Controlling Coffee Leaf Rust in Hawaii

HCA 5/20/22

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Teamwork!

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Blaine Luiz


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Katelin Branco

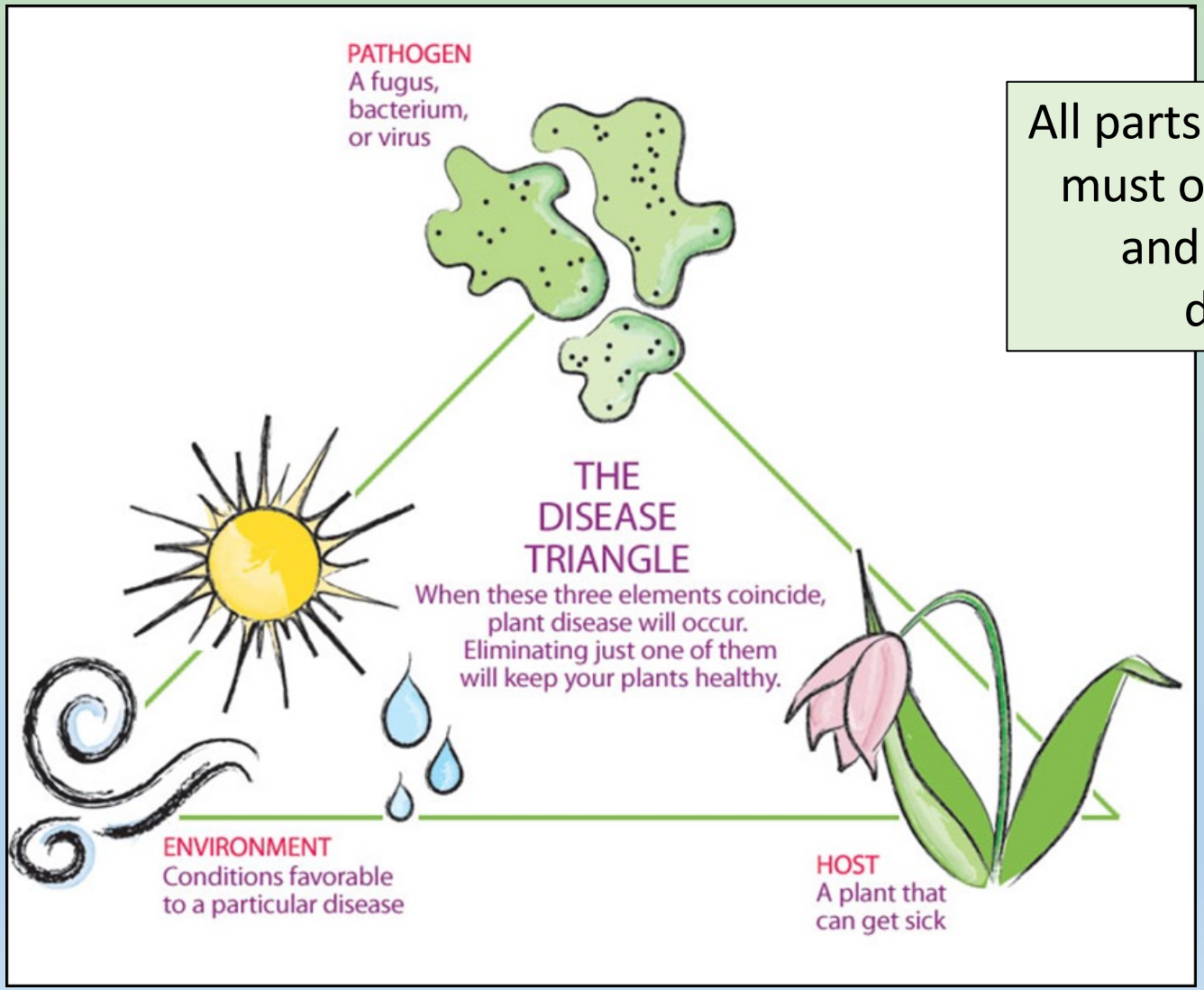

Madison Carvalho


Melissa Eyre


Pepe Miranda

And Many Others

How is Disease Caused in Plants?

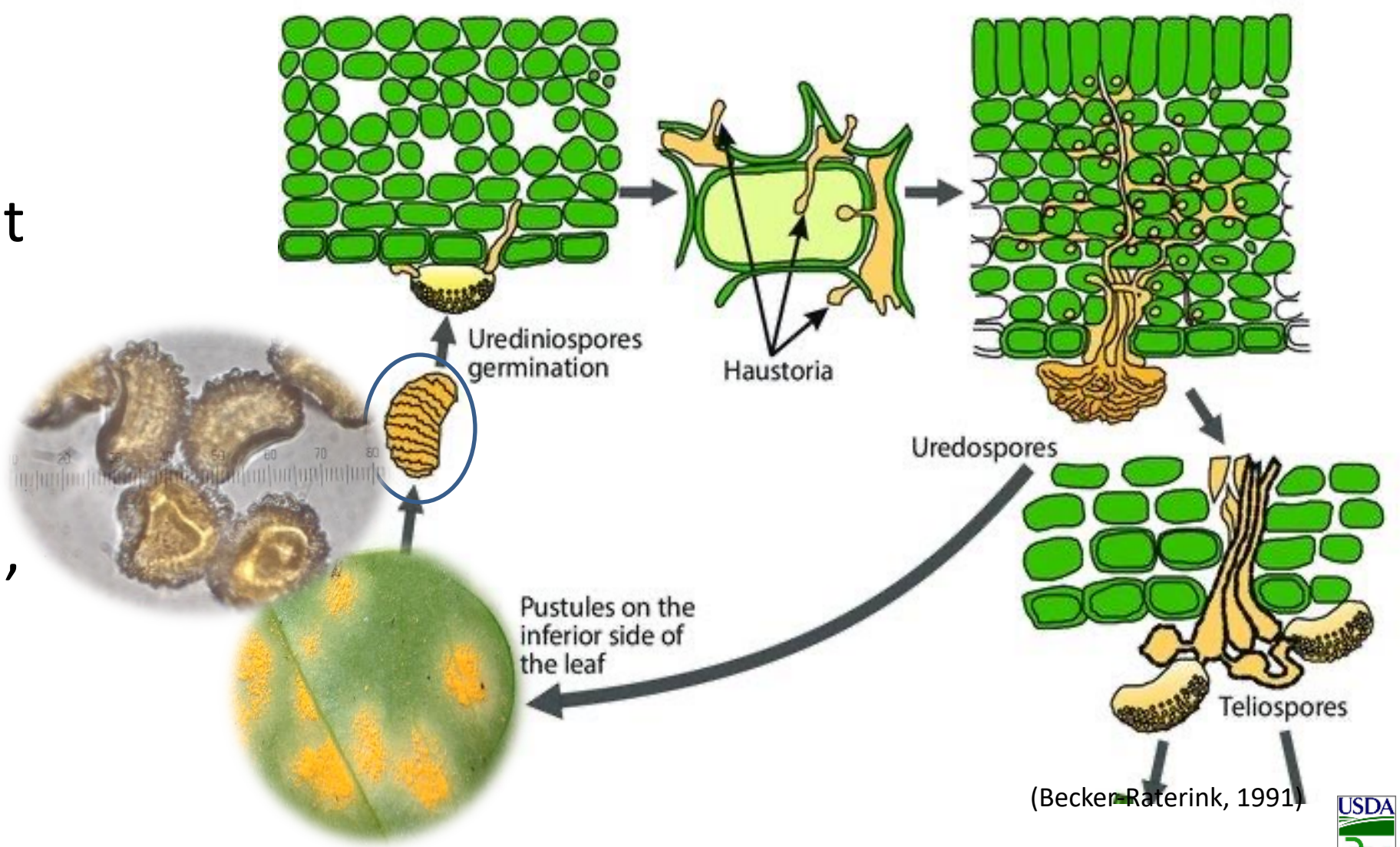


All parts of the disease triangle must occur at the right time and the right place for disease to occur

Photo: www.finegardening.com

Coffee Leaf Rust: *Hemileia vastatrix*

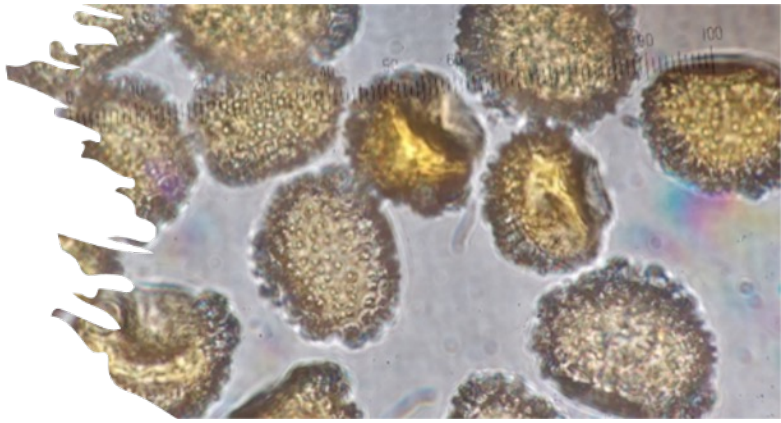
- Spores start infections that develop into spots/lesions that produce more spores
- Varies from season to season, depending on rainfall



(Becker-Raterink, 1991)

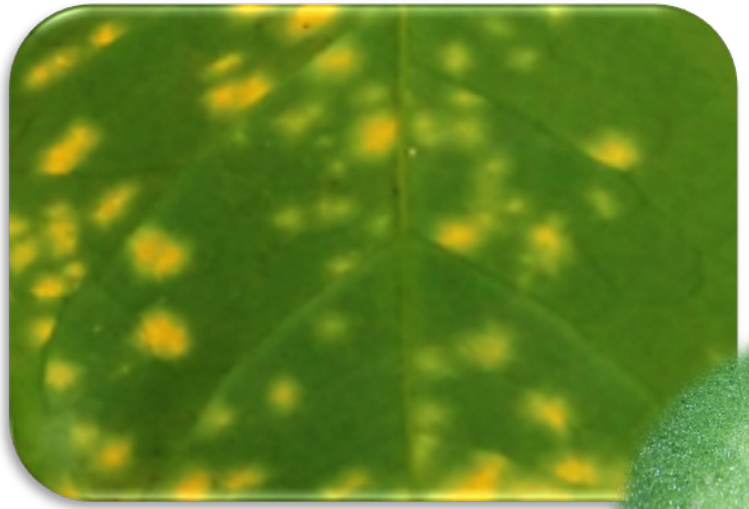
Coffee Leaf Rust

- Spore dispersal: Wind, rain and worker activity
- Infection through stomata; water is needed to germinate; temperatures in Hawaii favor disease



- Sporulation: 10-14 days from infection; Spots enlarge over 2 to 3 weeks
- Survival: primarily as mycelium inside the leaf; spores can survive ~ 6 weeks

upper



lower

Coffee Leaf Rust

Early Symptoms

- Small, pale-yellow spots on the upper surface of the leaf
- Can be anywhere on the leaf where stomates are
- All stages of leaf development are susceptible
- No pustule formation/no tissue disruption

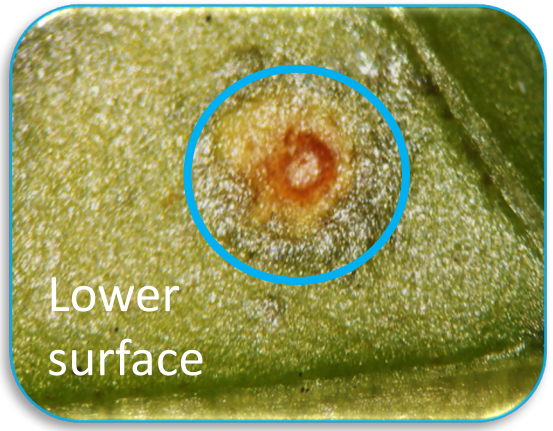
Signs

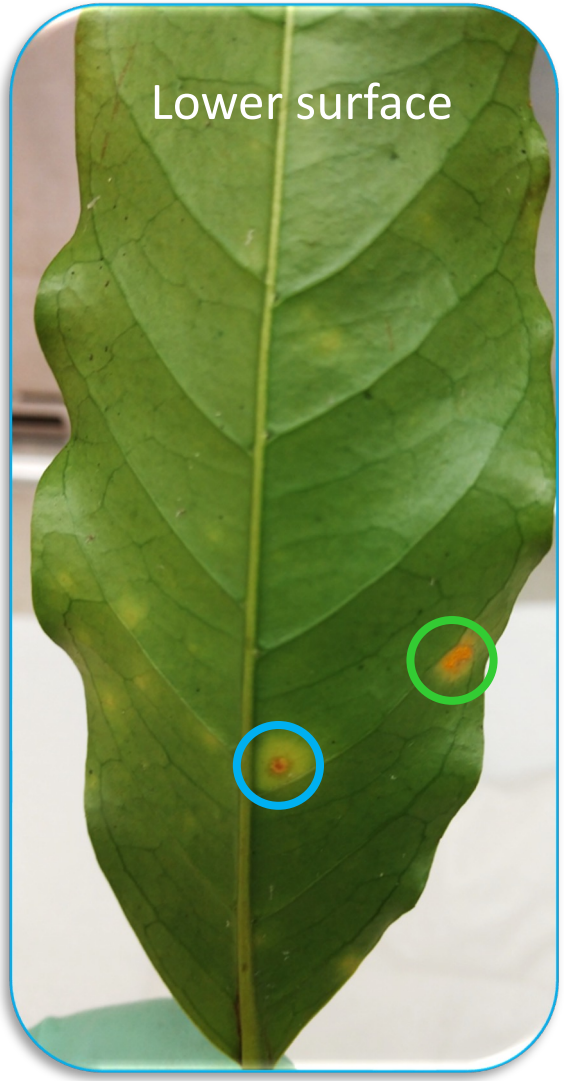
- Powdery spores on lower leaf surface

Visual Aid for Early Disease Detection:

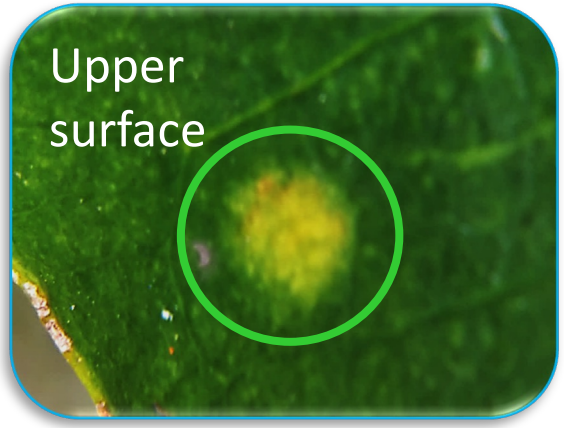
check ***shape*** (circular or irregular), ***location*** (upper and/or lower surface; leaf veins), and presence/absence of ***necrosis***

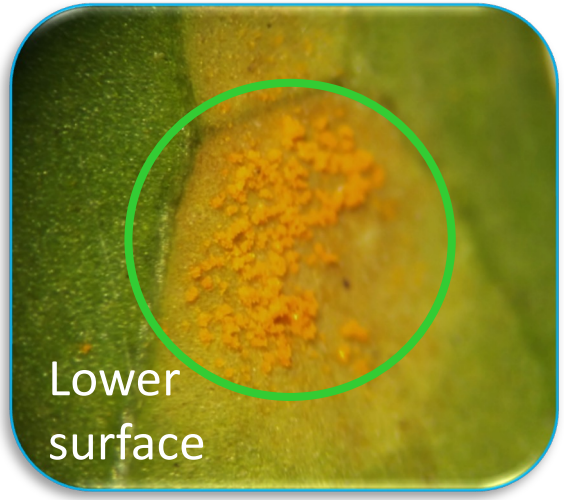
Cercospora leaf spot
(*Cercospora coffeicola*)





Coffee leaf rust
(Hemileia vastatrix)





Coffee Leaf Rust: Management

- Must be managed as a continuous epidemic
- Goal: reduce sporulation, spore dispersal, or infection
- Good cultural management is vital
- Susceptibility of the plant is affected by its nutritional status
  - Nitrogen (N) and phosphorus (P): reduces susceptibility
  - Excessive potassium (K): increases susceptibility
- Proper pruning and wider row spacing: prevents overcropping, maintains vigor, improves air circulation, promotes rapid drying of the foliage, improves spray coverage (reduces susceptibility to CLR)

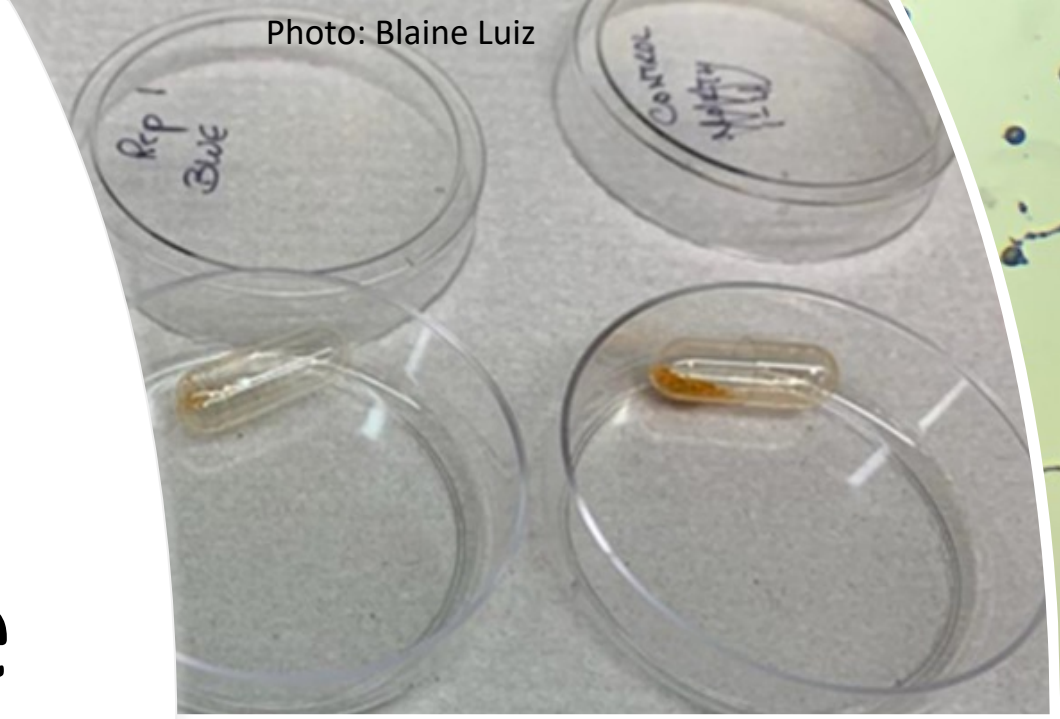
Coffee Leaf Rust: Management

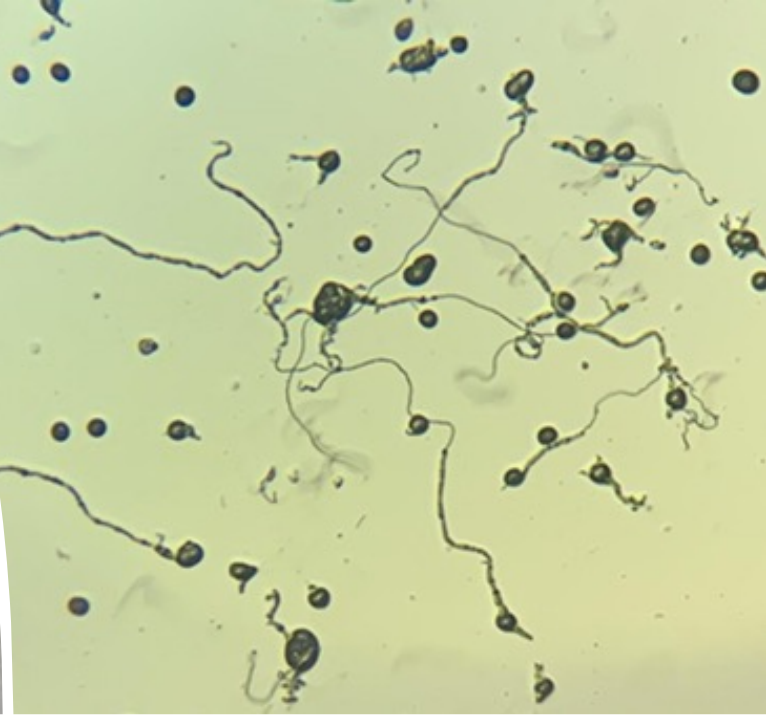
- Weed control: facilitates air circulation and rapid drying of the canopy; maintains plant vigor (reduces susceptibility)
- Fallen leaves should be removed from the farm (compost or destroy)
- Protectant and systemic fungicides (important tools; determine when and what to spray)
  - UH Guide; Label is law
- Resistant cultivars

- Mention of trademark, proprietary product, or vendor does not constitute a guarantee or warranty of the product by the U.S. Dept. of Agriculture and does not imply its approval to the exclusion of other products or vendors that also may be suitable

Fungicide Testing

Photo: Blaine Luiz



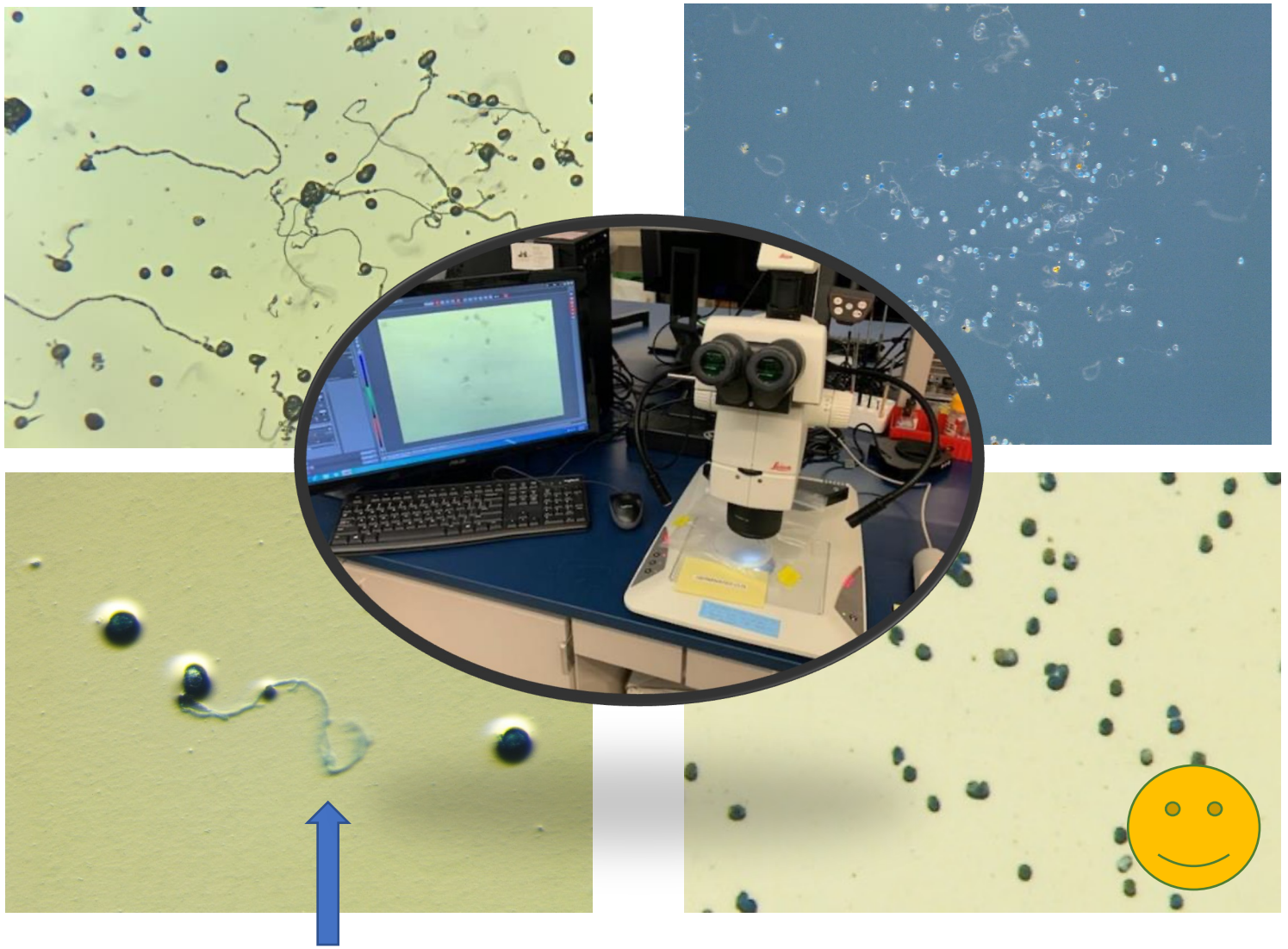


In Vitro Assays

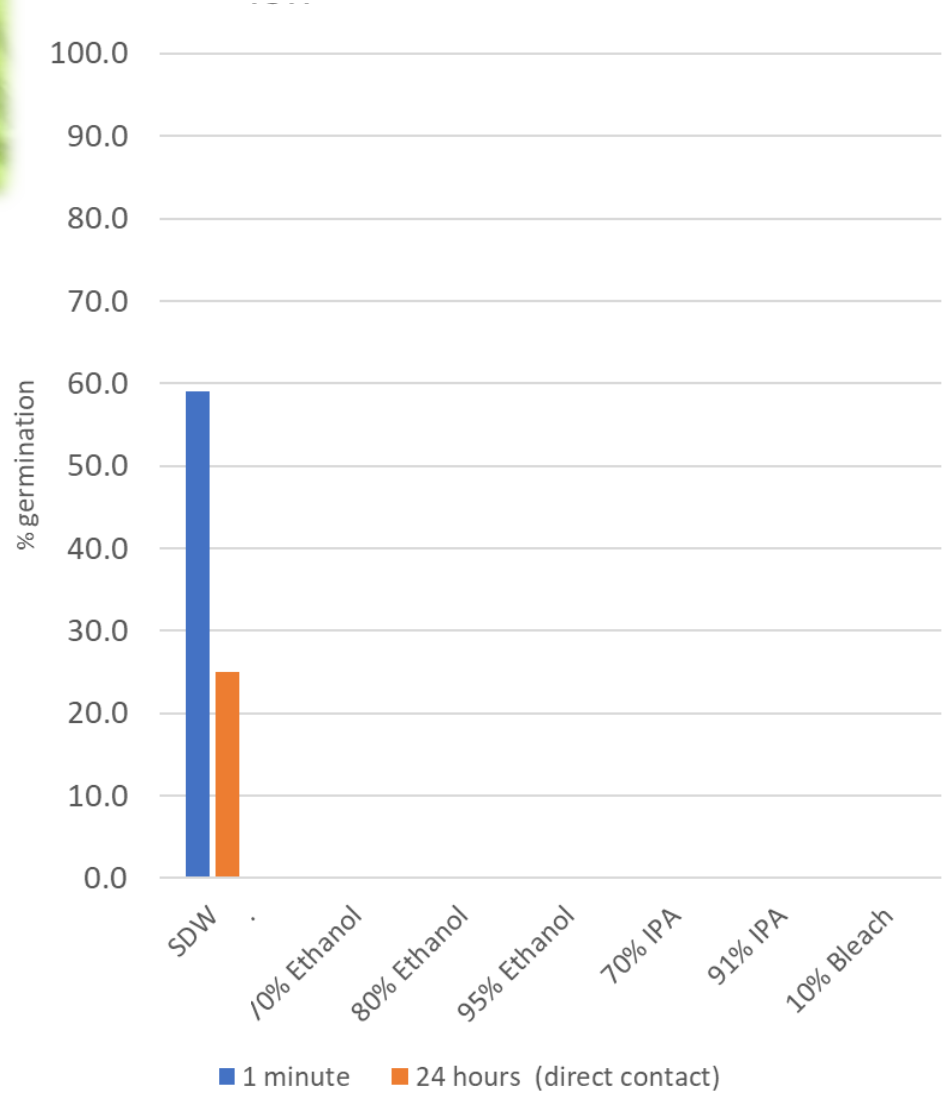
Method

(22C, dark, 12-15h)

*Direct contact / timing



Photos: JB Friday



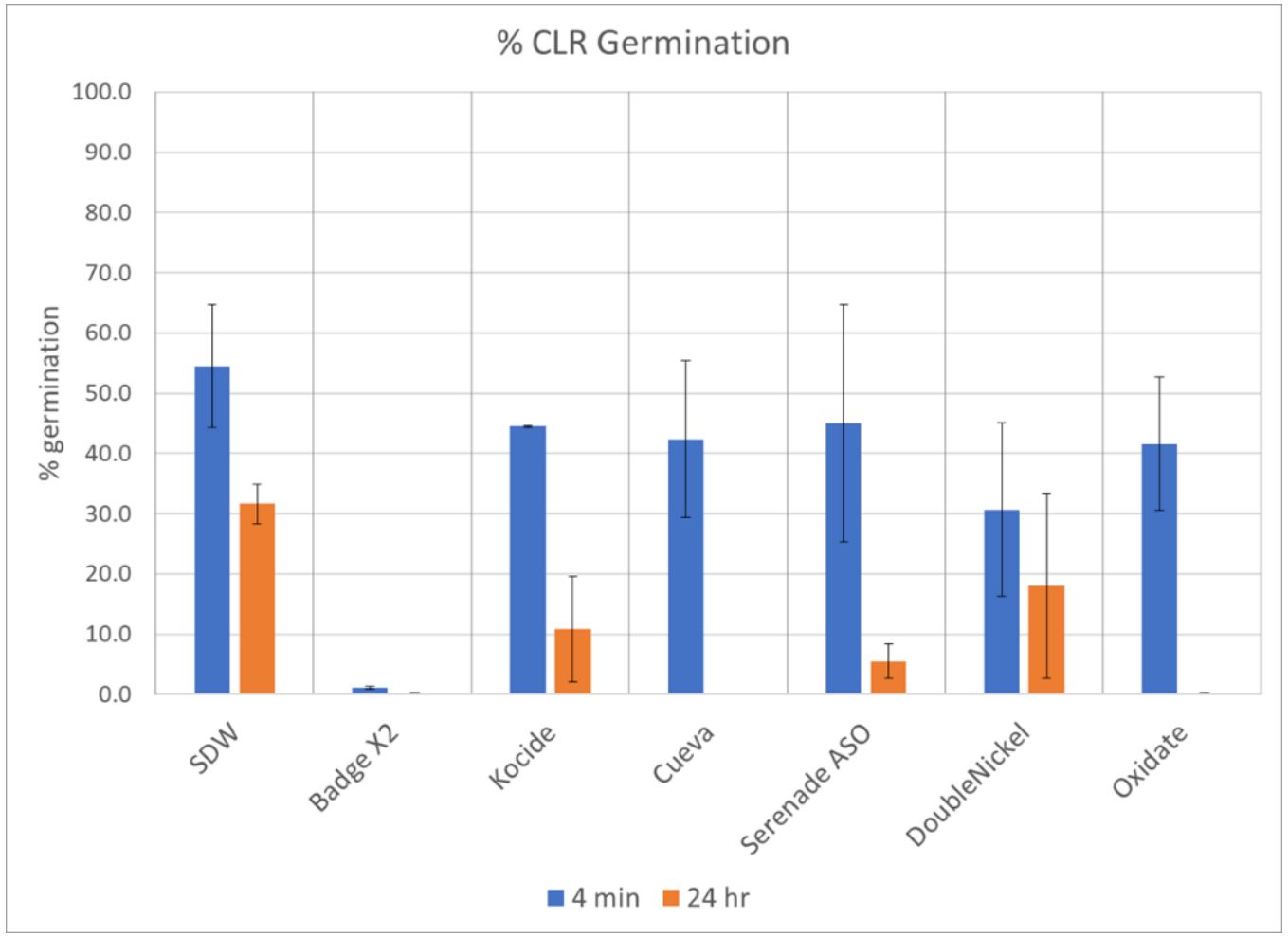
Sanitation Protocols

- 70%, 80%, 95% Ethanol

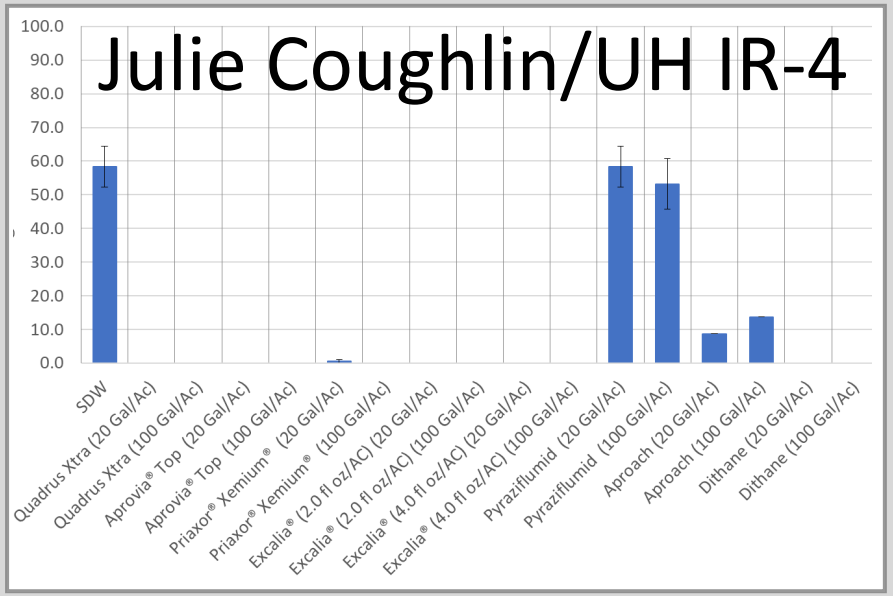
- 70%, 91% IPA

- 10% Freshly Prepared Bleach Solution

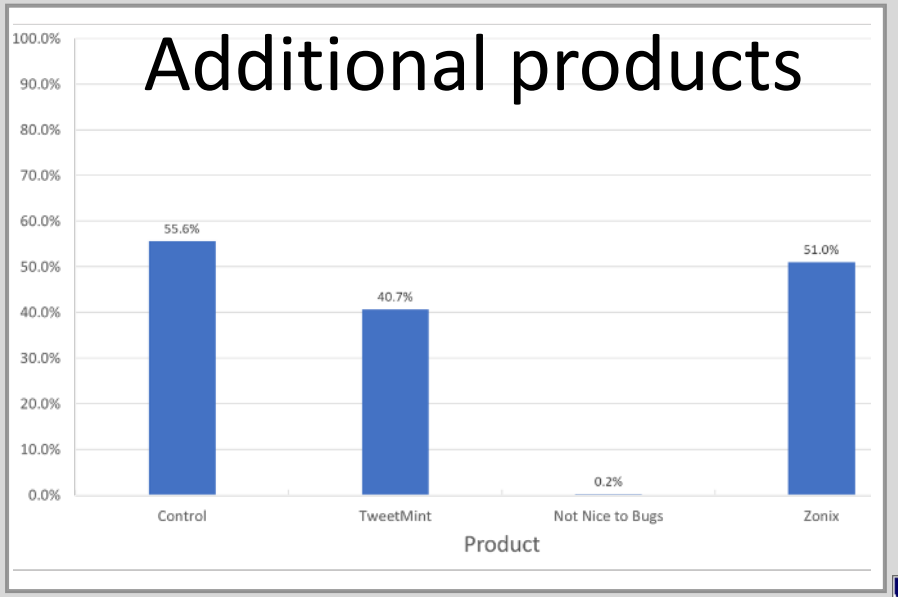
Registered for use in HI



Julie Coughlin/UH IR-4



Additional products



Fungicide Field Trial

Germination
Incidence
Severity

- Badge X2
- Kocide 3000-O
- Cueva
- Serenade
- DoubleNickel
- Oxidate 2.0

– Proper rotation so rust resistance doesn’t build up

Fungicide Protection Study

Photos: Blaine Luiz

Contact Fungicides

- Preventatives; Protectants
- Adsorbed to the leaf surface
- Must be applied before spores germinate
- Immobile
- Multi-site of action
- Few problems with resistance
- Low residual
- Higher doses
- More applications
- (ie. Copper, sulfur)

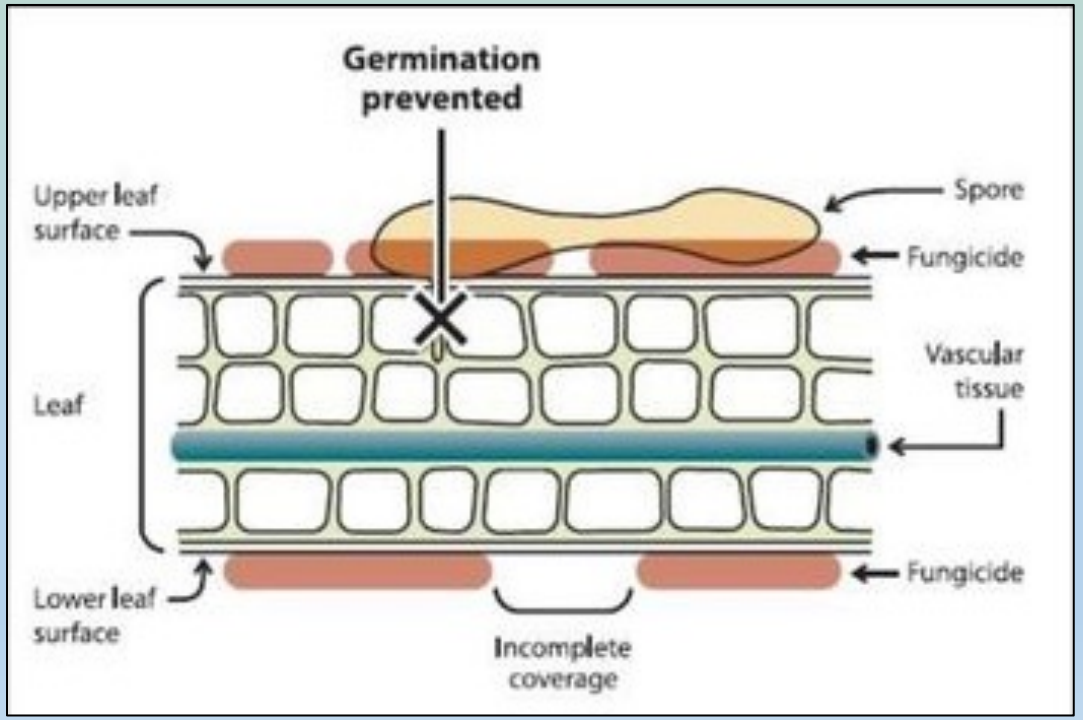
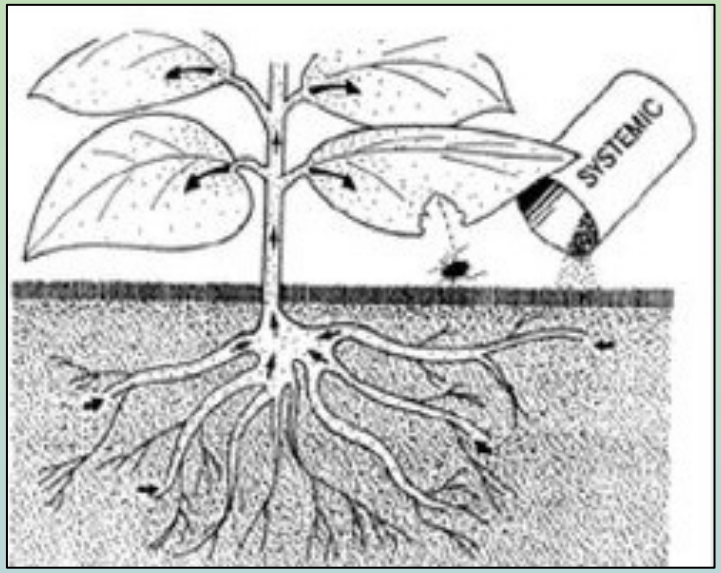


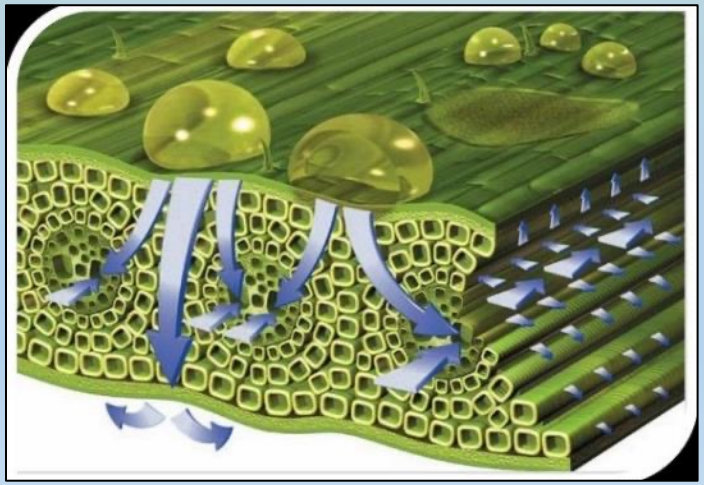
Photo: https://slideplayer.com/slide/11942496/

Systemic Fungicides

- Preventatives; Curatives
- Absorbed into plants
- Mobile in the plant (xylem, phloem)
- Single-site of action
- Medium to high residual
- Lower doses
- Fewer applications
- Greater chance of resistance



Translaminar



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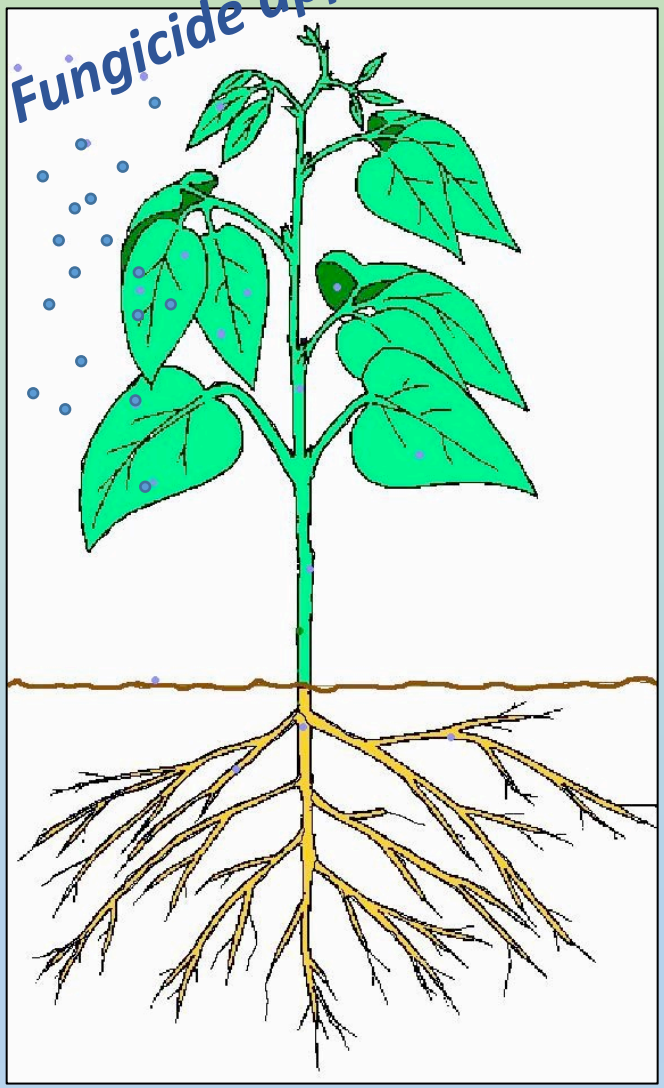
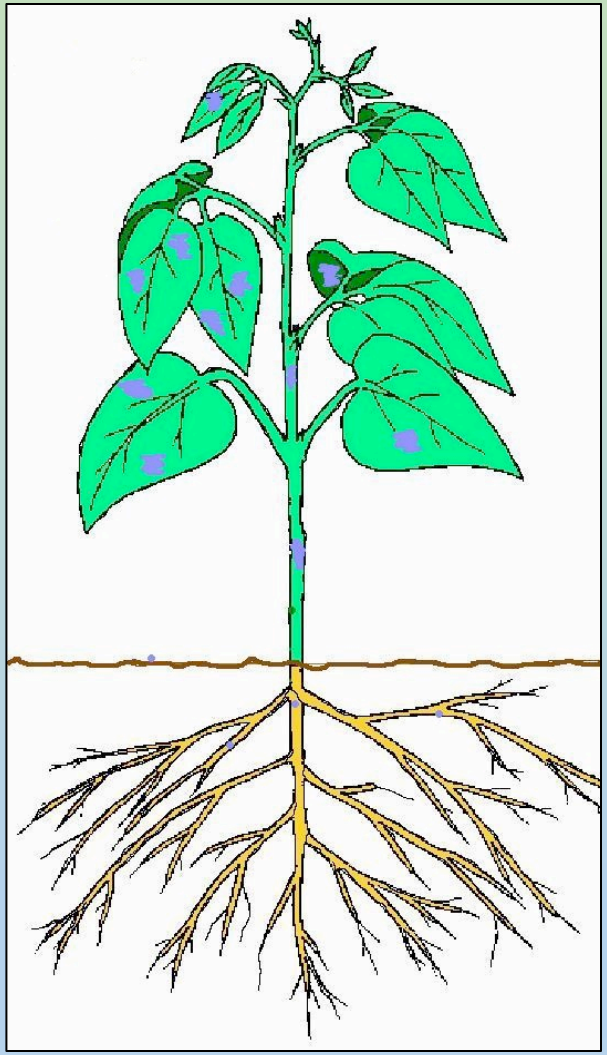
Fungicide Uptake & Movement

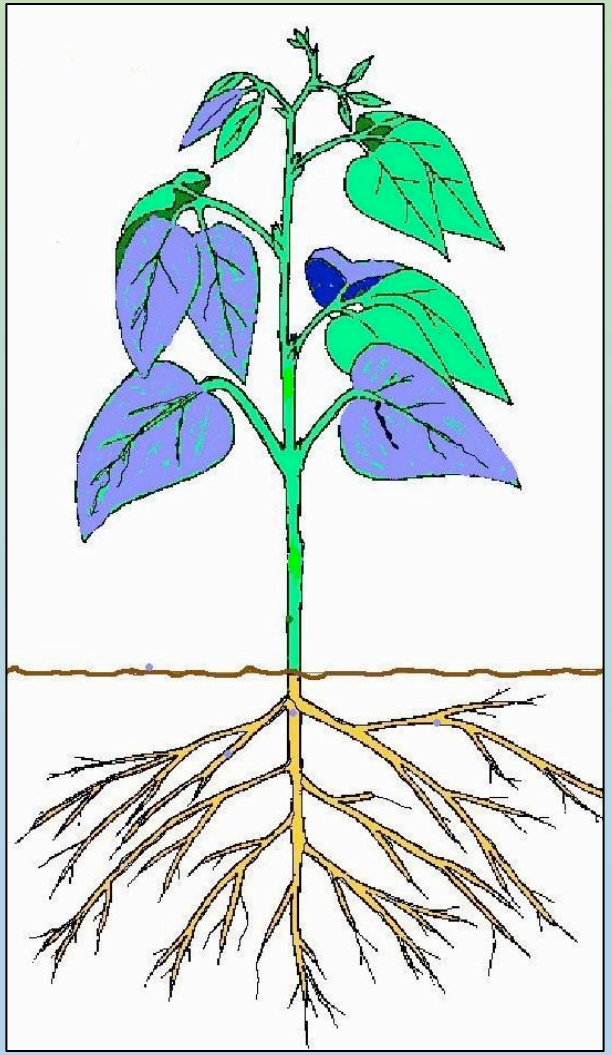


*Droplet spread/Movement

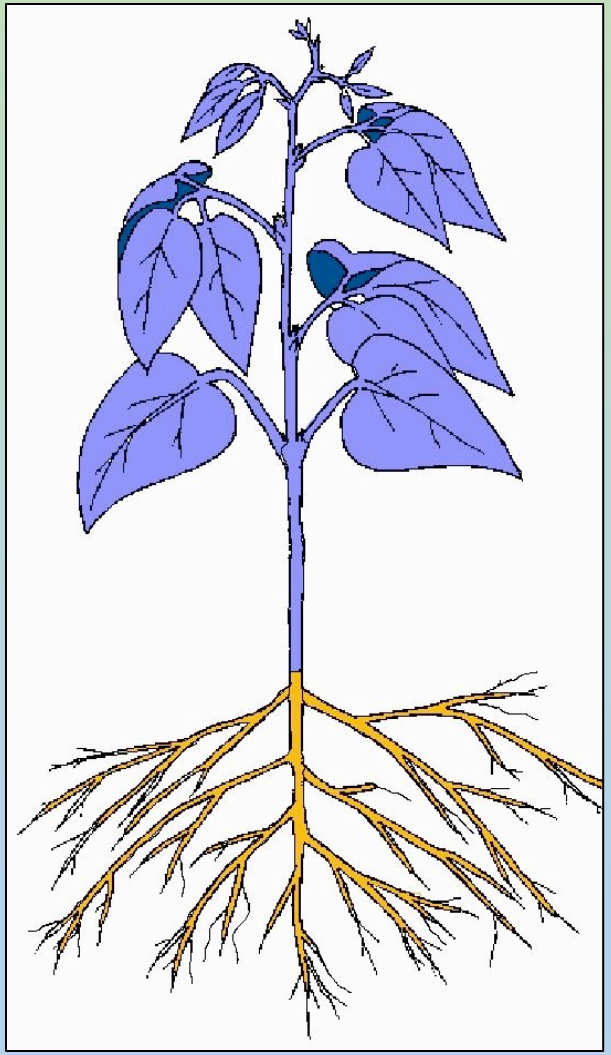
*New leaves protected?



Contact
(Protectant)



Locally Systemic
(Translaminar)



Systemic

https://www.extension.iastate.edu/sites/www.extension.iastate.edu/files/greene/Fungicide101.pdf/

Fungicide Uptake & Movement

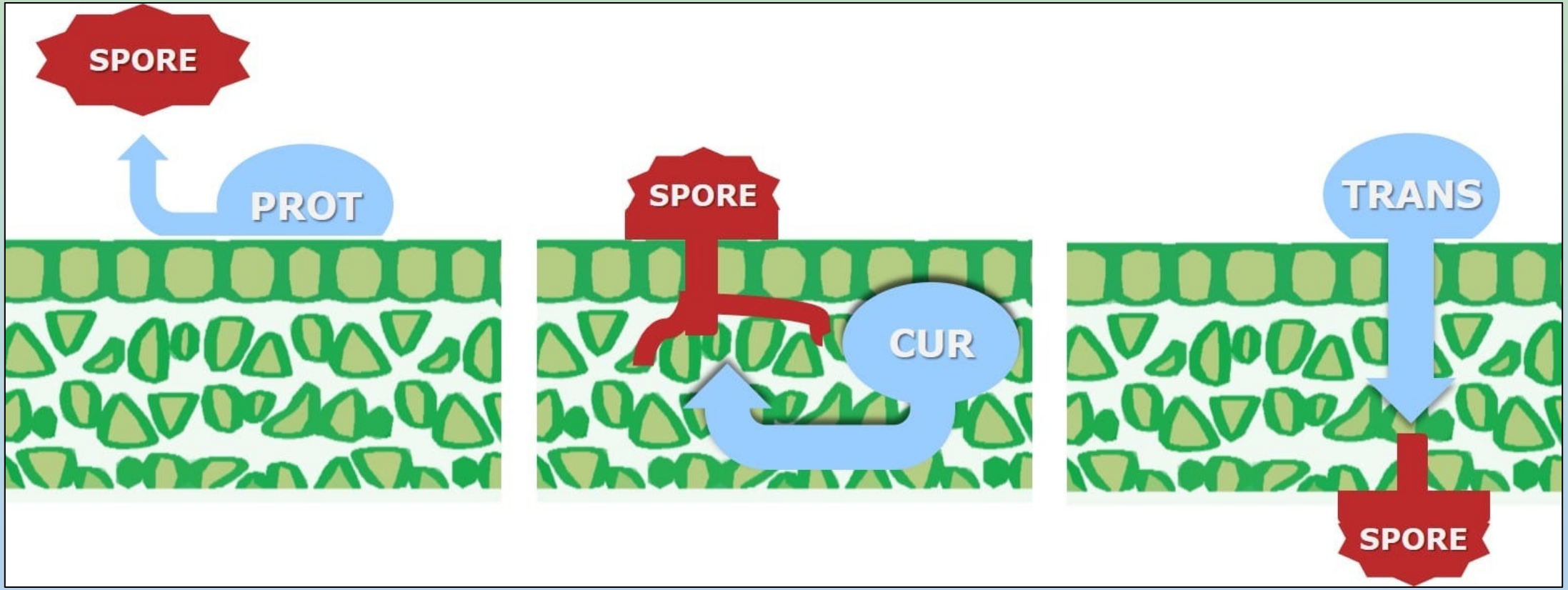


Photo: https://biocomm.eu/2017/12/17/fungicide-mode-action-labcoat-guide-pesticides-biopesticides/

Biologicals

Variety Testing

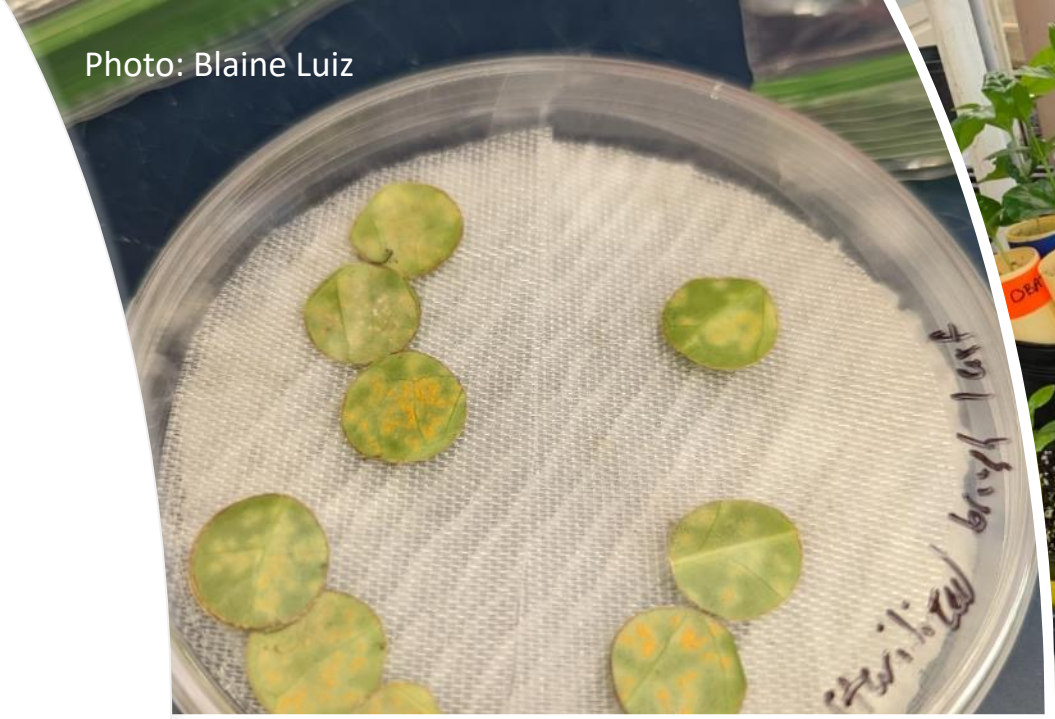
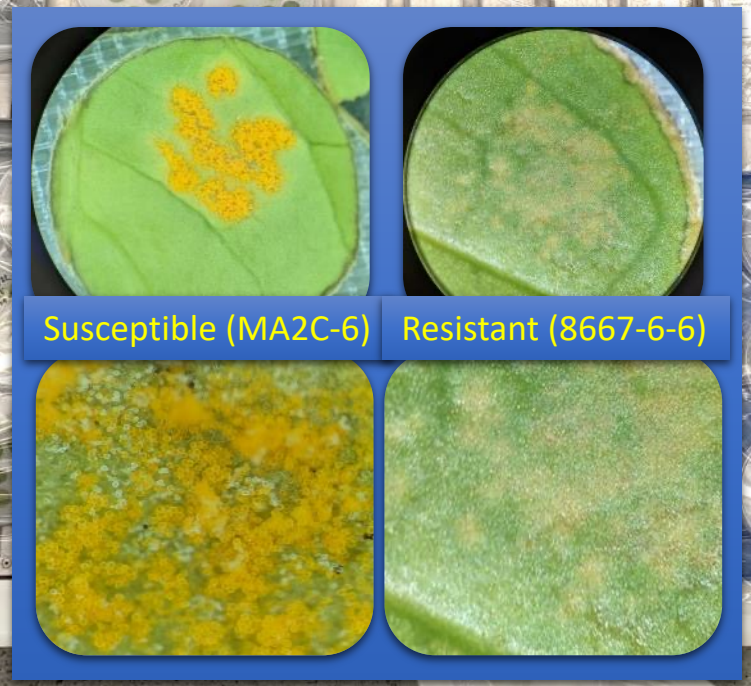


Photo: Blaine Luiz

Coffee Variety Resistance Screening (HARC)

(Accessions & F2 Catimor crosses)



Photos: Blaine Luiz

Natural Enemies of CLR Mycoparasite Survey

- Location (Kona, Ka‘u, Hamakua)
  - Elevation (200-700m)
- Sampled over 400 CLR lesions; >20 genera

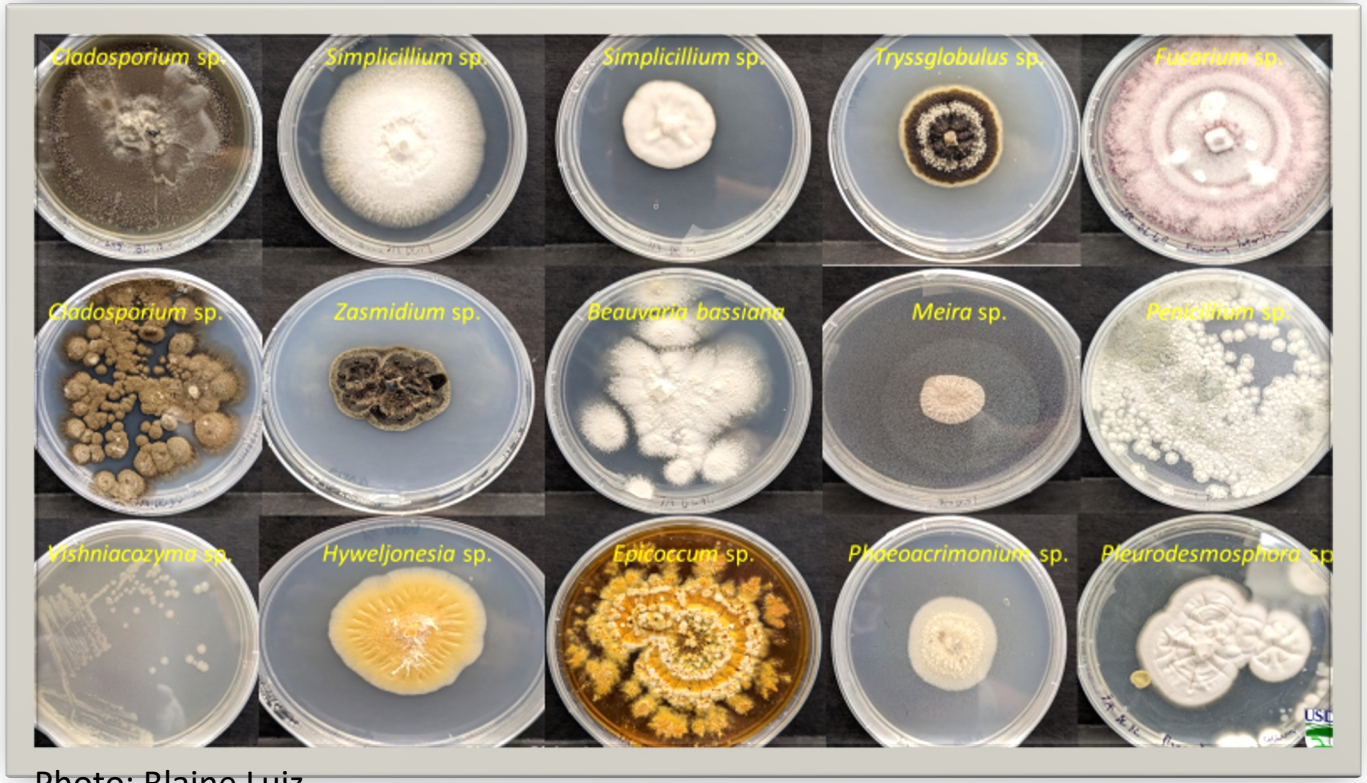


Photo: Blaine Luiz

Combating CLR in HI

- No silver bullet/Use IPM approach
- Short- & Long-term strategies
  - Scout regularly for disease symptoms
  - Improve/maintain plant and soil health
  - Practice good hygiene and sanitation
  - Important tool = fungicides (protectants and systemics)
  - Resistant varieties
  - Biocontrol

- Avoid introduction of new races; avoid evolution of new races


Thank you!
Questions?
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