Insect Resistance Traits in Developing Mapping Populations

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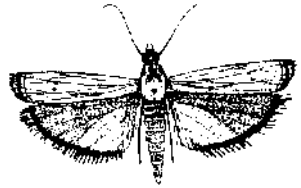
Mapping Efforts for Insect Resistance

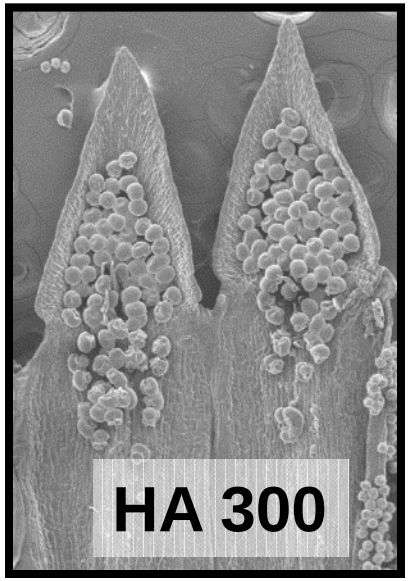
- **Sunflower moth**
  - **Glandular trichome number**
  - **Pericarp strength**
  - **(Glandular trichome chemistry)**



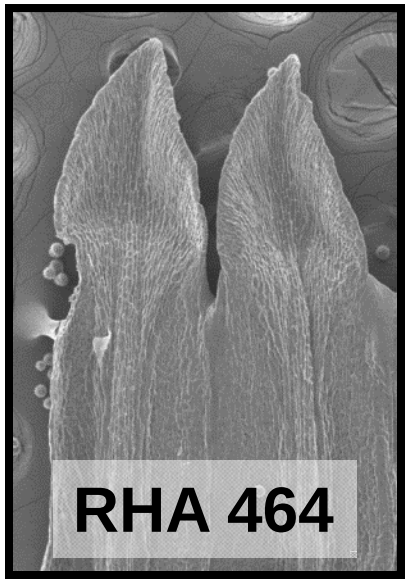
- **Red sunflower seed weevil**
  - **Unknown trait from PI 431542**

Sunflower Moth – Trichome Number

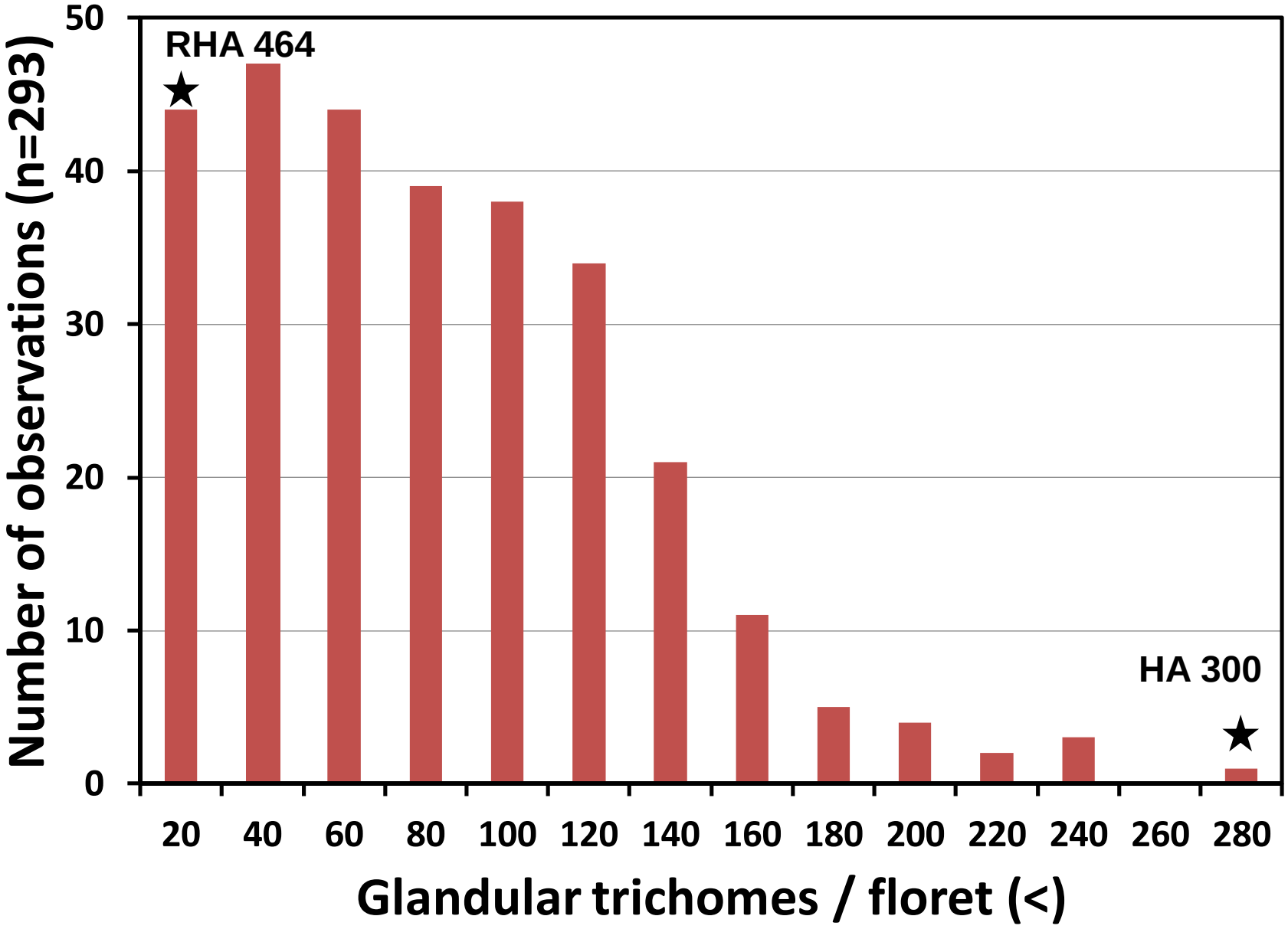
- **Glandular trichomes**
  - Store repellent chemicals on florets
  - Trichome number in wilds = HA > RHA
  - HA inbreds from 6 – 334 per floret



- **Mapping population**
  - HA 300 × RHA 464
  - Possible effects of restorer group
  - Grow normally in greenhouse

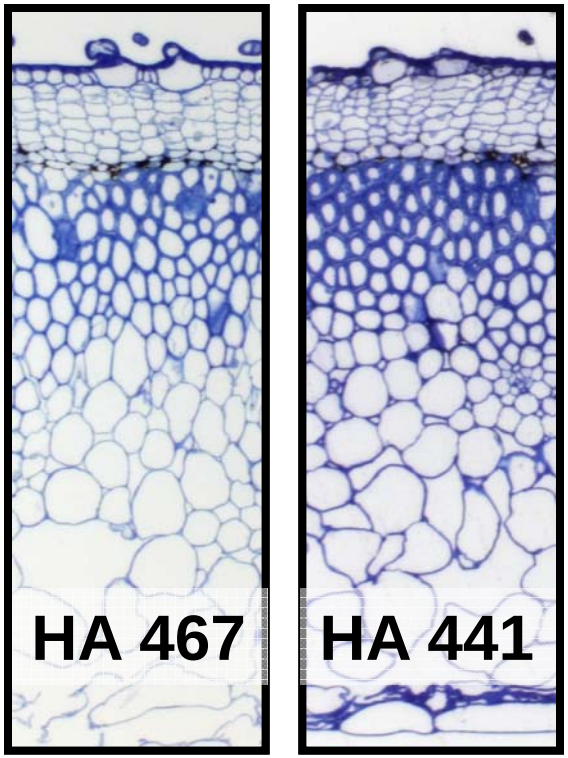


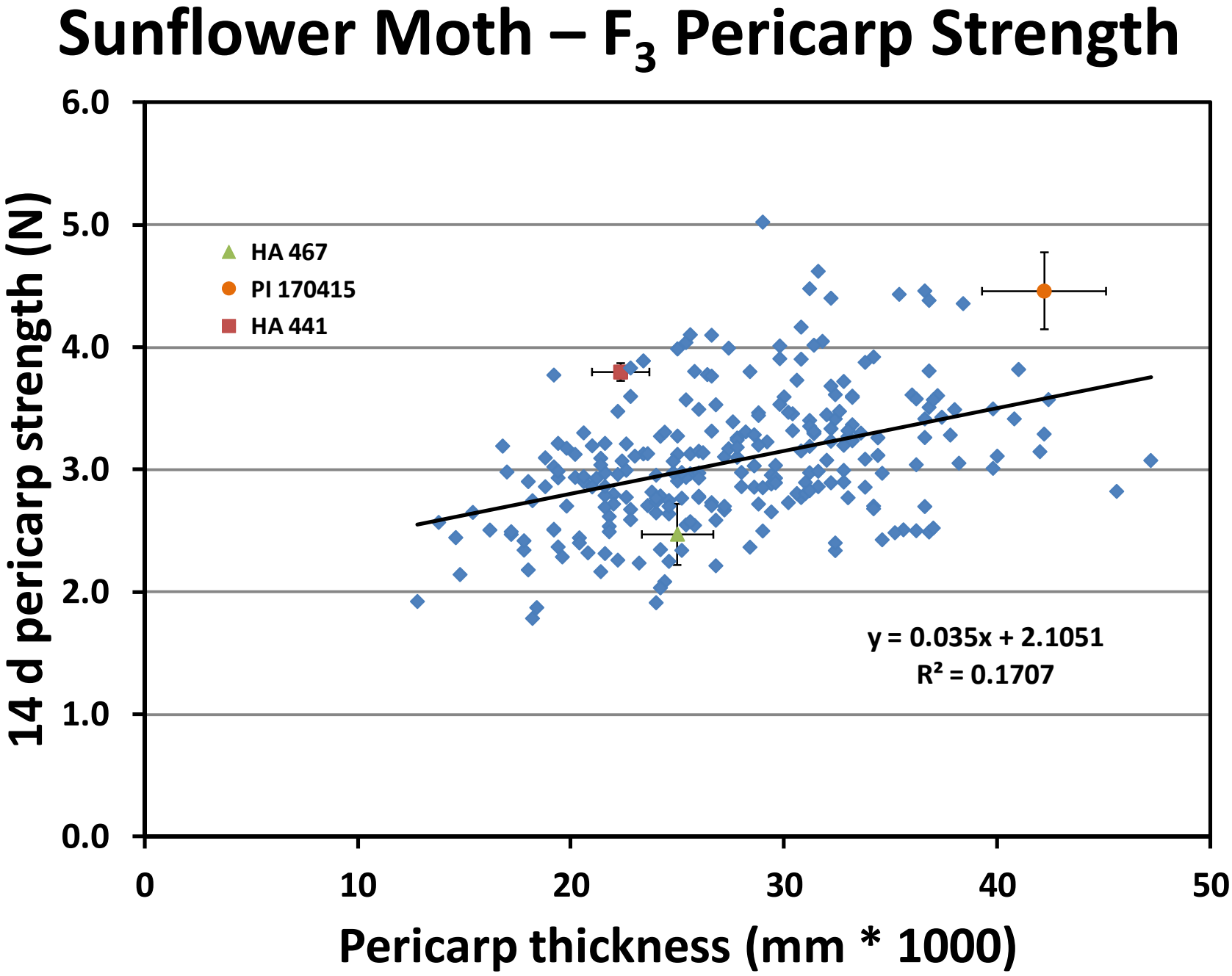
Sunflower Moth – F_2 Trichome Number



Sunflower Moth – Pericarp Strength

- **Physical resistance to feeding**
  - **Larvae prefer ‘soft’ seed**
  - **Strength related to thickness…**
- **Cross for mapping population**
  - **HA 467 × PI 170415**
  - **PI brings poor ‘self’ seed set**
  - **Tested $F_{2:3}$ in field for 2014**




Sunflower Moth – F3 Pericarp Strength
14 d pericarp strength (N)
6.0
5.0
4.0
3.0
2.0
1.0
0.0
HA 467
PI 170415
HA 441
y = 0.035x + 2.1051
R² = 0.1707
0
10
20
30
40
50
Pericarp thickness (mm * 1000)

Sunflower Moth – Pericarp Strength

- **Ongoing efforts**
  - **Testing oil content on population samples**
  - **Pericarp strength without loss of oil**
- **Moving towards mapping strength**
  - **$F_{2:3}$ tissue available for preliminary analysis**
  - **Likely need more inbreeding**
  - **High sampling effort in field (2015, 2016?)**

Red Seed Weevil – PI 431542

- **Resistance not based on attractiveness**
  - **No-choice infestation of HA 441, PI 431542**
  - **Each female on PI produced 86% fewer larvae**

- **Potential weevil nutritional issue**
  - **Females need SF pollen to produce eggs**
  - **PI amino acids, protein appear similar to HA 441**
  - **Analysis of sterols in pollen in 2015**

Red Seed Weevil – PI 431542

- **Mapping population**
  - **Alternate route to understanding resistance**
  - **HA 441/PI 431542//HA 467 as $F_{3:4}$ in 2014**

- **Field infestations in 2014**
  - **30 weevils / head onto 116 F_4 plants (57 entries)**
  - **Not scored for damage yet**
  - **Results will inform goals for $F_{5:6}$ in 2015**

Future Directions

- **Sunflower moth traits**
  - **Trichomes: substantial range in F_2 plants**
  - **Should be able to map trait on F_4 this spring**
  - **Pericarp: variation in strength, thickness**
  - **Apparently can have strong, thin pericarps**

- **Red seed weevil**
  - **Awaiting preliminary data in February**
  - **May try large-scale infestation summer 2015**

Future Directions – Trichome Chemistry