Disease Management in Organic Plantings

Annemiek Schilder

Department of Plant Pathology
Michigan State University
Healthy soil, healthy plants?
The Soil Food Web

First trophic level:
Photosynthesizers

Second trophic level:
Decomposers
Mutualists
Pathogens, parasites
Root-feeders

Third trophic level:
Shredders
Predators
Grazers

Fourth trophic level:
Higher level predators

Fifth and higher trophic levels:
Higher level predators

- Plants
- Nematodes
- Arthropods
- Fungi
- Birds
- Bacteria
- Protozoa
- Animals

Organic Matter: Waste, residue and metabolites from plants, animals and microbes.
Integrated disease management

- Involves the use of multiple disease control strategies
- Generally achieves better disease control than using a single method
- Reduces the need for emergency intervention strategies (e.g., fungicides)
Site selection and preparation

- Select site that is suitable for the crop
- Improve drainage to prevent soilborne diseases
- Have soil analysis done for nematodes and soilborne pathogens
- Remove wild hosts of pathogens in or near fields
- Consider airflow and shading that could affect
Crop rotation

- Rotate crops to break pathogen life cycle
- Grow nematode-suppressive crops
- Use legumes in the rotation to improve soil fertility
- Control weeds that host pathogens
Disease-resistant varieties

- Crop cultivars differ in disease susceptibility
- Under high disease pressure or if pathogen races are present, resistance may not hold up
- Difficult to find cultivars with resistance to multiple diseases
Use healthy plant material

- Buy certified virus-tested plants and disease-free seed
- When propagating, select only healthy-looking plants
- Rogue out diseased plants
**Intercropping and cover crops**

- Growing mixture of resistant and susceptible cultivars reduces severity of disease epidemics
- Growing multiple crops in the same field increases distance between susceptible plants
Environment modification

- Encourage airflow by increasing plant spacing and creating open canopy
- Plant rows in prevailing wind direction
- Reduce standing water by installing drain tile
- Use drip irrigation
- Reduce shading and tall weeds
Disease avoidance

- Use mulch to block inoculum
- Grow crops in raised beds to avoid soilborne pathogens
- Adjust planting time to avoid disease vectors
Scouting for diseases

• Scout fields regularly and know what to look for
• Correct disease diagnosis
• Understand disease biology to improve control
Sanitation

- Remove diseased plants/plant parts
- Burn or bury infested plant debris
- Soil solarization, flooding, or biofumigation
- Disinfest greenhouses, storage areas and containers
Reduce losses to diseases at harvest and post-harvest

• Timely harvest
• Rapid cooling or proper drying
• Clean harvesting and processing equipment
• Control insects that may create entry points for storage rots
Chemical control

- Copper (various formulations)
- Sulfur (various formulations) – best for powdery mildews
- Lime sulfur – mainly for dormant sprays
- Salts (e.g., potassium bicarbonate)
- Horticultural oils (e.g., mineral oil, vegetable oil)
- Plant extracts (e.g., citrus extract, garlic extract, mint oil, giant knotweed extract, neem oil)
In general, organic fungicides are not as effective as conventional fungicides; adjuvants may help.
Biological disease control

Nematicides

BioNem (Bacillus firmus)
DiTera (Myrothecium verrucaria)
Serenade, Kodiak (Bacillus subtilis)
Contans (Coniothyrium minitans)
Mycostop Biofungicide (Streptomyces griseoviridis)
SoilGard (Gliocladium virens)
Blight Ban (Pseudomonas fluorescens)
PlantShield (Trichoderma harzianum)

Fungicides and bactericides

Agri-Mycin (Streptomycin)
Firewall (Streptomycin)
Mycoshield (Oxytetracycline)

Antibiotics for control of bacterial diseases
Effect of Trichoderma hamatum (T382) in potting mix on Botrytis of begonias (un=untreated)
Compost tea

• Watery extract of compost (with or without additives)
• Aerated or non-aerated
• Brewed or soaked for 1 to 14 days
• Contains bacteria, fungi, protozoa, nutrients, etc.
• Applied to crops as foliar spray or soil drench
• Disease control variable; possible mechanisms:
  - Competition for space/nutrients
  - Antibiosis
  - Induced resistance
List of products allowed for use in organic crop production:

Organic Materials Review Institute
http://www.omri.org

…but local certifier ultimately decides what may or may not be used