

Traits for Resistance to Sunflower Moth Larval Feeding in Inbred, Hybrid, and Wild Sunflower



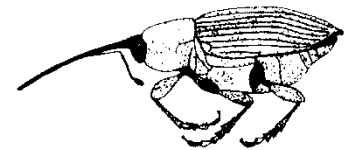
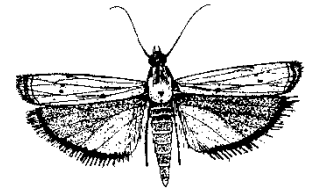
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Approaches to Plant Resistance Work

- **In-field screening for % damage**

- Expensive and slow
- Results inconsistent



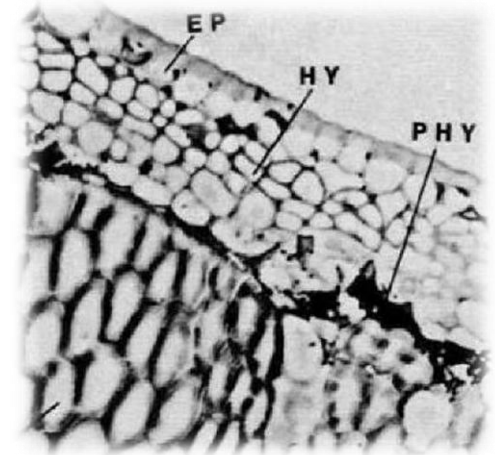
- **Selecting for specific plant traits**

- If valued traits are identified...
- Can have reliable evaluation and breeding
- In-field insect work, still needed – for validation



Previous Work on SM Resistance Traits

- **Pericarp hardness**
 - Variation can reduce SM damage
 - Linked to phytomelanin layer (Pml)



- **Glandular trichomes (w/ terpenoids)**
 - Toxic or repellent to several spp.
 - Believed to protect wild SF
 - Uncommon in cultivated SF (?)



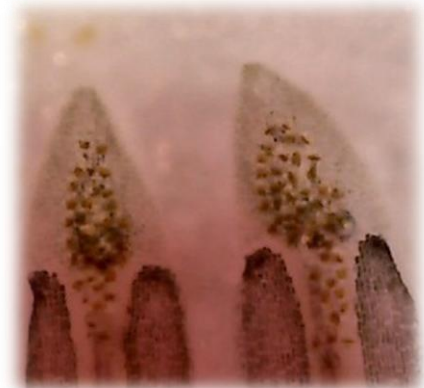
Limitations of Previous Work

- **Pericarp hardness**
 - Inbreds last tested in 1980's
 - Data primarily from greenhouse tests
 - Value of Pml versus innate hardness unclear
- **Glandular trichomes**
 - Germplasm last tested in 1980's
 - Data collected, not publicly disclosed
 - Link of trichome # to resistance not shown

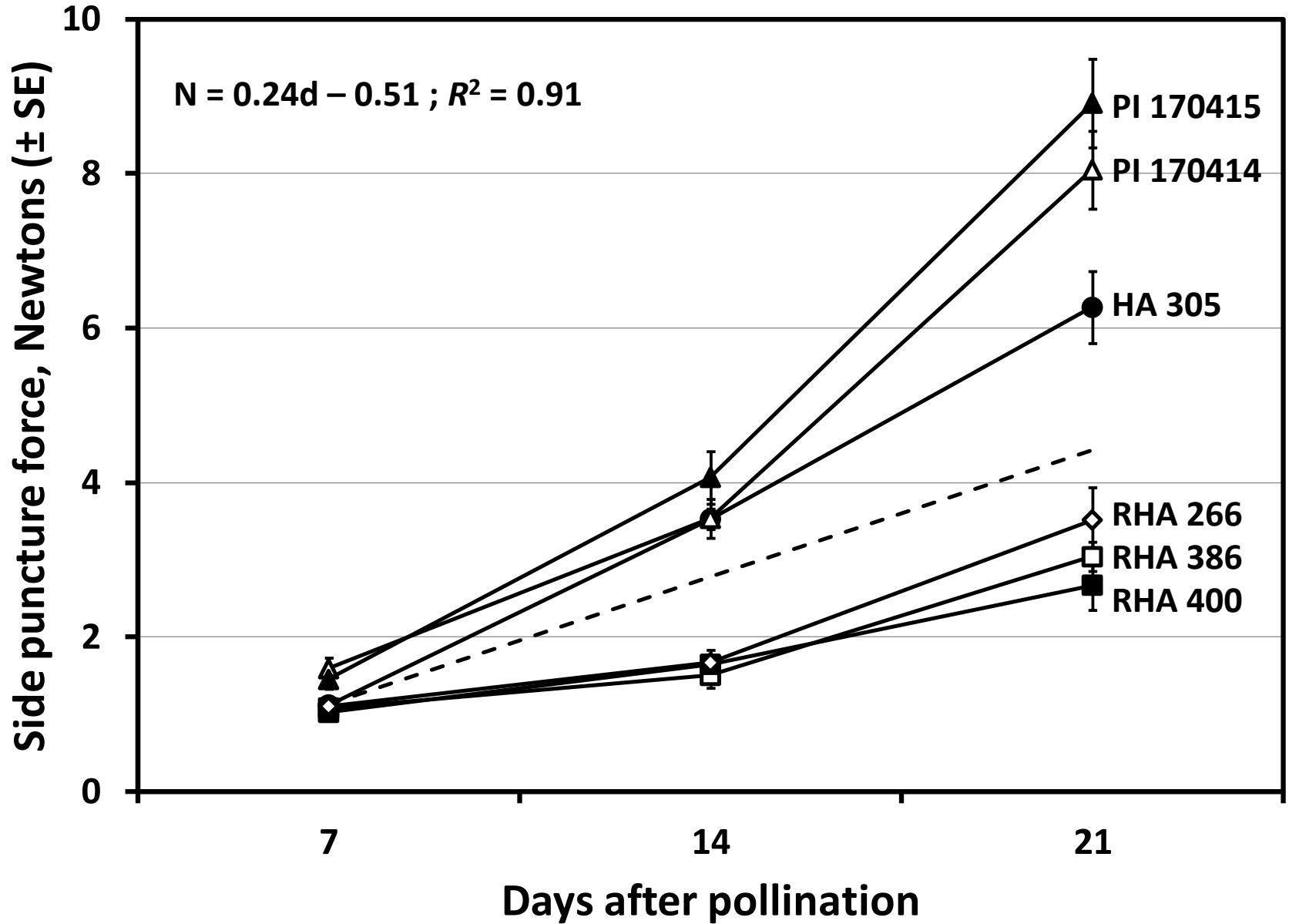
SM Traits in Local Field Trials (2012)

- **Pericarp hardness (53 entries)**
 - 15 each of RHA, HA, hybrids
 - 4 PI or interspecific w/ SM resistance
 - 5 plants @ 7, 14, 21 d after pollen shed

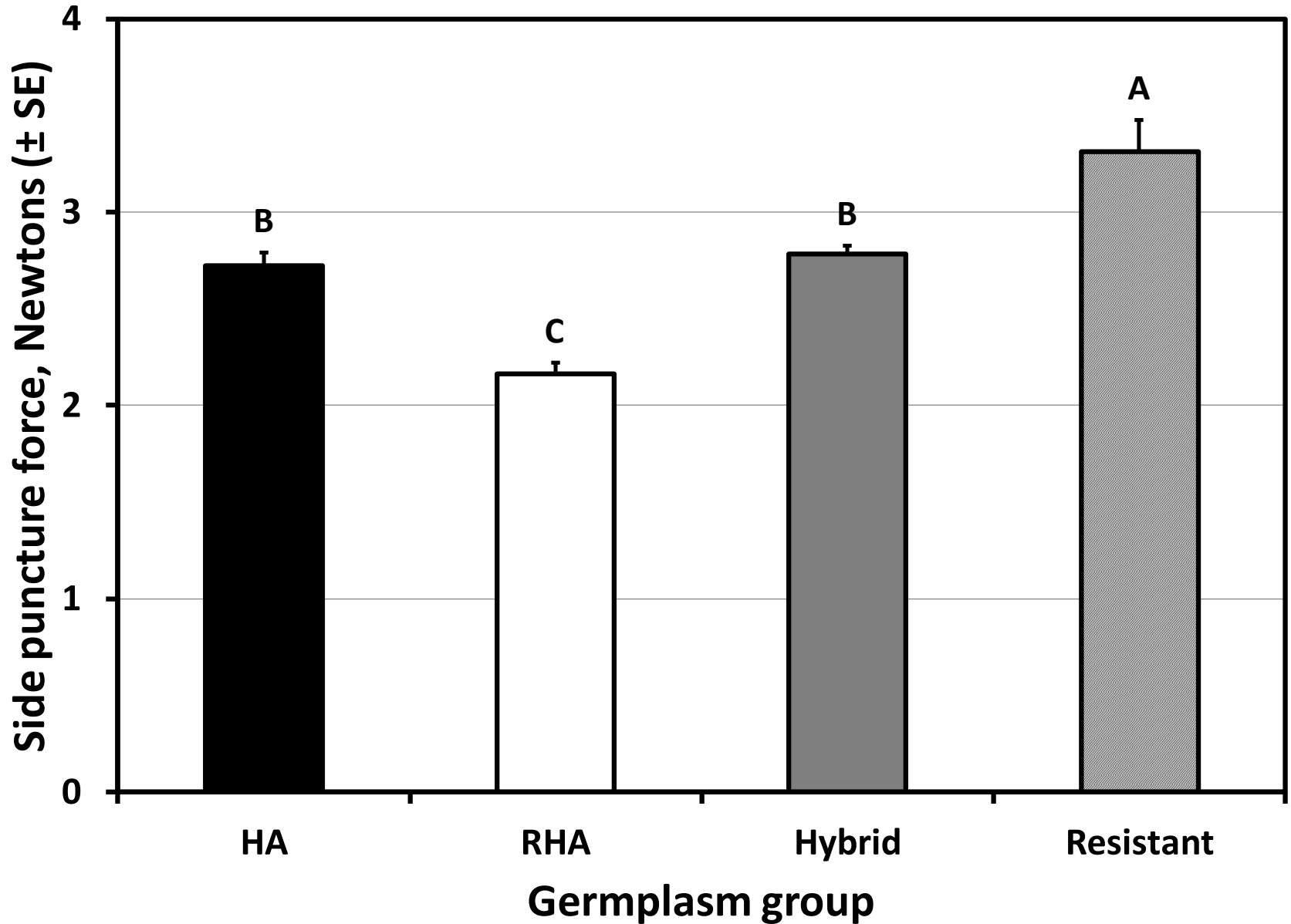
- **Glandular trichomes**
 - Above plus 15 wild PI (KS, TX, ND)
 - Collected florets just prior to anthesis
 - Counted for 3 florets × 3 plants



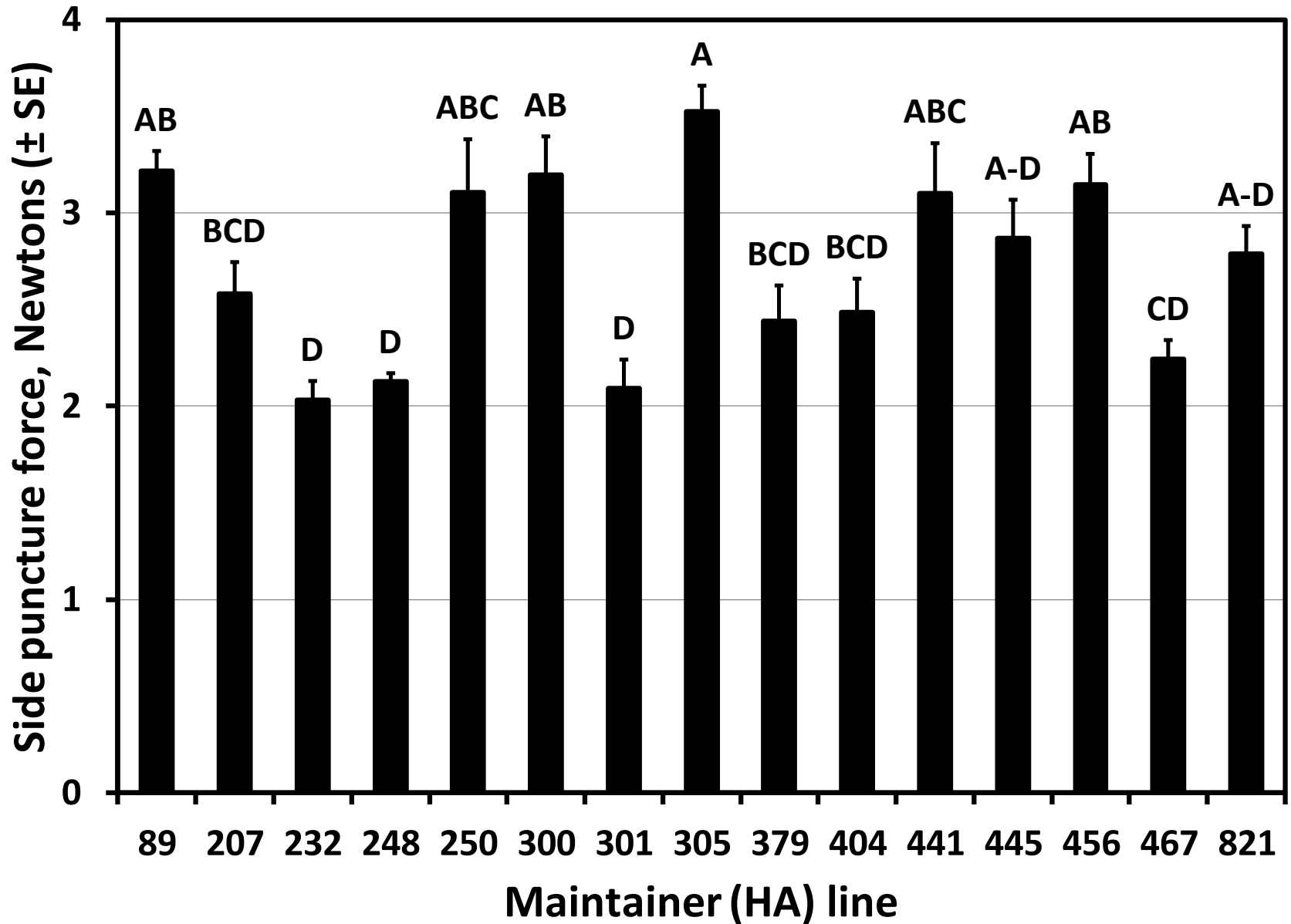
Pericarp Resistance Trends



Pericarp Resistance, by Group @ 14 d



Pericarp Resistance, within HA @ 14 d



Pericarp Resistance, Larval Feeding Test

- **Preliminary testing**
 - Groups of 1.5, 2.8, 3.7 strength
 - Resistance at ≈ 3.0 N?
 - 4th instar can start @ 11 days
- **Strength of 3.0 N reached at:**
 - 11 days for PI 170415
 - 14 days for HA 300
 - 19 days for HA 301

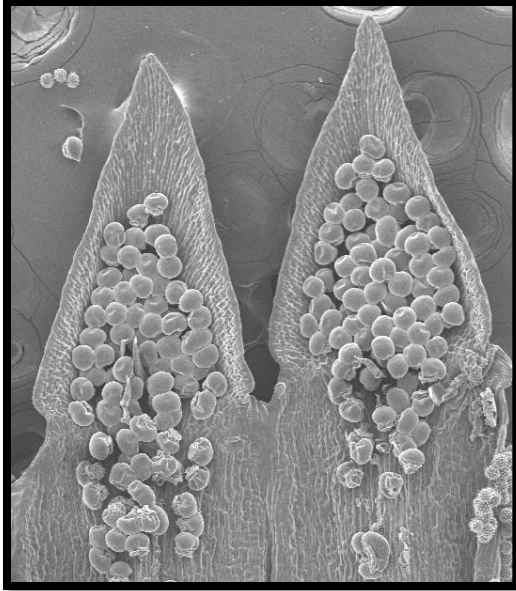


Pericarp Resistance, Summary

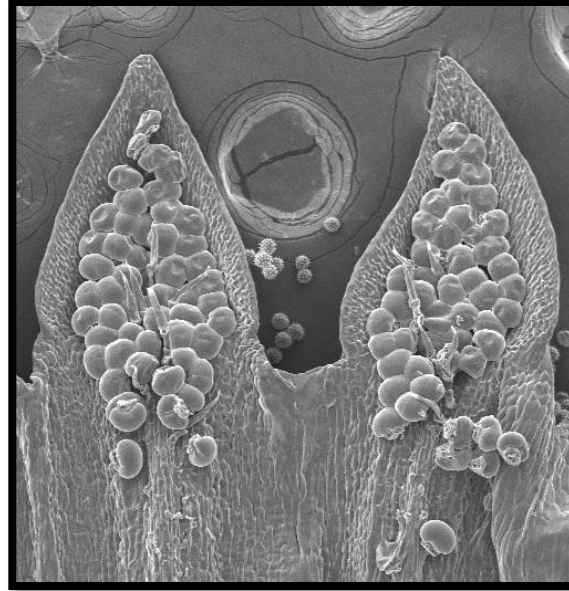
- **Pericarp hardness**
 - Room to improve USDA inbreds
 - Hardness of PI 170415 appears valuable
 - PI resistance may be enhanced by R-line
- **Winter–Spring 2013**
 - Assess breeding material based on PI 170415
 - Conduct additional SM feeding tests

Glandular Trichomes, Results & Summary

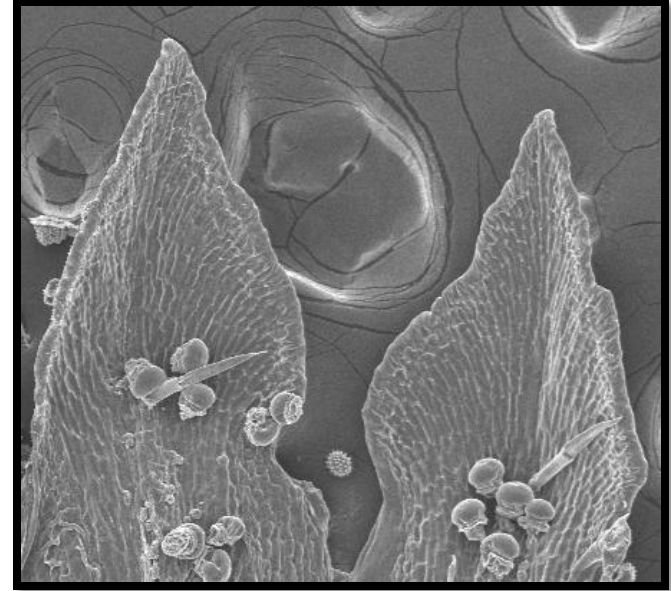
HA 300



PI 435556



HA 301



- **Gland numbers**
 - HA \approx Hybrids \approx Wilds $>$ RHA
 - Relationship with terpenoid content?

Future Directions, Acknowledgements

- **Priorities for future**
 - **Determine relative contribution of Pml, hardness**
 - **Specifics on terpenoid ID and quantification**
 - **Work towards mapping both traits**
- **Gerald Seiler - background on previous efforts**
- **Theresa Gross - pericarps & gland counts (> 100K)**