Rootball Preparation



Scoring Root Ball Before Planting



Correctly Prepare the Rootball



Remove Burlap and Check for Root Flare

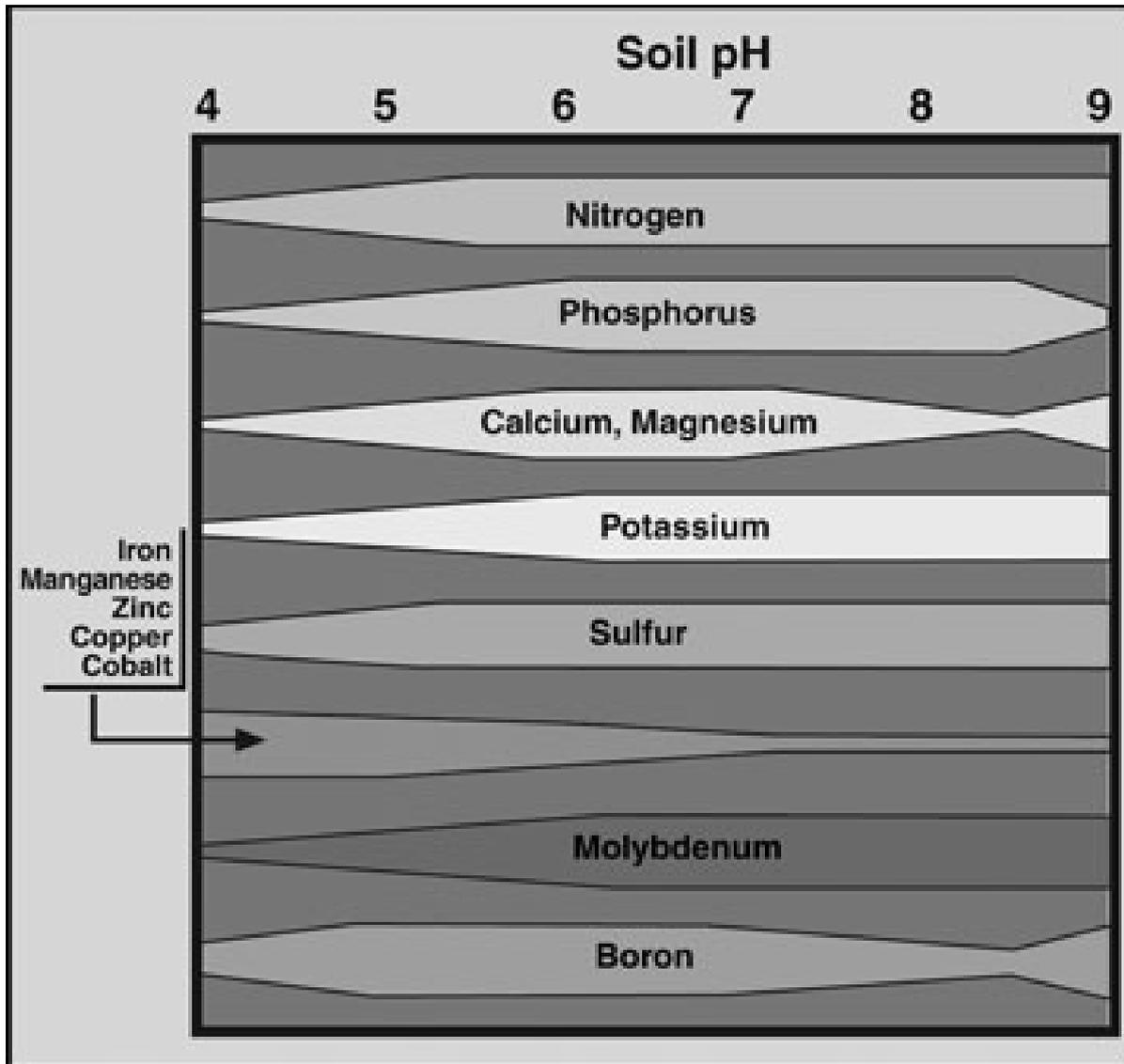


Plant Nutrition

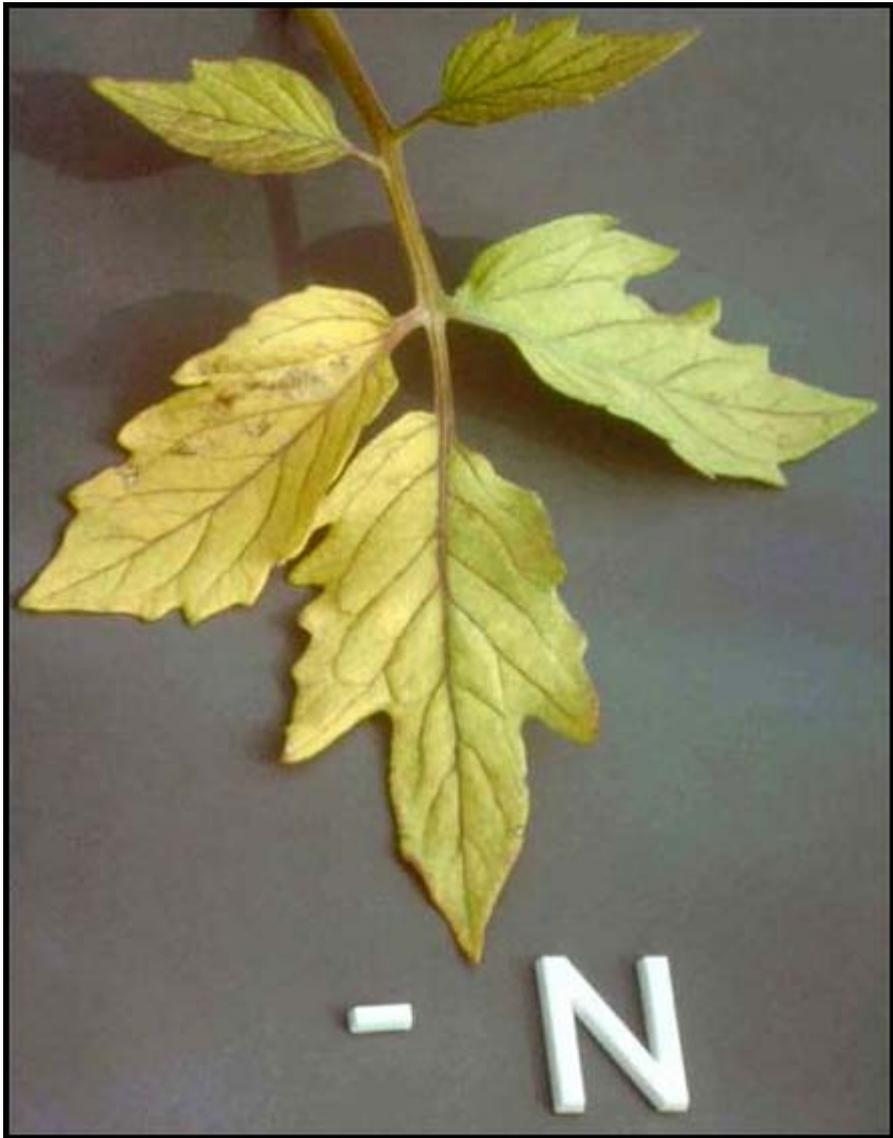
- Maintaining adequate nutrition.
- Applying fertilizer based on soil and/or plant tissue tests.
- Adjusting pH and improving soil biodiversity and tilth.



pH and Nutrient Availability



Deficiency Symptoms



Managing Water

- Maintaining adequate soil moisture.
- Plants need about 1 inch of water per week.



1. CULTURE (cont'd)

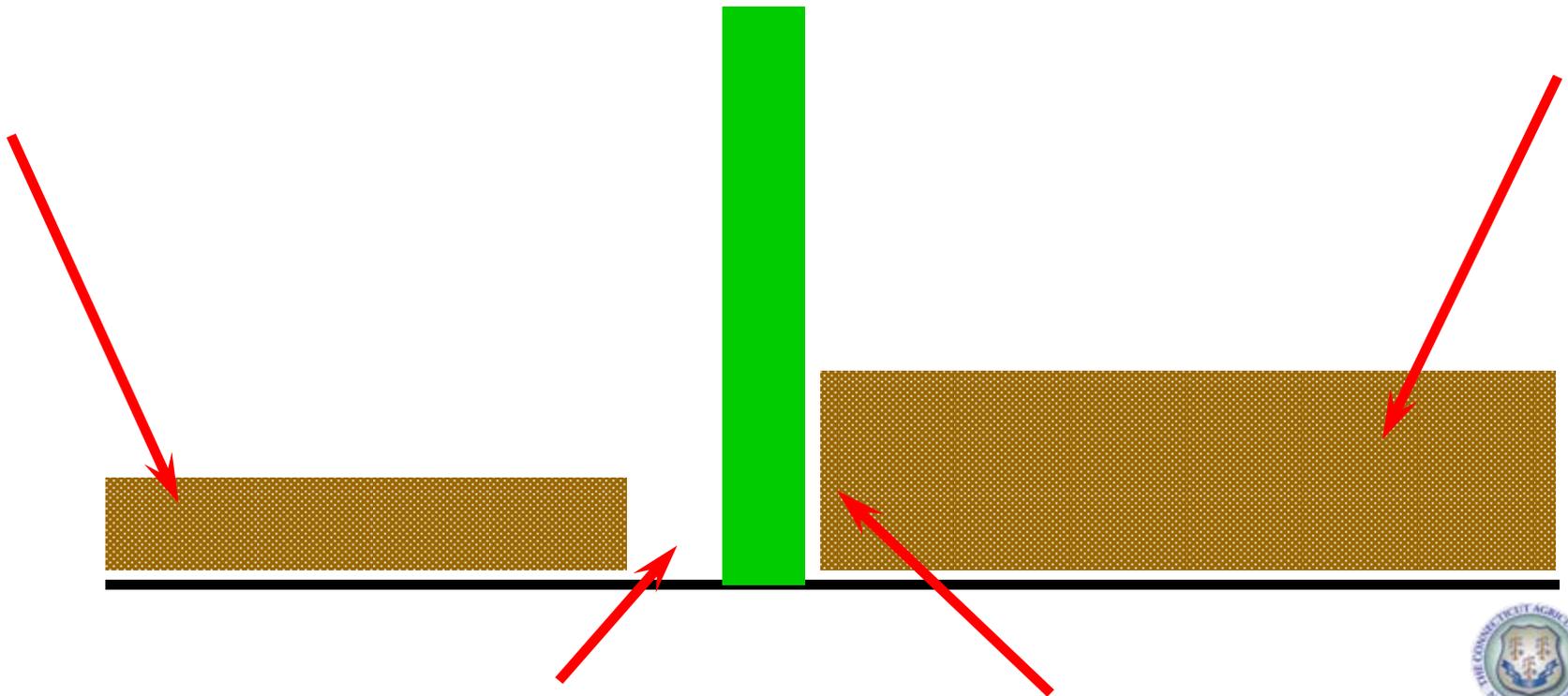
- Mulch.
 - Soil moisture retention.
 - Soil temperature moderation.
 - Weed control.
 - Compaction remediation.
 - *DISEASE CONTROL.*

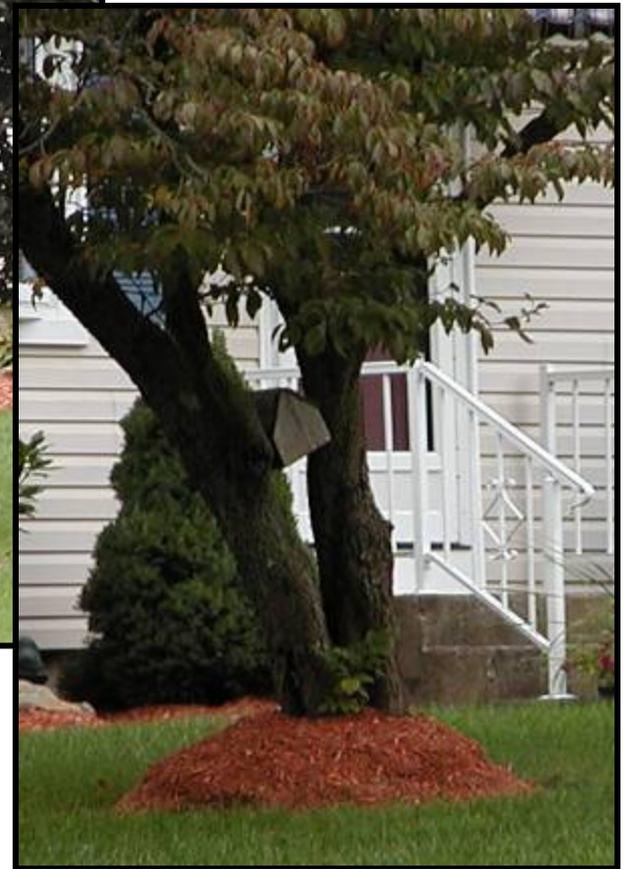


MULCHING METHODS

YES

NO

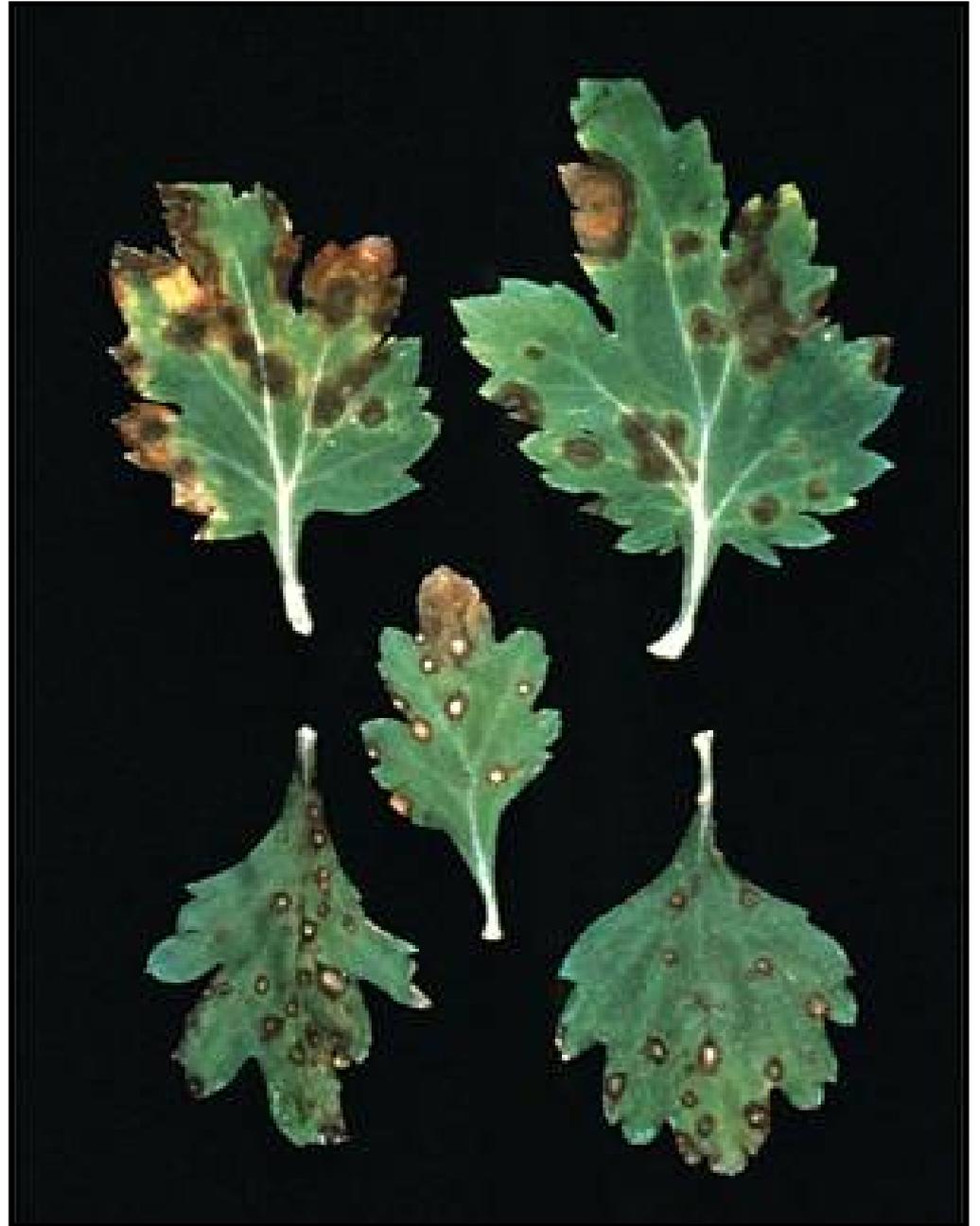




Proper Mulching



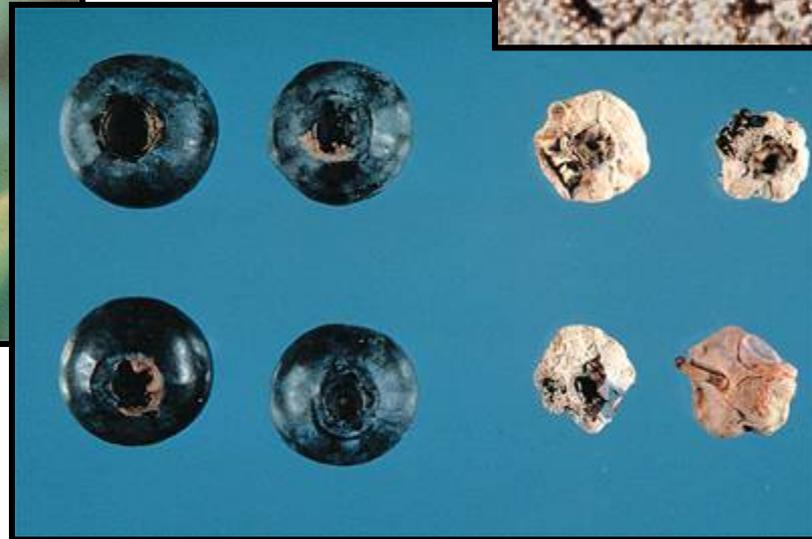
Leaf Spot of Chrysanthemum



Septoria Leaf Spot of Tomato



Mummyberry of Blueberry



1. CULTURE (cont'd)

- Weed Control.
 - Eliminates competition for available nutrients and water.
 - Eliminates reservoir hosts of plant pathogens.





Powdery Mildew of Tomato



INSV / TSWV (Tospo) Viruses



Thrips



1. CULTURE (cont'd)

- Scout.
 - Helps to identify and record outbreaks before they become widespread.
 - Examine upper and lower surfaces of leaves.



1. CULTURE (cont'd)

- Rotate Plants.
 - Practice of not planting members of the same family in the same location or part of a garden.
 - Rotation periods vary from 3-4 years or as many as 10 years.
 - Often not feasible for home plantings.



Verticillium Wilt



Fusarium Wilt



Club Root of Crucifers

7-10 year rotation



1. CULTURE (cont'd)

- Interplant (Companion Planting).
 - Practice of planting based on how plants interact or affect one another.
 - Still quite anecdotal.
 - Need for “sound science.”



Marigolds for “Trapping” Root Knot Nematodes



French or French Dwarf Marigolds



Root Knot Nematode Damage



2. SANITATION

- Select and plant pathogen-free stock.
- Remove or prune infected plants or plant parts.
- Groom plants during growing season.
- Use clean equipment.



Select and plant pathogen-free plants

- Purchase vigorous, pathogen-free seeds, bulbs, cutting, seedlings, or transplants.
- Inspect at time of purchase or prior to planting.



Infected Daffodil Bulb



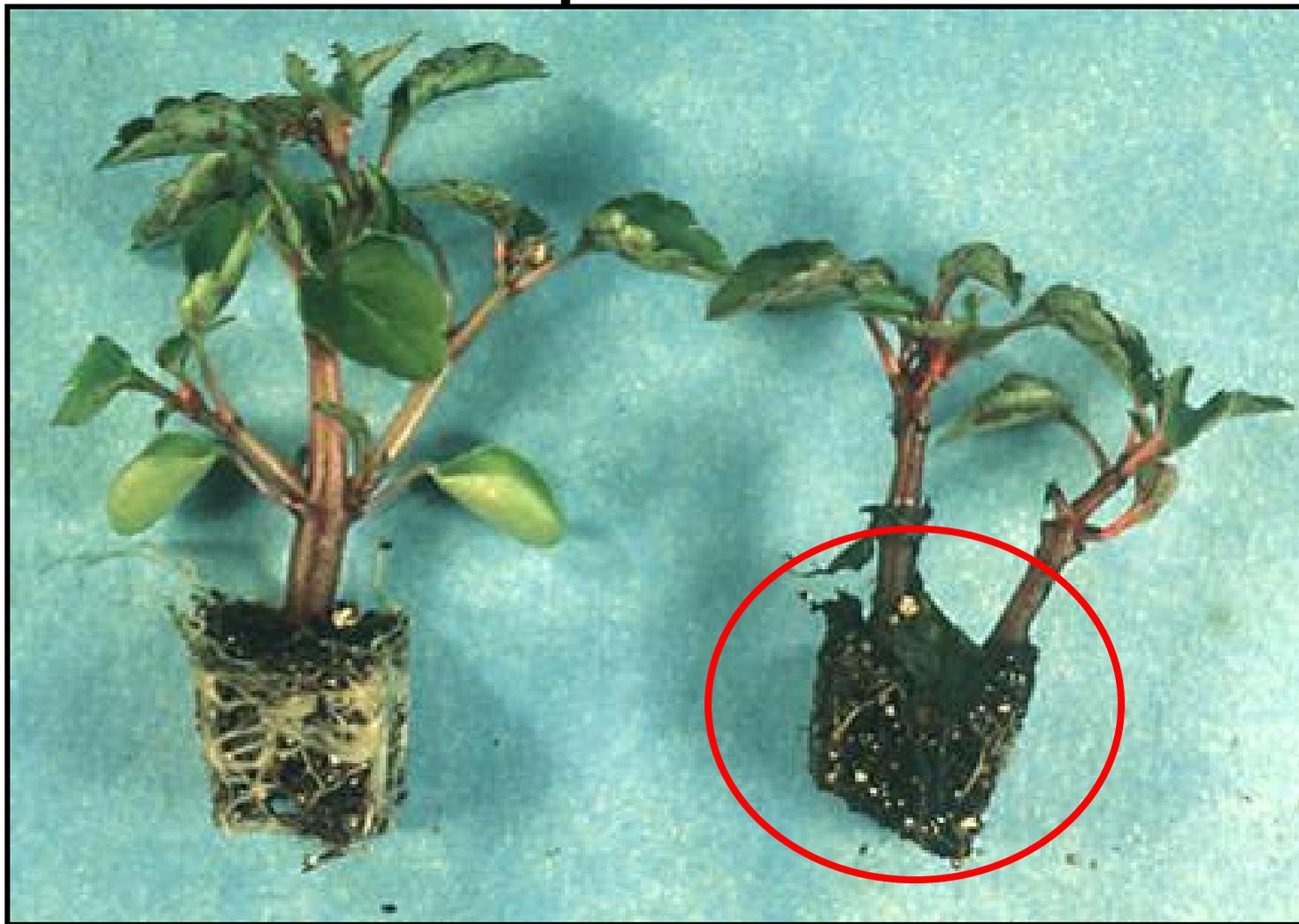
Pythium Root Rot



Botrytis Blight



Phytophthora Root Rot- Impatiens



Thielaviopsis Root Rot



Remove or prune infected plants or plant parts

- Prune affected plant parts.
- Rake or remove fallen leaves.
- Remove tops of perennials with a history of disease after they are killed by frost.



Scab of Crabapple





Tar Spot of Maple

Hollyhock Rust



Adaxial surface

Abaxial surface



Volutella Blight of Pachysandra



Botryosphaeria Canker of Rhododendron





Black Knot

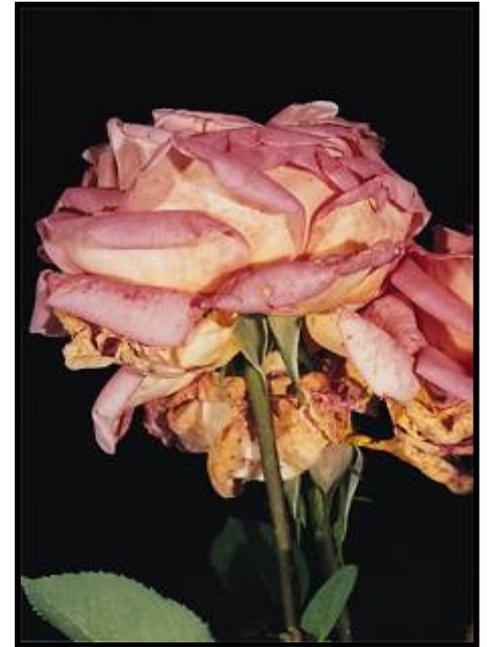


Groom plants



Botrytis Blight of Peony





Botrytis Blight of Rose



Botrytis Blight-Geranium



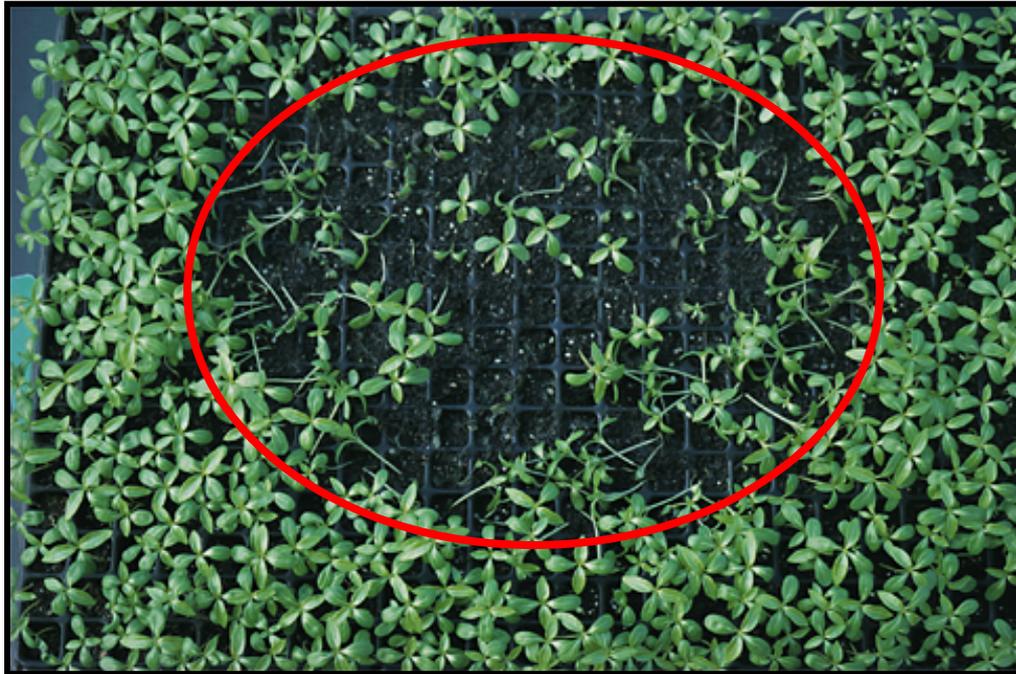
Use clean equipment



Disinfest All Equipment



To Prevent Damping-Off



3. RESISTANCE

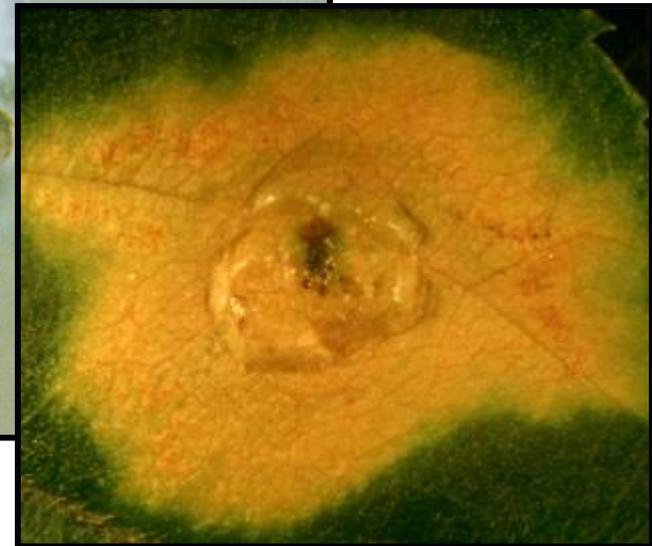
- Use resistant or tolerant species or cultivars, especially for recurring diseases.
- Very effective but a genetic trait, can't be conferred to existing plants!
- Considerable interest and breeding activity.
- Examples:
 - Dogwoods: Anthracnose resistance.
 - Junipers: Kabatina and Phomopsis resistance.
 - Monarda: Powdery Mildew resistance.



Verticillium Wilt



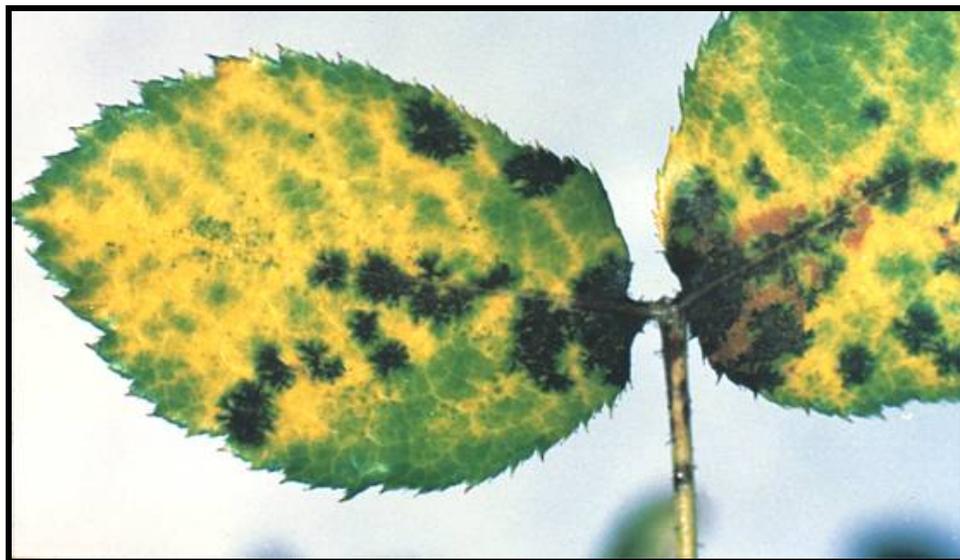
Cedar-Apple Rust of Crabapple



Dogwood Anthracnose



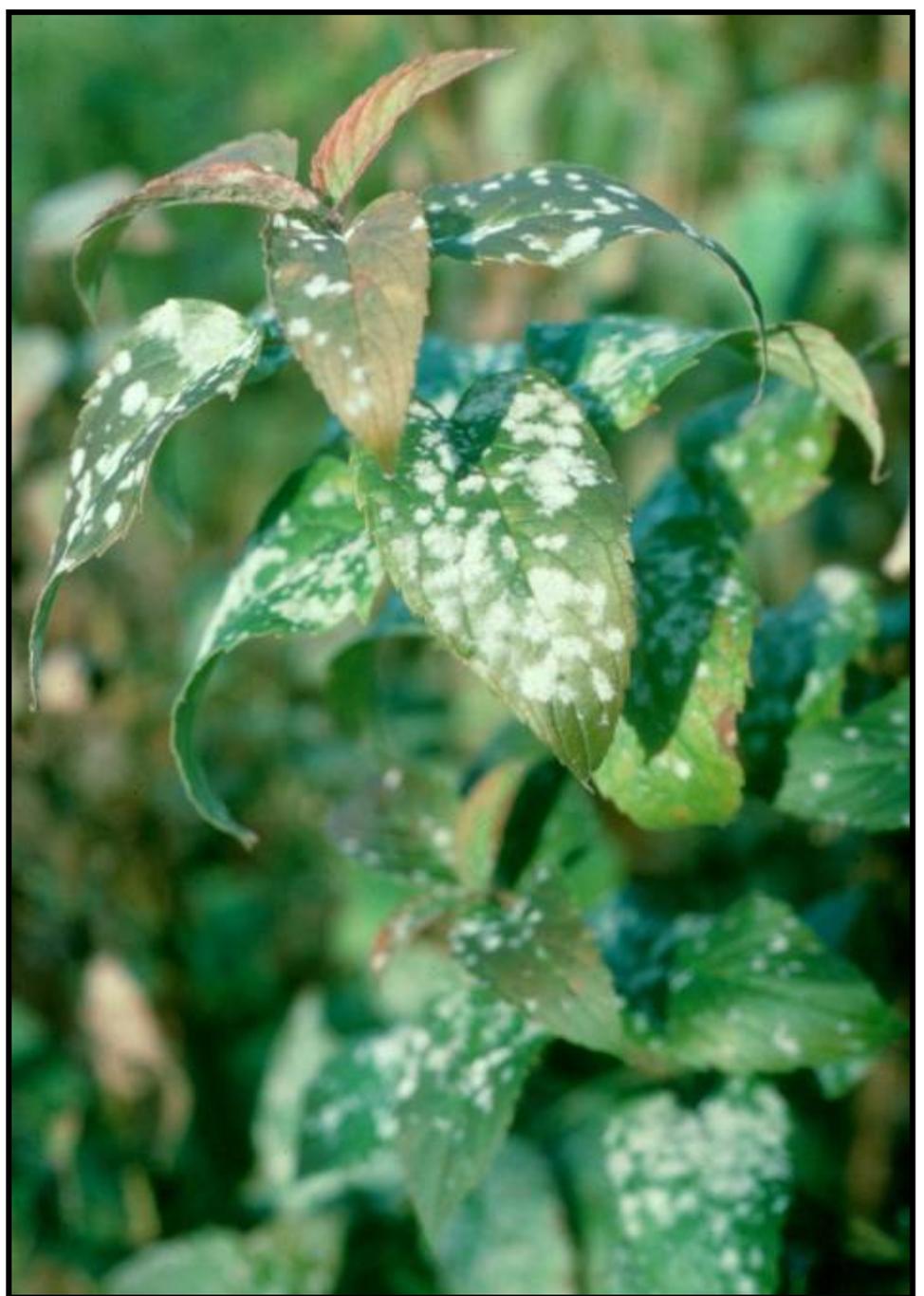
Black Spot of Rose



Fusarium Wilt of Tomato



Powdery Mildew of Monarda



Powdery Mildew of Phlox



4. BIOLOGICAL

- Also called *BIOPESTICIDES*.
- Use of living organisms to control plant pathogenic organisms (good guys vs. bad guys).
- Modes of action:
 - Direct (Parasitism, Competition, Antagonism)
 - Indirect (Induced Resistance, Enhanced Growth)



4. BIOLOGICAL: (cont'd)

- Have EPA registration numbers.
- Examples:
 - *Trichoderma harzianum* Rifai strain KRL-AG2 (Root Shield, Plant Shield)
 - Fungus that protects against root pathogens (Pythium, Rhizoctonia, and Fusarium) and many others.
 - *Bacillus subtilis* QST 713 strain (Cease, Rhapsody, Serenade)
 - Bacterium with a broad spectrum of activity: Mildews, blights, leaf spots, rusts
 - *Streptomyces griseoviridis* Strain K61 (Mycostop)
 - Broad spectrum of activity. Mildews, blights, leaf spots

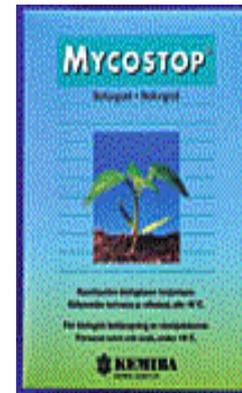


Eco-Friendly Biofungicides

Bacteria

Actinomycetes

Fungi



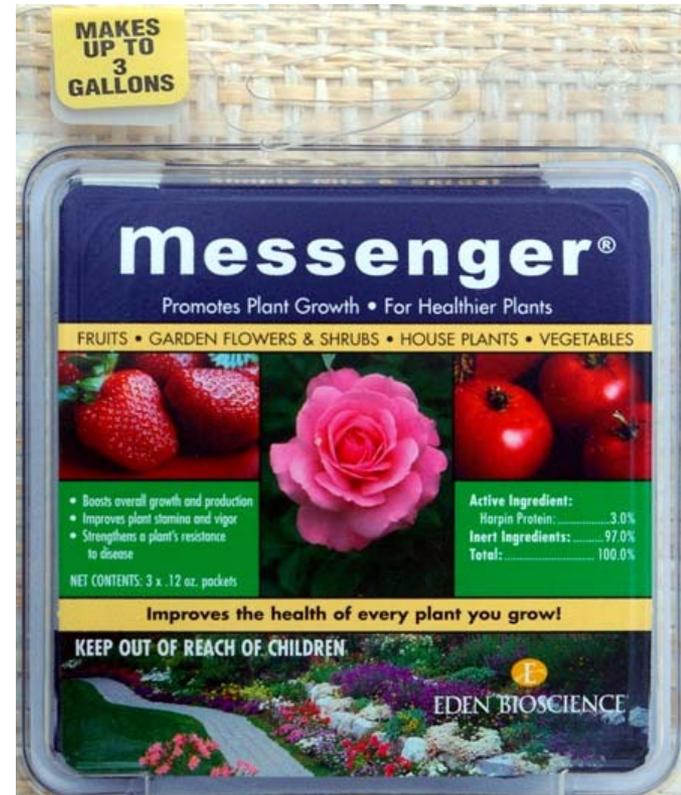
Suppress root and foliar pathogens



Eco-Friendly “Biofungicide”

Not a living organism.

- It a protein extracted from a bacterium.
- Turns on defense mechanisms in plants.



Black Root Rot- Vinca (Thielaviopsis Root Rot)





Crown Gall



Powdery Mildew



Columbine

Lupine



5. CHEMICAL



CATEGORIES OF PESTICIDES:

- Biological (Biopesticide)
- Biorational
- Traditional-Chemical



KEY FACTORS FOR PESTICIDE USE:

- *When* to Treat
- *What* to Use



BIOLOGICAL PESTICIDES (BIOPESTICIDES):

- Use of living organisms to control other living organisms.
- Modes of action:
 - Direct (Parasitism, Competition, Antagonism)
 - Indirect (Induced Resistance, Enhanced Growth)



BIORATIONAL PESTICIDES:

- “Environmentally” friendly.
- “User” friendly.
- OMRI-approved (organic).
- Examples:
 - Potassium bicarbonates (Milstop, Kaligreen)
 - Oils: Horticultural & Neem (JMS Stylet Oil, PureSpray Green and Ultra-Fine Oil, Triact)
 - Soaps (Safer Insecticide Soap)



Eco-Friendly Biorational Pesticides



Suppress foliar diseases such as Powdery Mildews and Leaf spots



Eco-Friendly “Household” Biorationals



1 tbs baking soda to 1
gallon water and 1 tbs
horticultural or vegetable oil



Mix 1:1 with water



TRADITIONAL (CHEMICAL) PESTICIDES:

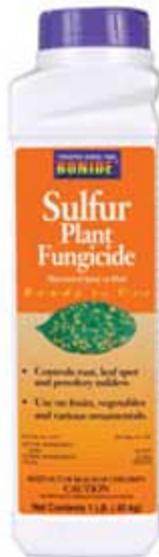
- Traditional compounds with traditional modes of action.
- Some are acceptable for organic land care.
- Examples:
 - Copper products (Champion, Concern Copper Soap Fungicide)
 - Sulfur (Safer Garden Fungicide II)



Inorganic Fungicides

Sulfur based

Copper based



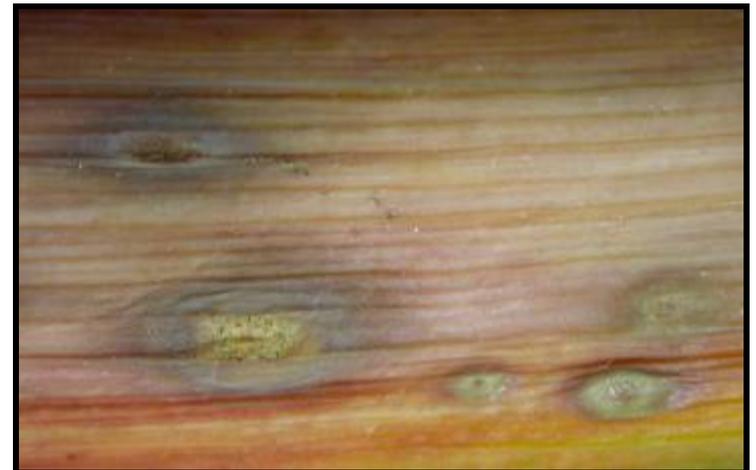
Suppress foliar diseases such as Powdery and Downy Mildews and Leaf spots



Septoria Leaf Spot on Rudbeckia



Didymellina Leaf Spot of Iris



Powdery Mildew of Hydrangea



Downy Mildew- Impatiens



Black Spot of Rose



Bacterial Spot of Zinnia





Thank you.

