GRIMM FAMILY CENTER FOR ORGANIC PRODUCTION AND RESEARCH

HOST SPECIFICITY AND CHARACTERIZATION OF DOWNY MILDEW PATHOGENS ON THE CA CENTRAL COAST BRASSICA CROPS:

The Central Coast of California is key region for Brassica crops like broccoli, cauliflower, arugula, and kale. Downy mildew, caused by Hyaloperonospora spp. is a major threat for these crops. This research uses morphological analysis and genetic sequencing to identify specific strains and understand their interactions with Brassica hosts. By doing so, it aims to support targeted disease control measures, including guidelines for brassica crop rotations.

STUDY DESIGN

Sample → Molecular Study → Pathogenicity Test → Assessment → Morphological Study → Phylogeny

Sample collection
11 Locations
6 Host Plants
21 Isolates

Molecular Identification
ITS & Cox2
Phylogeny

Genetic Diversity
Disease Severity
Host Pathogen Interaction

Pathogenicity Test
Inoculated 6 Host Plants
3 Downy Mildew Isolates
Koch's Postulates

DISEASE SEVERITY SCALE

Score	Host Pathogen Interaction
0	No symptoms or sings on any leaves
0.1	Chlorotic tissue present
0.5	Scattered necrotic flecks, no sporulation
5	5% of the plant is sporulating
10	10% of the plant is sporulating
25	25% of the plant is sporulating
50	50% of the plant is sporulating
75	75% of the plant is sporulating
100	100% of the plant is sporulating

Healthy Leaf

Chlorosis & Necrosis

Sporulation

Crops Evaluated

- Wild arugula
- Cultivated arugula
- Baby kale
- Kale
- Collard
- Cabbage
- Broccoli
- Mustard
- Kohlrabi

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KEY FINDINGS

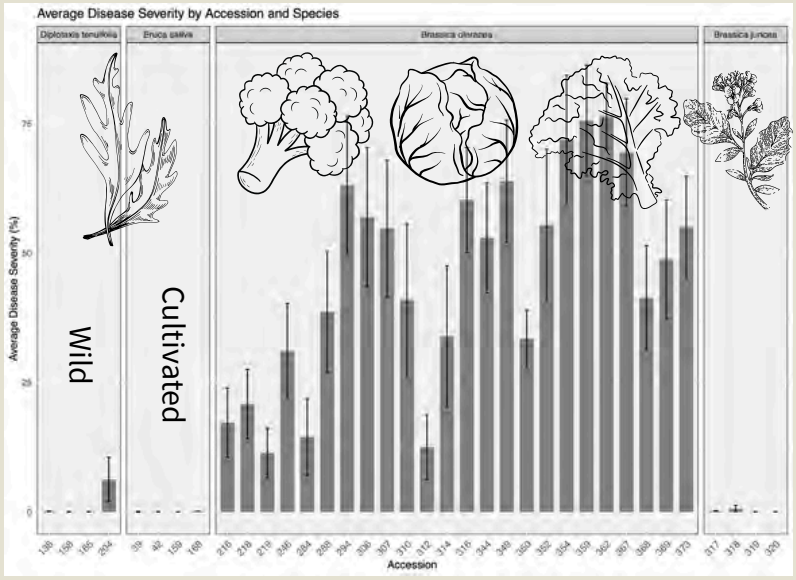

Fig. 1 Disease severity on a panel of Brassica plants 9 days post inoculation with *Hyaloperonospora brassicae* (BKG22).

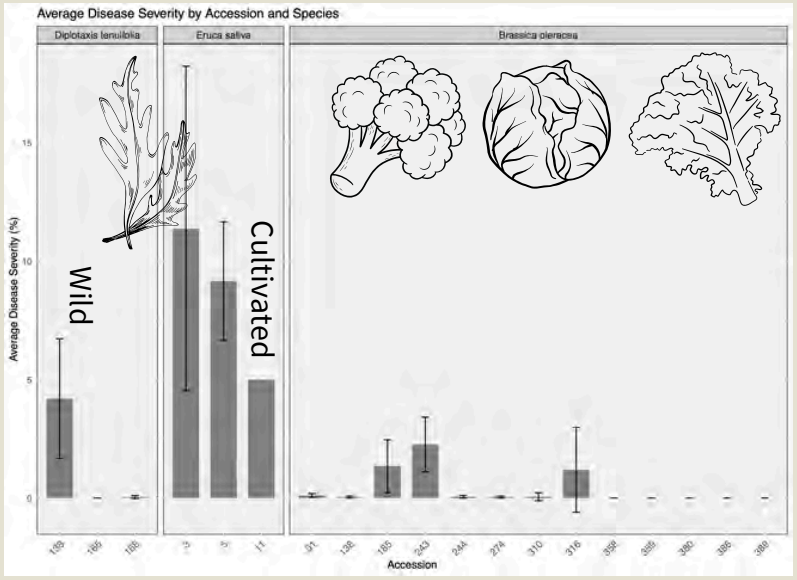

Fig. 2. Disease severity on a panel of Brassica plants 9 days post inoculation with *Hyaloperonospora erucae* (CAS23).

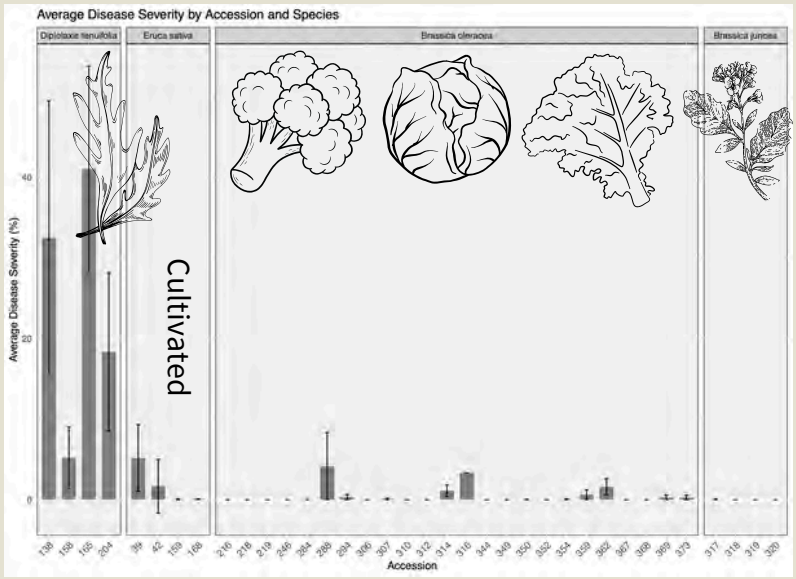

Fig. 3. Disease severity on a panel of Brassica plants 9 days post inoculation with *Hyaloperonospora diplotaxidis* (WASJ20).

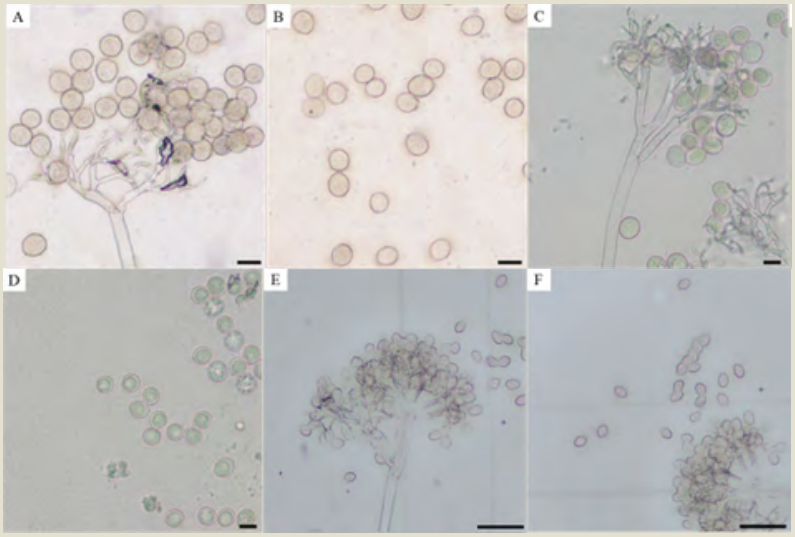

Fig. 4. Morphological characteristics of three *Hyaloperonospora* species; H. *brassicae* (A-B); H. *erucae* (C-D); H. *diplotaxidis* (E-F). Sporangiophore (A, C, E), Sporangia (B, D, F). (Scale bars: A–D = 50 µm, E–F = 20 µm).

CONCLUSIONS

- **Infection caused by *H. diplotaxidis* in wild arugula; *H. brassicae* in baby kale, kale, cabbage; *H. erucae* in cultivated arugula. Wild mustard had little infection.**
- **Brassica rotations among wild and cultivated arugula and other crops could reduce cross crop transmission.**
- **The presence of some cross-species infection suggests that downy mildew pathogens have the potential to shift towards broader host ranges.**

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