Environmentally safe methods for vegetable disease control

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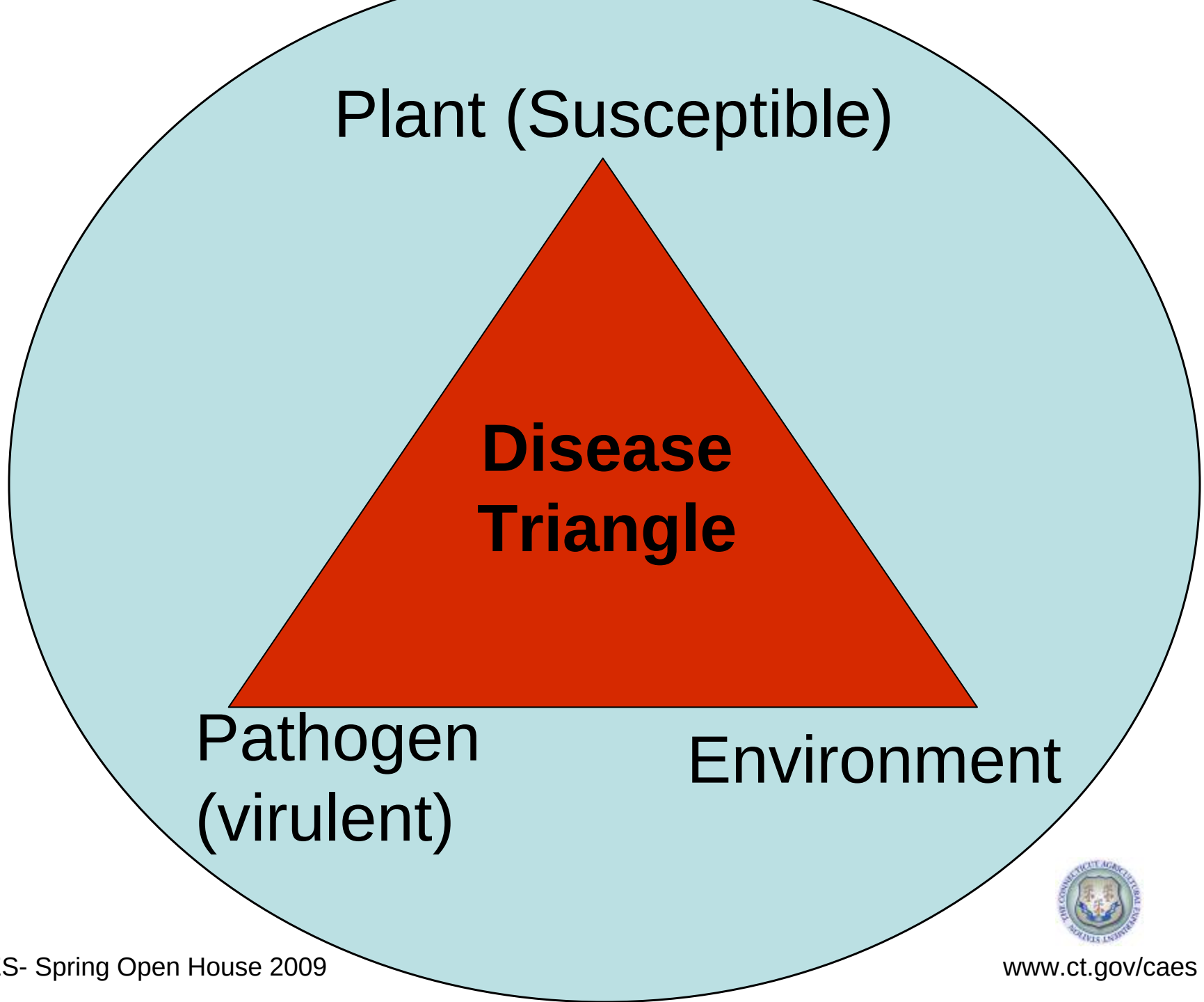
Environmentally Safe

Designed to minimize harm to the natural world

How do we suppress vegetable diseases with environmentally safe methods?


Plant (Susceptible)
Disease Triangle
Pathogen (virulent)
Environment

How do we suppress disease with environmentally safe methods

- Plants
  - Resistant Vegetables
  - Nutrition
- Pathogen
  - Inoculum management
  - Inoculum reduction
- Environment
  - Fertilization
  - Water management
  - Soil health

Resistant Tomatoes

"VFN" indicates resistance to Verticillium wilt, Fusarium wilt, and Root-knot Nematodes. Some varieties have a "T" designation to indicate resistance to tobacco mosaic virus

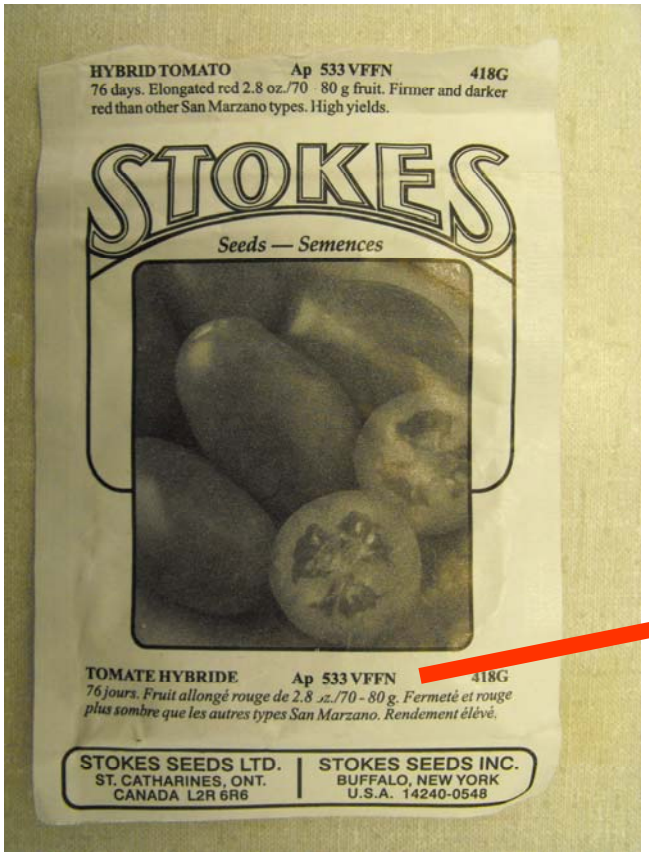
Verticillium wilt

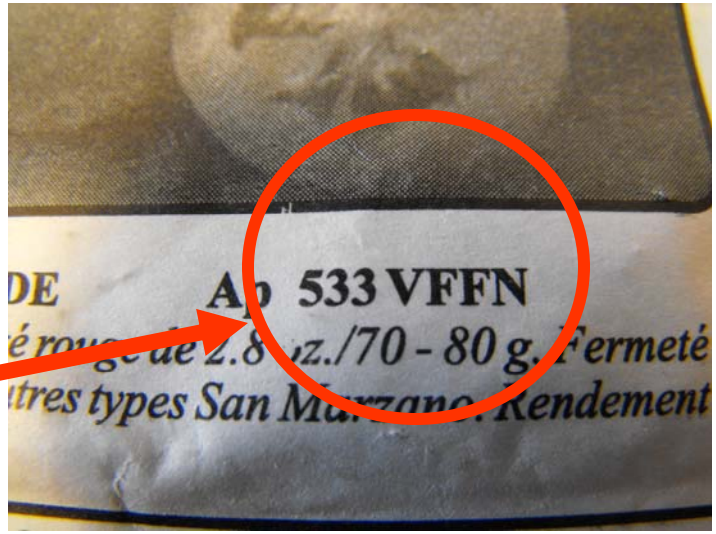
Fusarium wilt
Fusarium crown rot

Root Knot
Nematode

TMV

“VFFN” indicates resistance to Verticillium, Fusarium wilt, and Fusarium crown rot and Root-knot Nematodes.





Resistant Basil

Fusarium wilt resistance has been released in ‘Nufar’

Fusarium wilt

Nufar

Resistant Cucurbits

"PMR indicates resistance to Powdery Mildew

Powdery Mildew of Pumpkin

Merlin
Magic Lantern
Mystic Plus

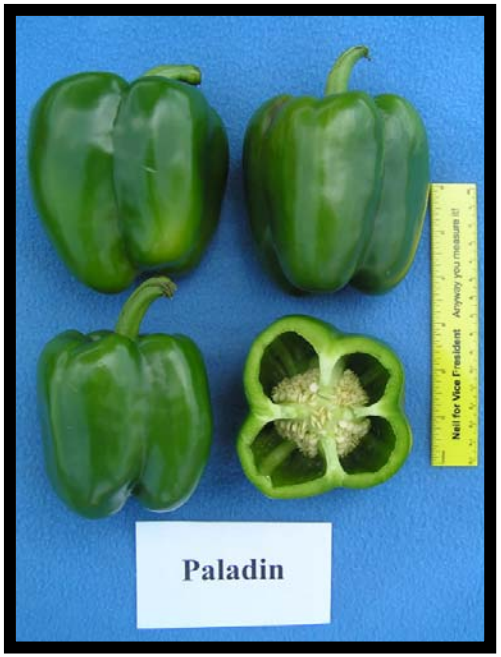
First commercialized varieties

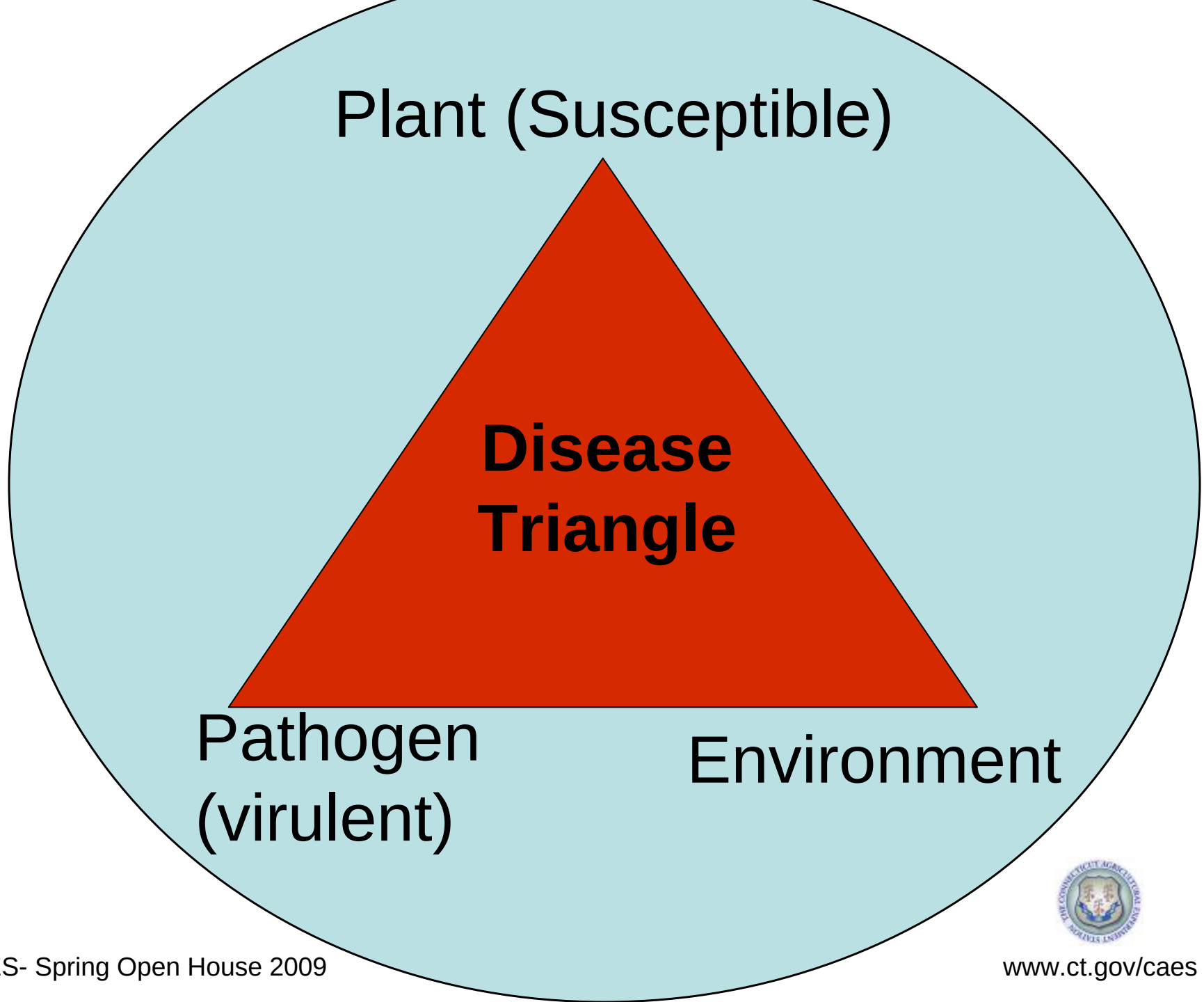
Resistant Pepper

"Phytophthora resistance

Paladin

Phytophthora blight of pepper




Plant (Susceptible)
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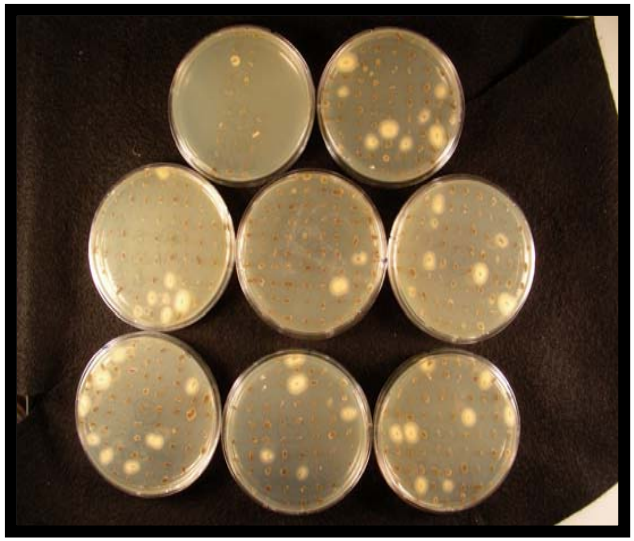
The Pathogen

Reducing inoculum at the beginning of the season.

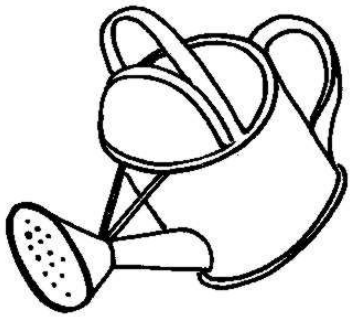
- Sanitation
  - Using clean seed.
  - Buying healthy transplants and tubers.
  - Using clean potting mixes, trays, and pots.

Sanitation



Disinfesting seeds, pots etc.

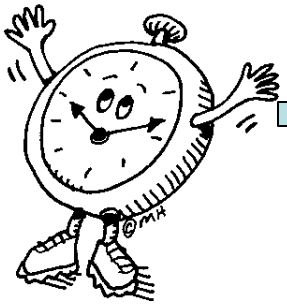
A 10% household bleach soak for 1-2 min.



1 teaspoon Bleach

9 teaspoons water

1 drop of soap



Rinse
Rinse
Rinse

1-2 minutes

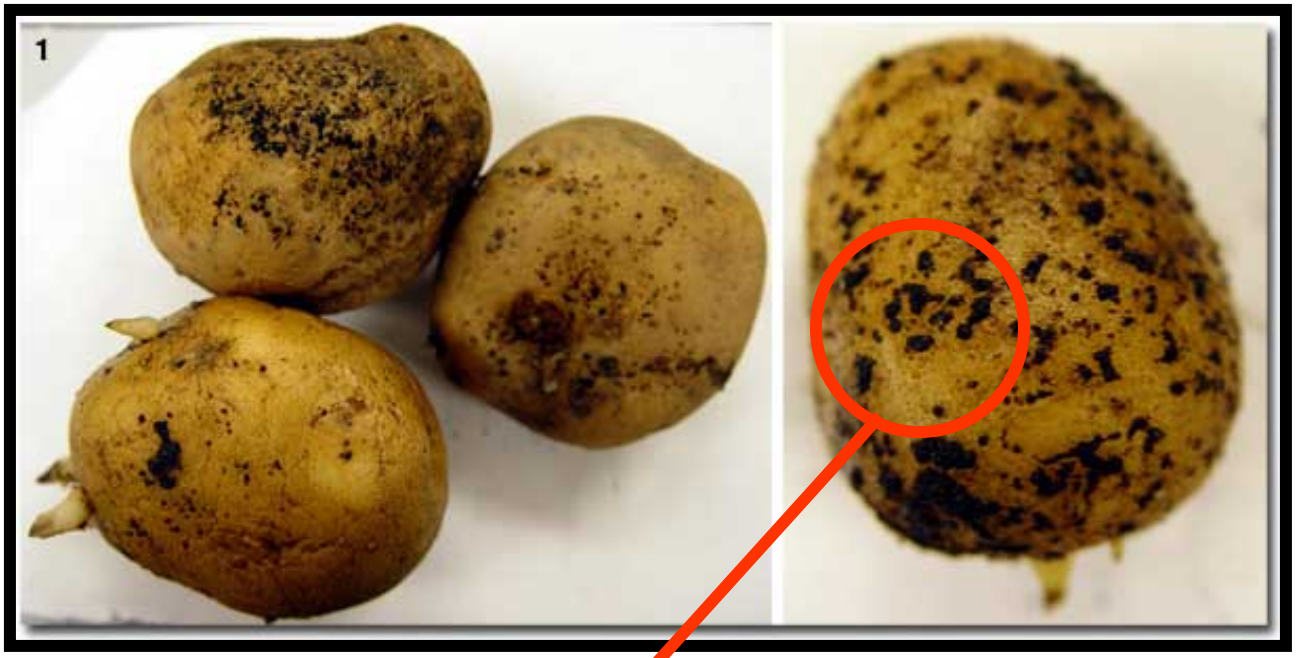
Then Plant

Seed disinfestations

- Experiment on a few seeds first.
- Does not work well for some seed.
- For example, Basil.
- Can be used for disinfesting pots, and trays.

Sanitation

Inspect transplants and tubers.



Rhizoctonia

The Pathogen

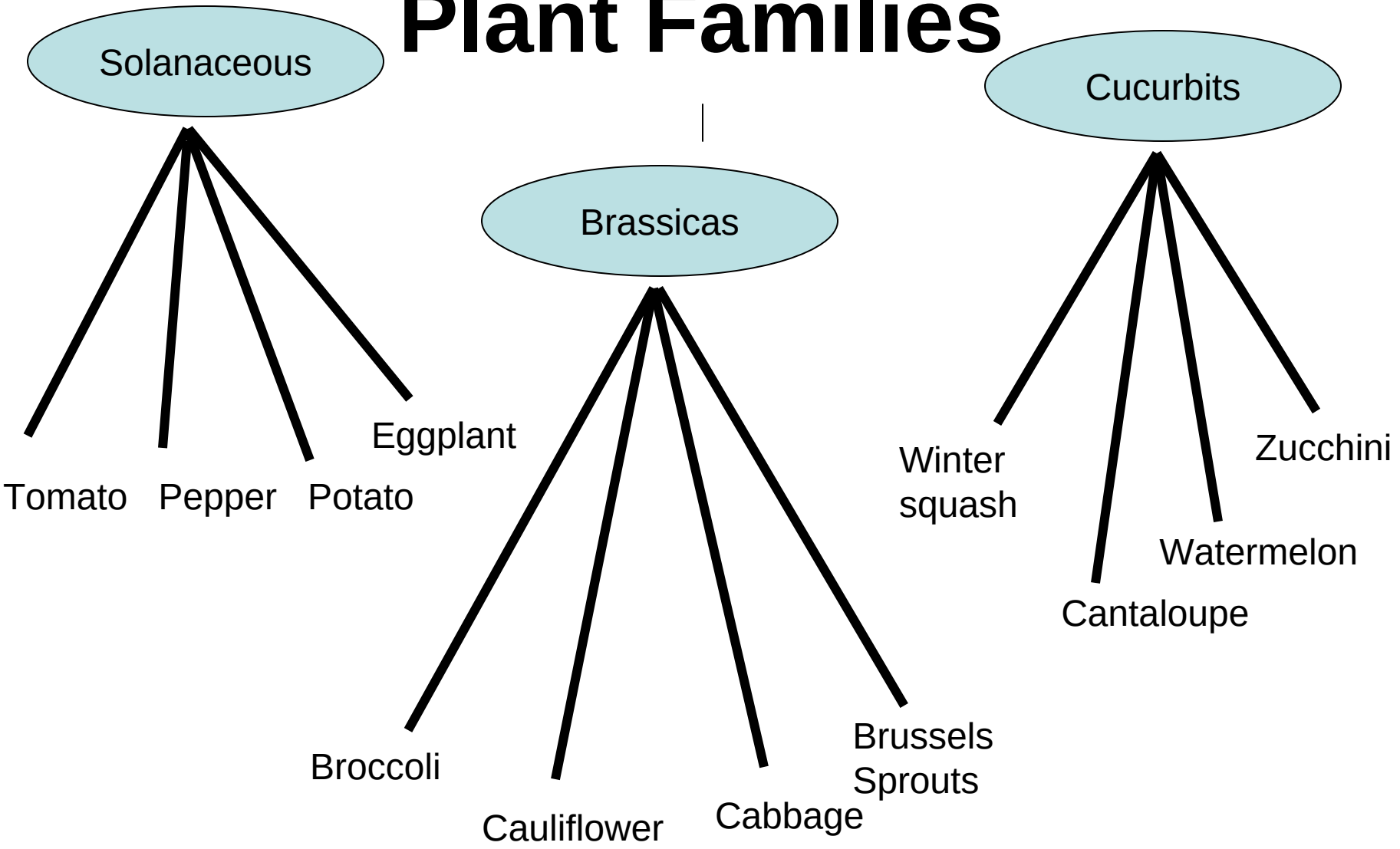
Reducing inoculum at the beginning of the season.

Rotation

- Rotate your vegetables to different parts of the garden.

- Rotate plant families.

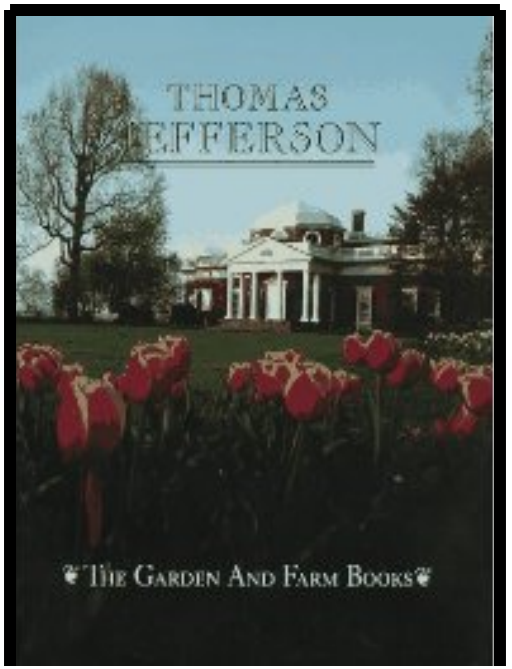
Plant Families



How long?? Minimum = 2 years

Rotation

- Keep records



The Pathogen

Reducing inoculum at the beginning of the season.

- Use proper plant spacing.
- Follow recommendations.

The Pathogen

Reducing inoculum during the season.

- Do not use overhead irrigation water.
- Water in morning.

The Pathogen

Reducing inoculum during the season.

- Using fungicides.

  Chemical fungicides

  Biological fungicides

The Pathogen

Reducing inoculum during the season.

- Chemical Fungicides

  Environmentally safe (Biorationals)

  Environmentally unsafe

Environmentally Safe Inorganic Fungicides

Sulfur based

Copper based

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

Environmentally Safe (Commercial Biorationals)

Suppress foliar diseases such as Powdery Mildews and Leaf spots

Environmentally Safe (Household Biorationals)

1 tablespoon/gallon

mix 1:1 with water

The Pathogen

Reducing inoculum

- Biological Fungicides = Environmentally safe

Environmentally Safe (Commercial Biofungicides)

Bacteria

Actinomycetes

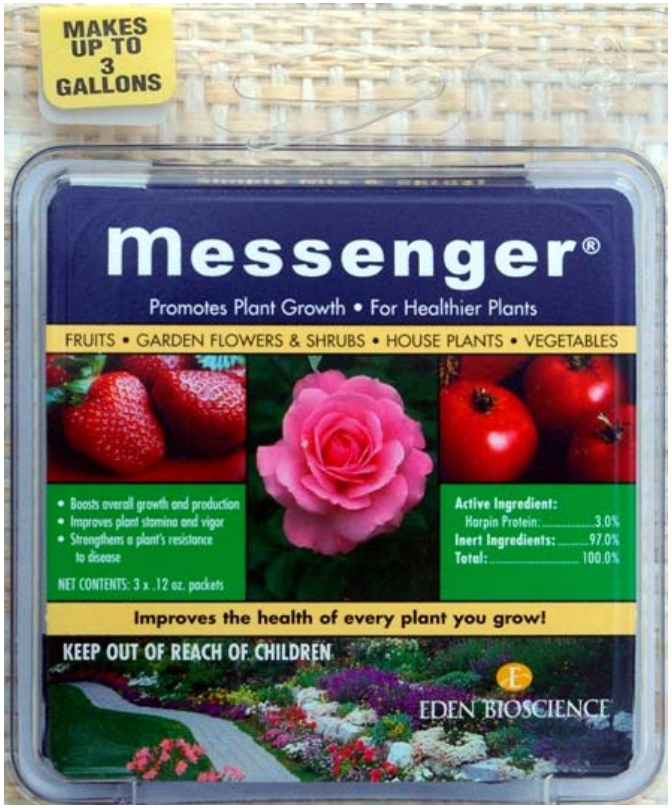
Fungi

Suppress root and foliar pathogens

Environmentally Safe (Commercial Biofungicides)

Messenger

Not a living organism.
It a protein extracted from a bacterium.
Turns on defense mechanisms in plants.



Environmentally Safe Fungicides

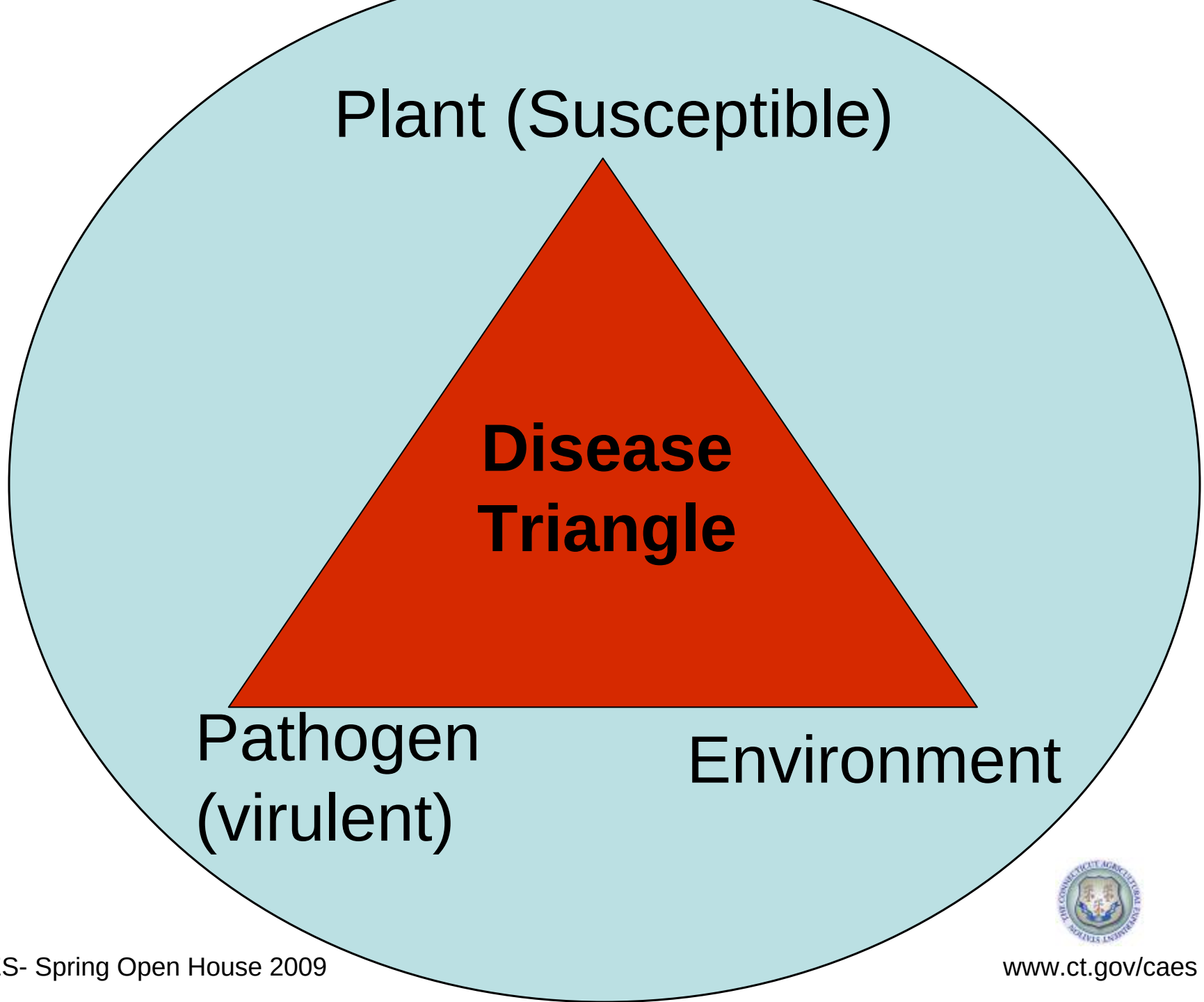
- Most biorational, inorganic, and biological fungicides need to be applied before the problem emerges.

- They have no or little curative effect.

The Pathogen

Reducing next year's inoculum

- Clean up the garden in the fall.
- Rake and/or pull up old stems and vines.
- Discard or compost the debris.
- Till under plant residues (add lime).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The Environment

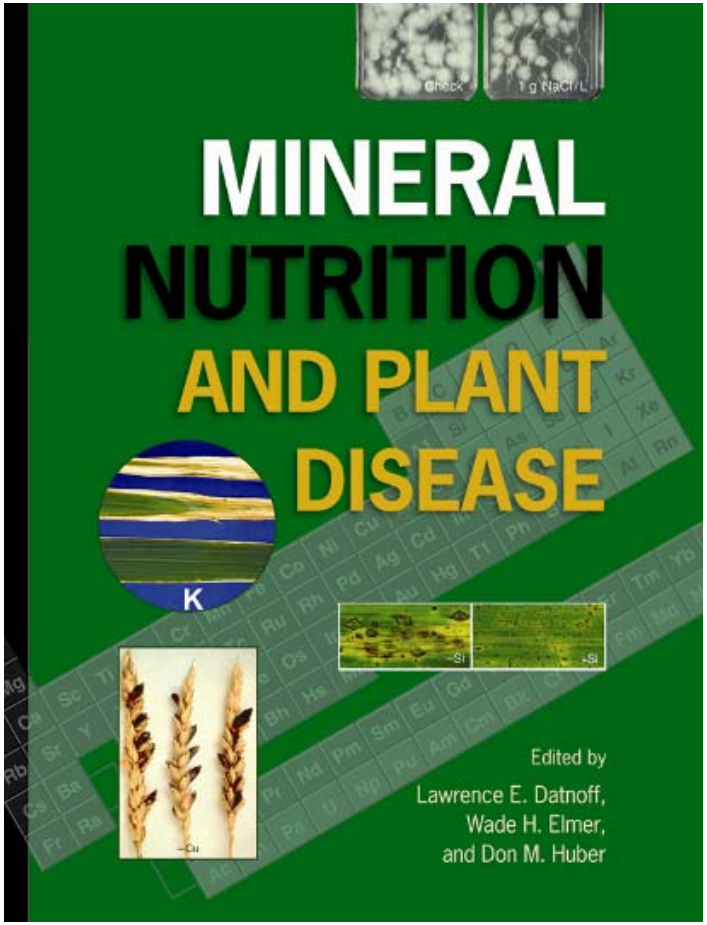
Moisture

- Soil and Air

Fertility

- Fertilization
- Soil health

The Environment



Fertilization

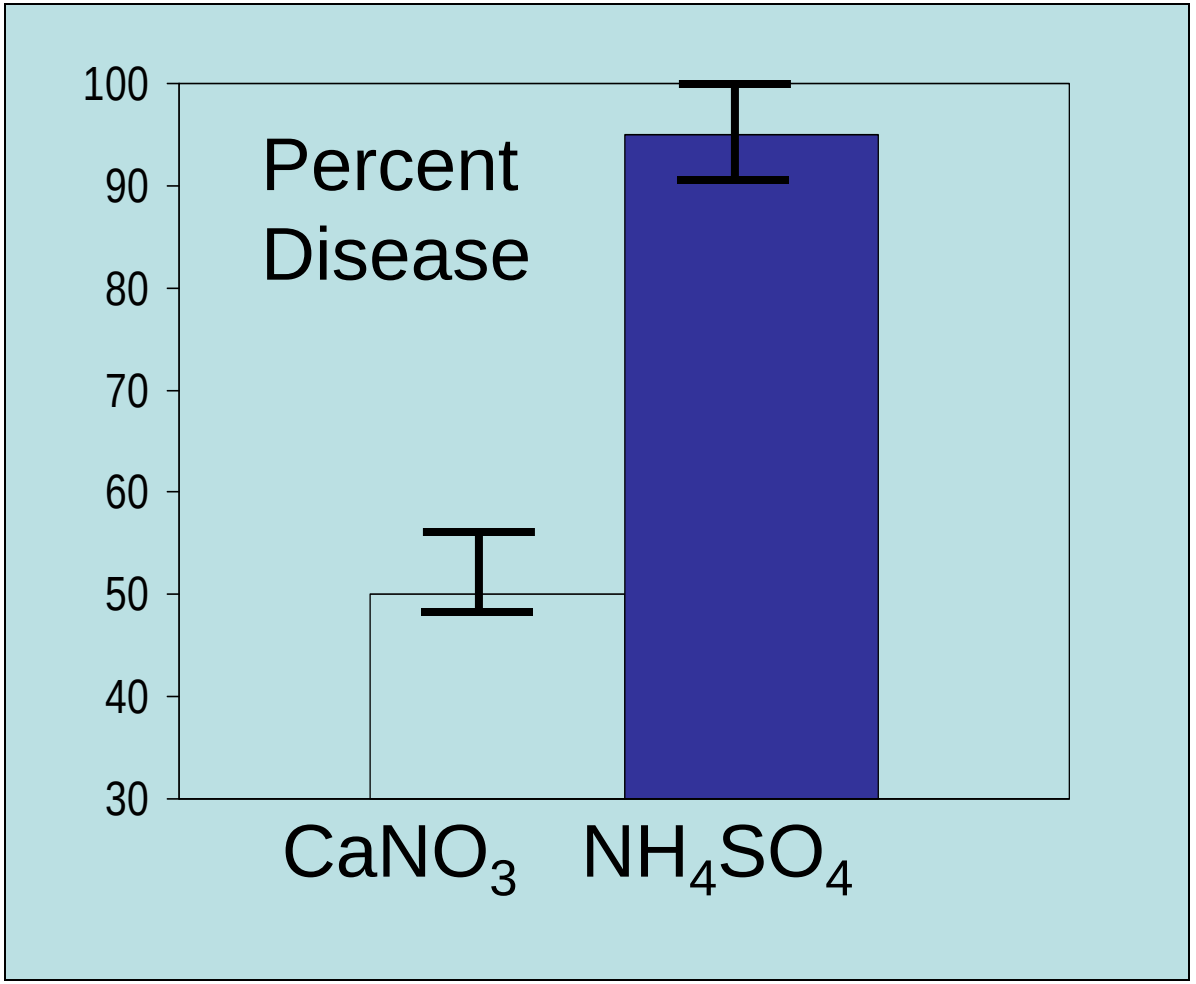
Mineral nutrition can increase resistance to disease

Case studies of over 526 reports

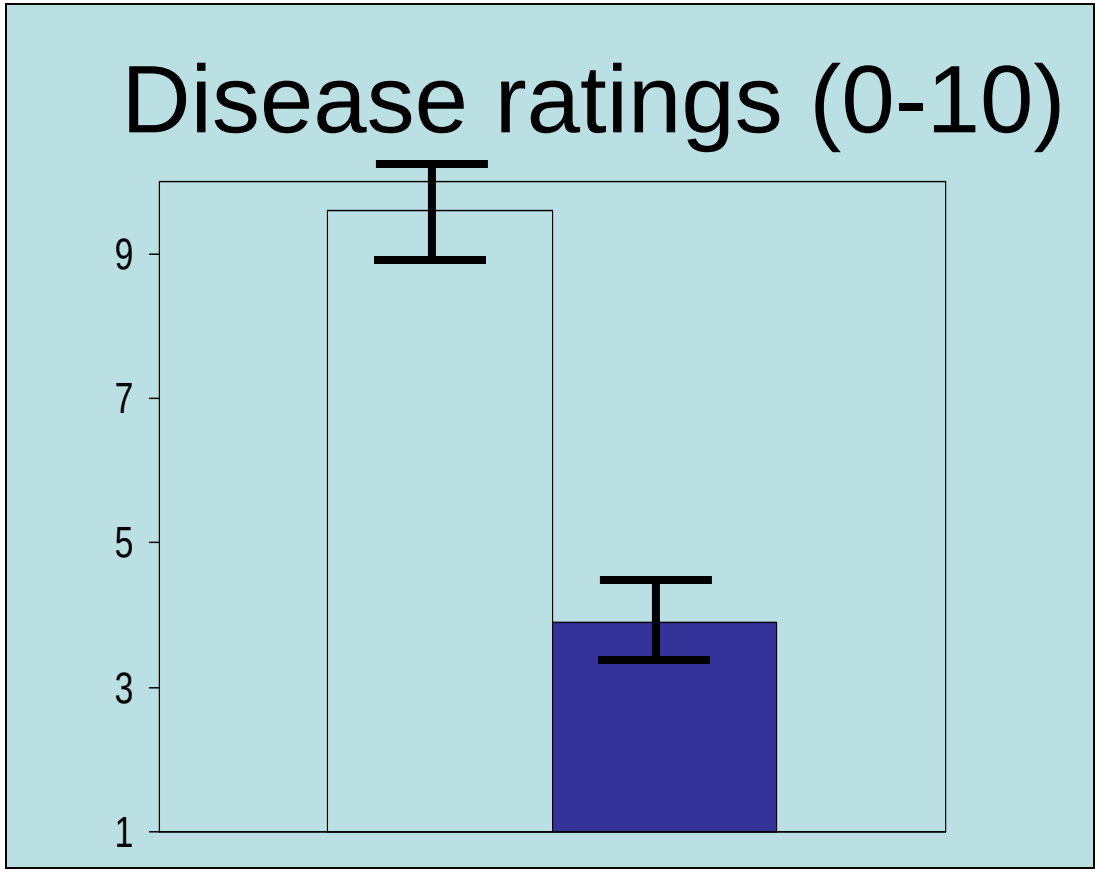
Vegetable Examples

		Suppressed by
Asparagus	Fusarium crown rot	NO_3
Tomatoes	Fusarium wilt	NO_3
Beets	Rhizoctonia root rot	NO_3
Eggplants	Verticillium wilt	NH_4
Potato	Verticillium wilt	NH_4
Strawberries	Black root rot	NH_4

Effect N-form on Fusarium wilt of tomato



Effect of N-form on Verticillium wilt of potato



The Environment

Soil health

Role of earthworms

Questions?

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