Disease Basics in Hemp

Ann Hazelrigg
Plant Pathologist
UVM Plant Diagnostic Clinic

Chris Motyka
Vermont Technical College
Institute for Applied Agriculture and Food systems
Plant Disease: Change in the form or the function of the plant

**Biotic diseases** are caused by living organisms—fungi, bacteria, and viruses, nematodes.
Abiotic diseases are caused by non-living things—weather, drought, nutrient deficiencies, etc.
Chimera - genetic mutation
Rule out arthropods first - cast skins, webbing, frass, eggs, actual pest

Potato leafhopper

Whitney Cranshaw, Colorado State University, Bugwood.org

Two spotted spider mite
If you see a problem in the foliage, check the lower stem and roots first!
Hemp root rots

- Infrequent in the field unless saturated soils and cool temps, poorly drained fields or low spots
- More common in greenhouse transplants
- 4-5 different soil borne fungi in all soils that become active when wet/cool and roots are growing slowly-keep roots warm/dry
- Start with clean flats, soil-less mix, Rootshield (Trichoderma)
Abiotic Clues

- Often a pattern of injury—entire row, crop/living org. would be random
- Comes on quickly/living organisms build up slowly
- One age tissue affected—living organisms would attack all ages
- Gradient of injury away from source
- More than one crop affected
- No cure, plants should grow out of it—watch new growth
Biotic-LIVING ORGANISMS

- Fungi
- Bacteria
- Viruses
- Nematodes
- Higher plants

Often there is a “sign” of the pathogen-actual presence of the pathogen
Botrytis blight - “sign” actual presence of pathogen-spores, mycelium, overwintering structures
Spores - lightweight carried on air currents, tools, etc. can get into tissue on their own.
6-8 hrs leaf wetness or high rh
Most fungi overwinter on diseased refuse or may have long term overwintering structures like sclerotia.

Sclerotia

Hyphae or mycelium
Scout!

• Scout fields on a regular basis going into the inner rows, low areas, etc.

• Easier to manage pests or diseases if you find them early
Botrytis gray mold

- Most economically damage hemp disease
- Everywhere-wide host range!
- Will attack any plant part, alive or dead
- Cooler temps and hi moisture-Fall
- As flower buds mature, check for botrytis
- Gray spores are visible to naked eye
Scouting Botrytis flowers

- Look for any necrotic (dead) tissue close to the bud. Look closer at the interior of these flower buds (though botrytis can infect the dense interior tissue without any sign on the exterior of flower)

- Scout by "cracking" the buds to get a view inside the flowers as soon as buds start to gain density and or weather favors Botrytis. Wash hands if you come into contact with Botrytis so scouting doesn't end up spreading the disease
Botrytis management

Environment:
• Field-lower RH by avoiding overcrowding/plant spacing
• GH-spacing, lower RH with roll up sides, fans, vents, heat

Host: no resistant cultivars

Pathogen: OW as sclerotia-clean up disease debris, GH clean up debris and any senescing tissue
• Rotation
• Protectant fungicides-if there are the right environmental conditions the fungicides we have to work with probably can’t overcome the disease
Botrytis management

- One of the most useful tools on the Vermont state list is Hydrogen peroxide (ai in Zerotol and Sanidate) which can be used both pre and post flower and is non residual.

- Some growers have also experimented with dipping freshly harvested flower stems in a peroxide solution, though dip should be a lower concentration than spray recommendation and flower should be dried quickly prior to hanging.
Leafspot disease management

Environment:
• Spacing
• Avoid over head irrigation

Host: probably no res cultivars, but may notice differences in susceptibility

Pathogen:
• OW in plant debris, so clean up field and rotate 3 yrs, mulch will prevent splash up
Leafspot disease management

• Pruning all lower leaves and small interior branches can help deter leafspots from soil borne diseases like Septoria and increase airflow to help prevent powdery mildew and botrytis.

• Though this is time consuming, it may be worth the effort for smokeable flower.
Powdery mildew-only requires high humidity

Symptoms-white powdery coating on upper surface of foliage
In field, often after warm humid weather
Will only live on live tissue

Whitney Cranshaw, CSU
**Powdery mildew management**

- Environment: spacing, lower humidity, free moisture will inhibit the disease
- Host: resistant cultivars
- Pathogen: needs living host
  - Fungicides: horticultural oils, neem
Wilting in the field

- Entire field—probably abiotic—heat/drought

- Individual plants—look lower on stem for canker disease
Sclerotinia white mold

- Symptoms: wilt, death. White, fluffy fungal growth on the stem
- Very wide host range
- Hit or miss in low, wet areas of the field.
- Sclerotia can live for many years just waiting for right conditions.
- Avoid poorly drained areas
- Rotation
- Spacing for good air circulation
- Cut plant off at the base and remove from the field before sclerotia are produced.
Viruses—are submicroscopic particles of protein and nucleic acid
Symptoms—mottling, stunting, leaf roll, chlorosis, curling, twisting, spotting throughout plant

• SEVERAL!
• Can be seedborne or introduced by wounds, vector or tools
• No cure, rogue out of field
• Testing for viruses is $
Disease management in general

• Start with healthy transplants, clean flats
• Choose good site with good drainage and soil fertility
• Plant with good spacing to promote air circulation
• Scout!
• Rotate hemp growing fields
• Use drip irrigation and mulch to prevent splash up
• Sanitation-remove any virus or white mold infected plants
• Clean up fields after harvest
Use of Biologicals

- Use of Regalia (botanical extract) and biologicals such as Bacillus spp. and Trichoderma to work in concert with plant processes to heighten natural plant defenses.

- More research needed but these materials are on the state list and show promise for hemp.

- Biological products must be protected from heat and stored appropriately to retain efficacy.