

## Growing Hops (pests)

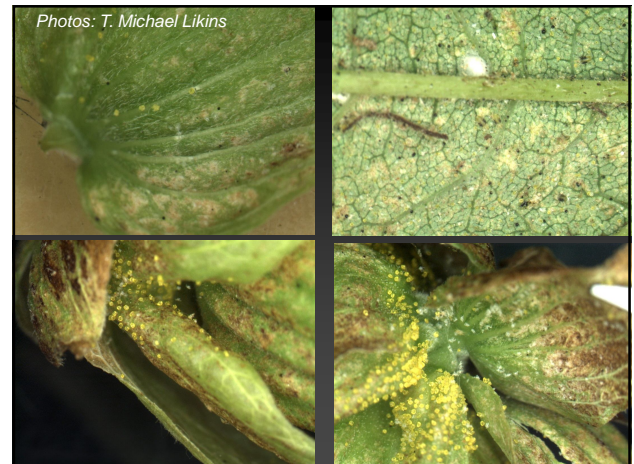
### Pests of Hops



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## Arthropods of Hops

- Insects, mites and such
- 2-spotted spider mites
  - Hot-n-dry problem
- Suppression in small plantings
  - Cold water sprays



## Mite control

- Treat when detected, not preventatively
- Thresholds not established yet
  - 2-3 mites/leaf up to July
  - 10 mites/leaf after July
- M-Pede®
  - Potassium salts of fatty acids
  - 0 days-to-harvest restriction
- Other miticides are available
  - May be in large quantities or
  - Require air blast equipment, etc.

## Diseases of Hops, U.S.

- 24 ± fungal diseases (in 16 genera)
  - 328 fungal diseases worldwide
- 2 bacterial diseases
- 6 nematodes (in 3 genera)
- 7 viruses
- Aphids, mites, weevils
- Sooty molds
- Undetermined chlorotic disorder

## Fungi of Hops

- Downy mildew vs Powdery mildew
- *Armillaria* root rots
  - soil-borne, native, large host range
- Black root rot
  - *Phytophthora citricola*
  - not same as disease of Japanese holly
- Botrytis blight (gray mold)

## Hops Downy Mildew

- Fungus-like disease
  - *Pseudoperonospora humuli*
- Yield and quality loss
- Favored by warm, moist conditions
  - RH above 71%
  - Night-time temps above 41°F
  - (Optimum between 59° and 84°F)
- Overwinters in plant debris
  - Leaves, shoots, cones, buds, crowns

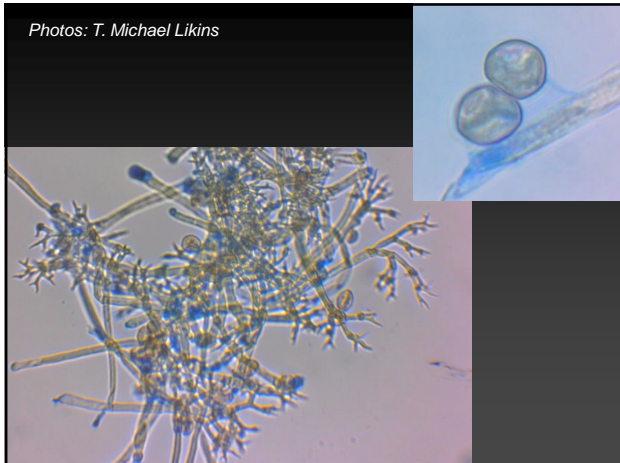
## Hops Downy Mildew

- Extremely contagious
  - Spores easily dislodged
- Local spread
  - Splashing water, wind
- Long distance spread
  - Wind currents, rain storms

## Hops Downy Mildew

- Spore production on underside of leaf
  - HDM is on "down-side" of leaf
  - (powdery mildews on top of leaf)





## Hops Downy Mildew Control

- Use resistant varieties
  - “Moderate” resistance
    - Cascade, Chinook, Crystal
  - Susceptible
    - Nugget
- No cultivar is immune.

## Hops Downy Mildew recommendations

- Integrated approach (IPM)
  - Good cultural conditions
    - Routine soil testing, etc.
  - Disease-free transplants
  - Monitoring
  - Remove DM plants immediately
  - Fungicides for protection only

## Viruses

- Smallest pathogens
- Difficult to see; easier to diagnose
- Symptoms include
  - Yellowing
  - Stunting
  - Abnormal/deformed growth
  - Mosaics
  - Ring patterns

## Viruses

- Require molecular confirmation
- 1. Hops latent virus
- 2. American hop latent virus
  - Aphid transmission
- 3. Apple mosaic virus
  - Plant-to-plant contact, nematodes
  - Can cause 30% loss in cones
  - Decrease  $\alpha$  acid levels

## Apple mosaic virus in Hops



Photos: K. Eastwell and C. M. Ocamb, PNW Handbook

## What to do if pests strike?

- **DON'T PANIC!**
  - (Get an accurate diagnosis
  - Your local Extension office
    - Sends to VA Tech Lab
  - Chesterfield Extension Lab
    - Call first to be sure I'm there