Evaluation of Pericarp Hardness Traits for Resistance to Seed-Feeding by the Sunflower Moth

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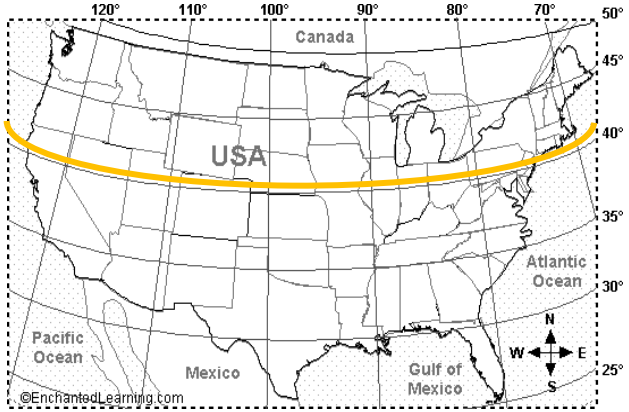
Sunflower Moth Background

- **SFM on sunflower throughout North America**
- **Southern Pest (cold-intolerant)**
- **Carried by wind into Dakotas and Canada in August**



SFM Damage

- **Larvae feed on pollen, florets and seeds**

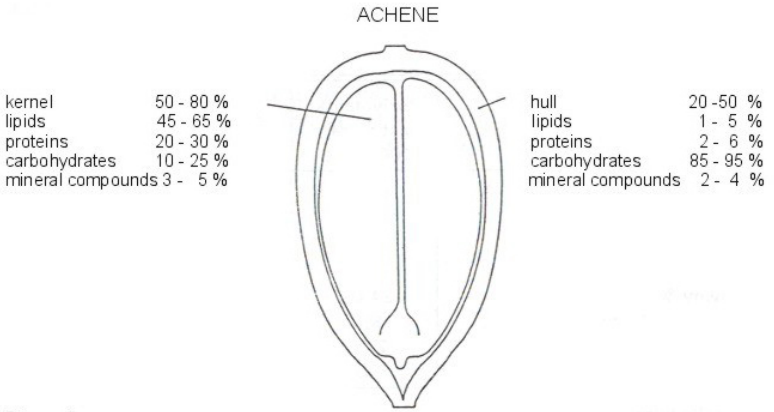
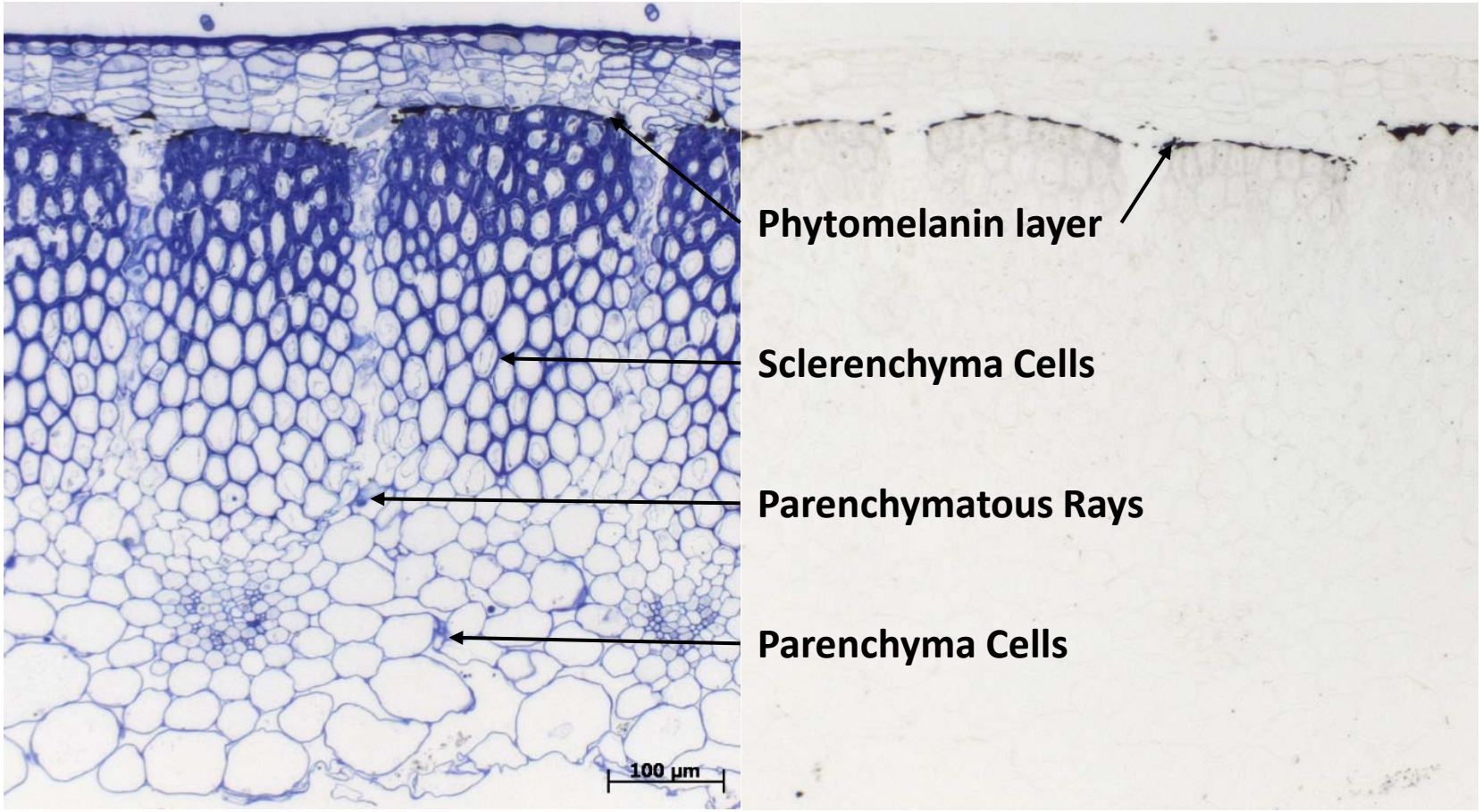


Figure 3.

Pericarp Structure



SFM Management

- *Bacillus thuringiensis* sprays can suppress infestations
- Broad-spectrum insecticides used
- Terpenoids in glandular trichomes
- Phytomelanin Layer (Pml): strength or deterrence?

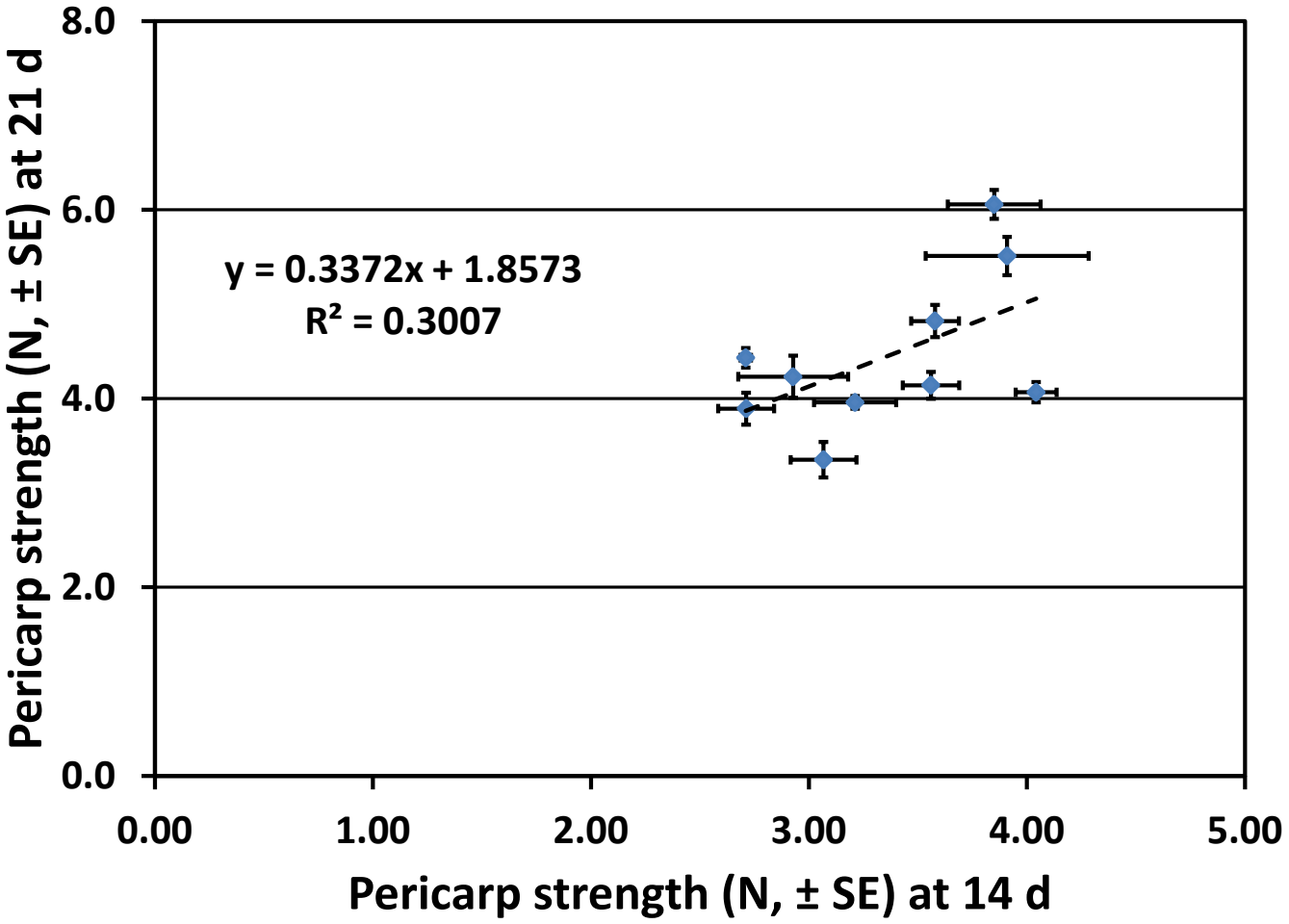
Research Questions

- **Does pericarp thickness or phytomelanin account for pericarp strength?**
- **Does feeding on phytomelanin affect sunflower moth larvae (independent of strength)?**
- **How do pericarp traits affect sunflower moth larval damage in the field?**

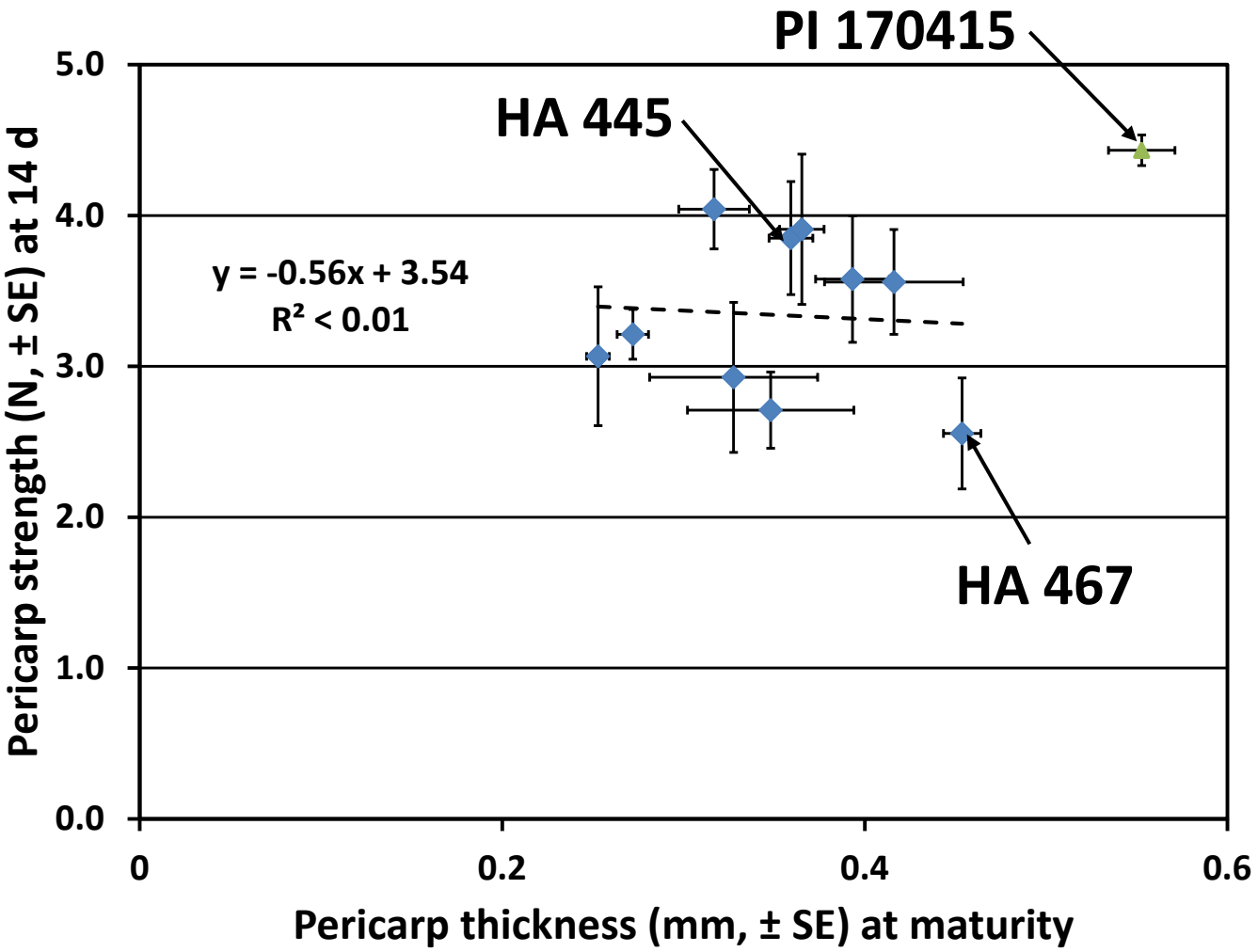
Pericarp Traits in Field Trials (2013)

- **Pericarp strength (11 entries)**
  - **10 maintainer lines, PI 170415**
- **Measurements**
  - **Strength: 14, 21 days after anthesis, maturity**
  - **Thickness: maturity**
  - **Cross sections: 14, 21 days after anthesis**

Pericarp Strength at 14 and 21 days

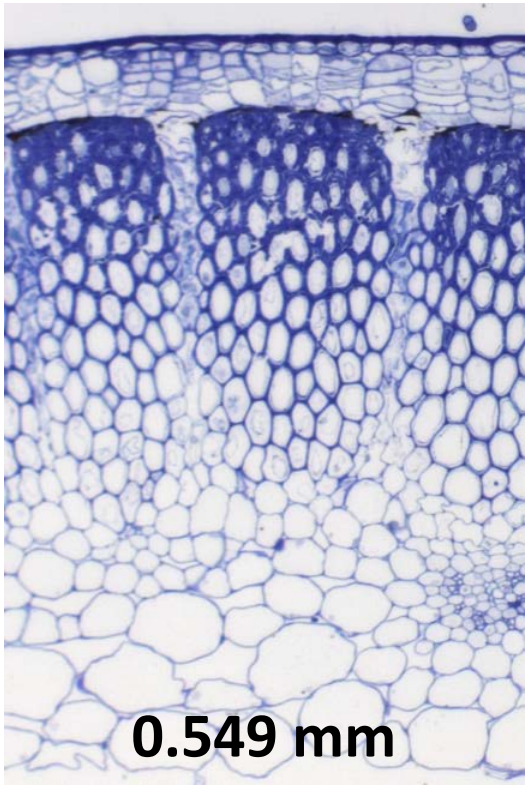


Pericarp Strength and Thickness



Relative Strength and Pericarp Structure

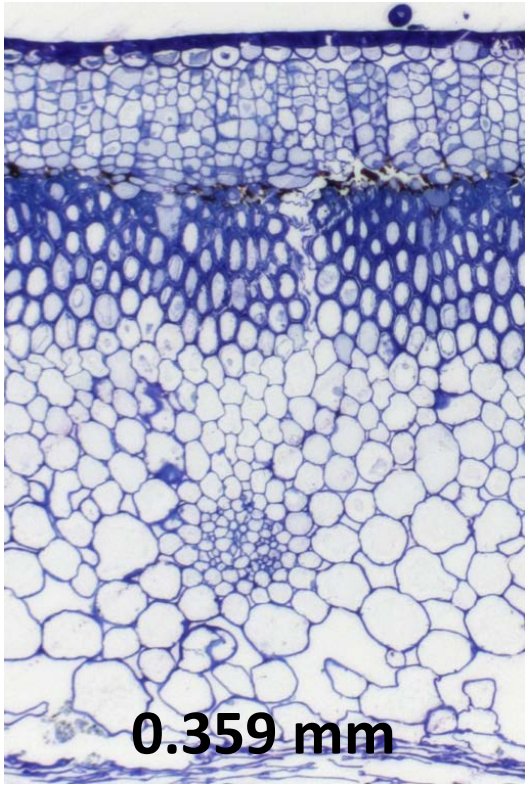
PI 170415 14d



4.33 N

High Sclerification

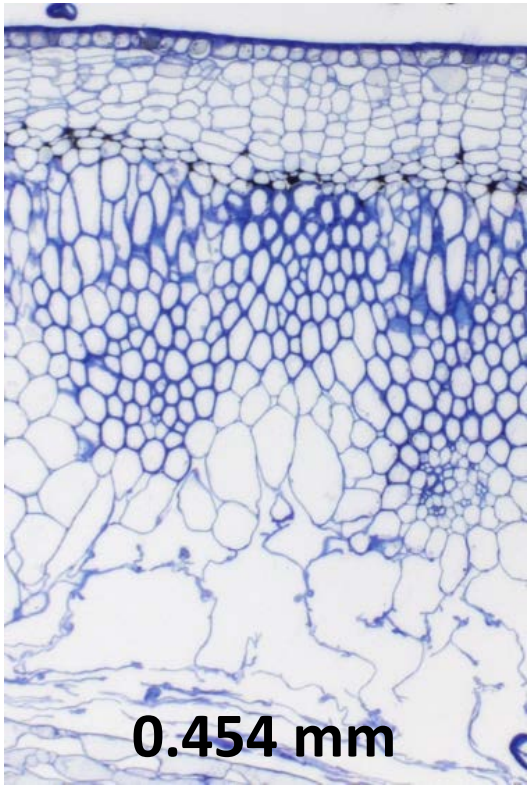
HA 445 14d



3.85 N

Medium Sclerification

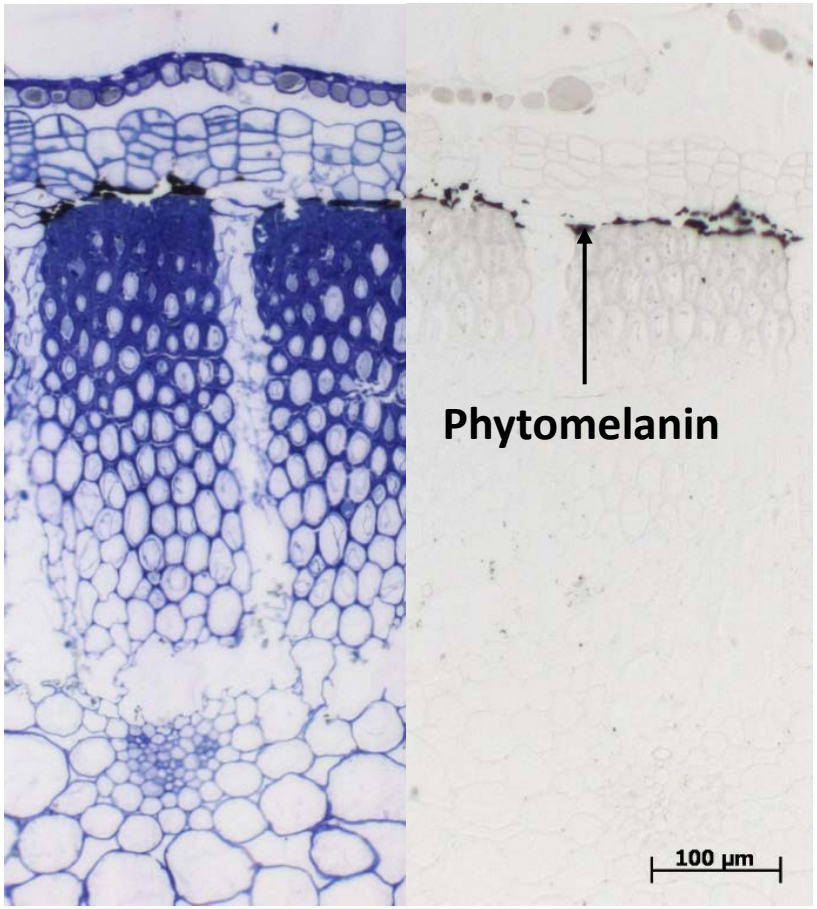
HA 467 14d



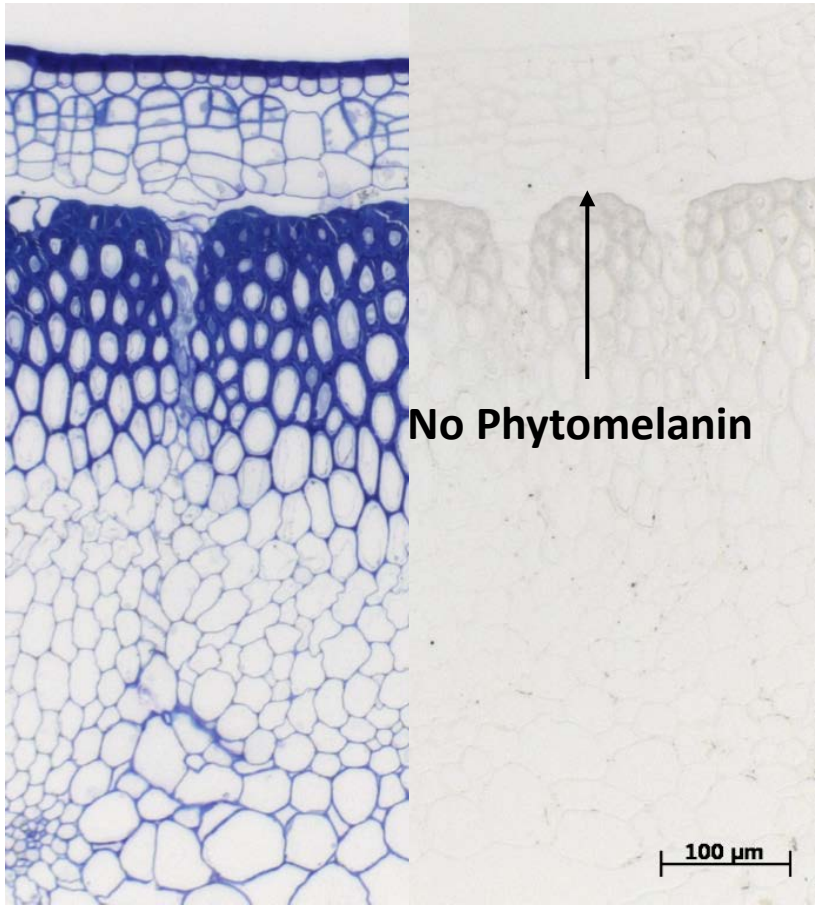
2.56 N

Low Sclerification

Phytomelanin in PI 170415



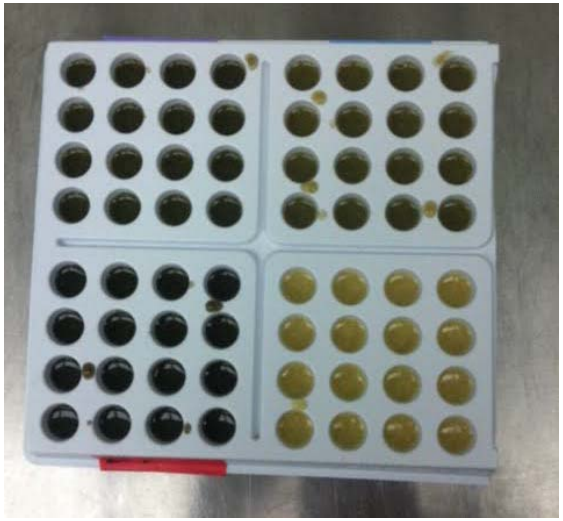
PI 14d with Pml



PI 14d without Pml

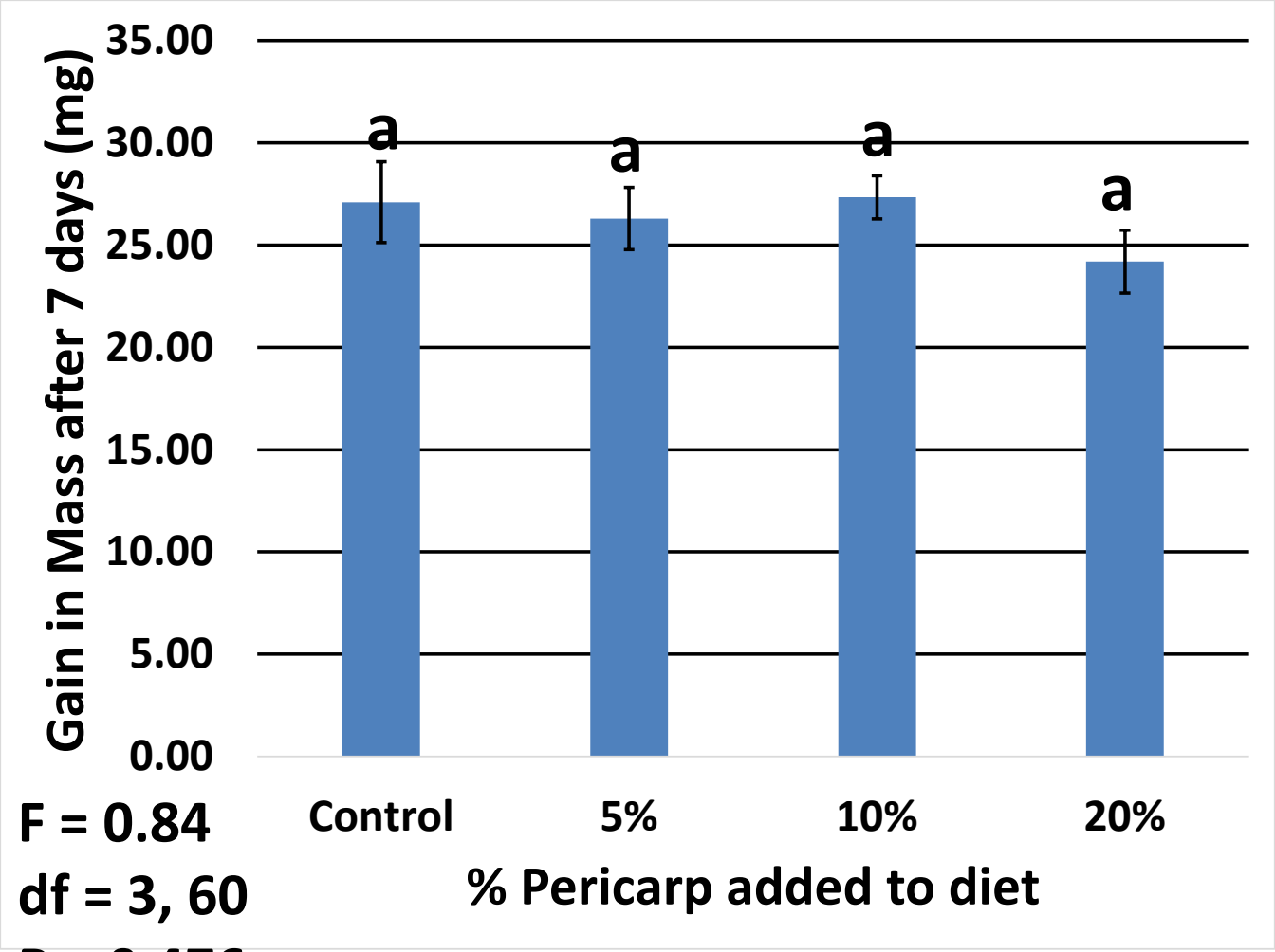
Bioassay Test, Phytomelanin Effects

- Testing with artificial diet
  - Control, 5%, 10% and 20% ground pericarp
  - 16 larvae/treatment
  - Placed on treatments 5 days after hatch
  - Removed 7 days later (12 d)



- Measurements
  - Weighed larvae at 5 d (=)
  - Re-weighed 7 days later (12 d)

Phytomelanin Bioassay



F = 0.84

df = 3, 60

P = 0.476

Summary

- **Pericarp Strength**
  - **Thickness does not = strength**
  - **Sclerification, not Pml, may explain strength**
- **Phytomelanin layer**
  - **Pml may not be toxic to larvae**
  - **Need more realistic follow-up tests**

Future Plans

- **Further examine cause of pericarp hardness (slide images)**
- **Improved bioassay tests using similar lines with and without Pml**
- **On-plant feeding trials**