

# **Update on Host-Plant Resistance to Seed- and Stem-Infesting Insect Pests**



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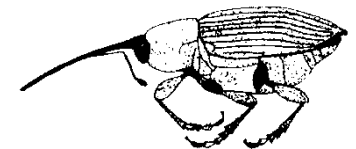
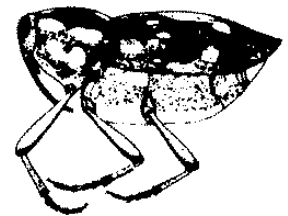
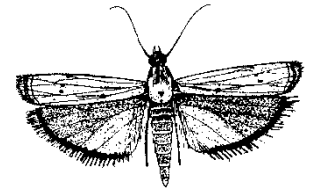
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**Kathy Grady, SDSU**

**Rob Aiken, Kansas State University**

# Recent USDA Plant Resistance Work

- **ID germplasm with insect resistance**
  - All four insect pests
  - Field trials in ND, SD, KS
- **End of ‘combined’ project in 2014**
  - Very high labor costs
  - Impractical to run four projects well
  - Focus on specific traits

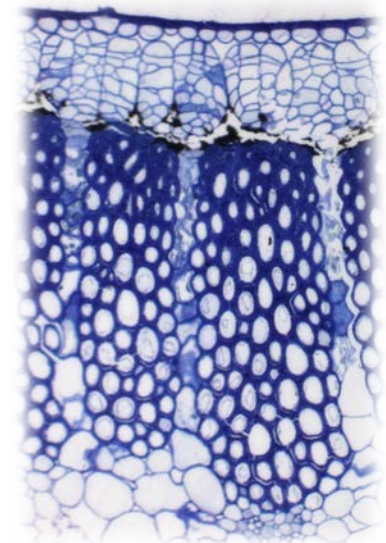
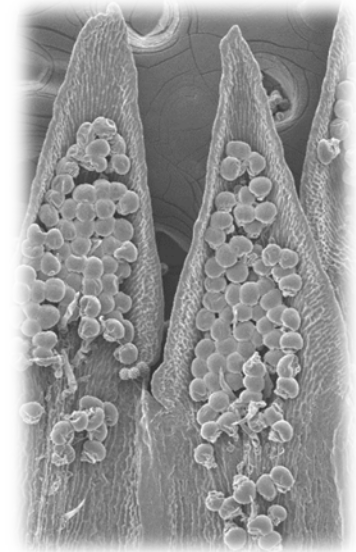


# Changing Approach, Updates

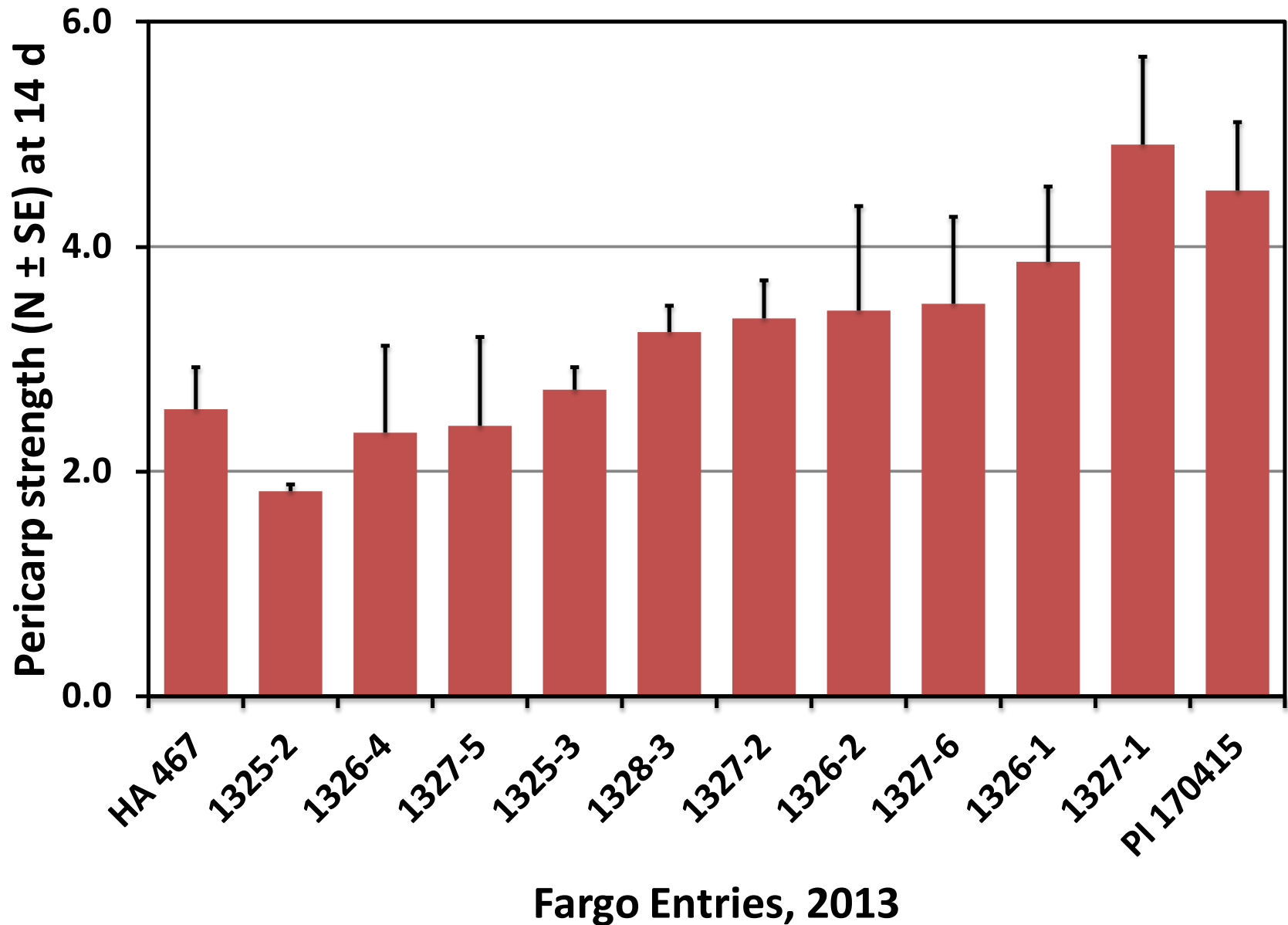
- **‘Mechanism phenotyping’**
  - Assess traits proposed to convey resistance
  - e.g., amount of chemical ‘X’, toxic to target pest
  - Field screening for confirmation (smaller scale)
- **Updates for insects**
  - Some projects on hold
  - Others accelerating or finishing

# Sunflower Moth – Mechanisms

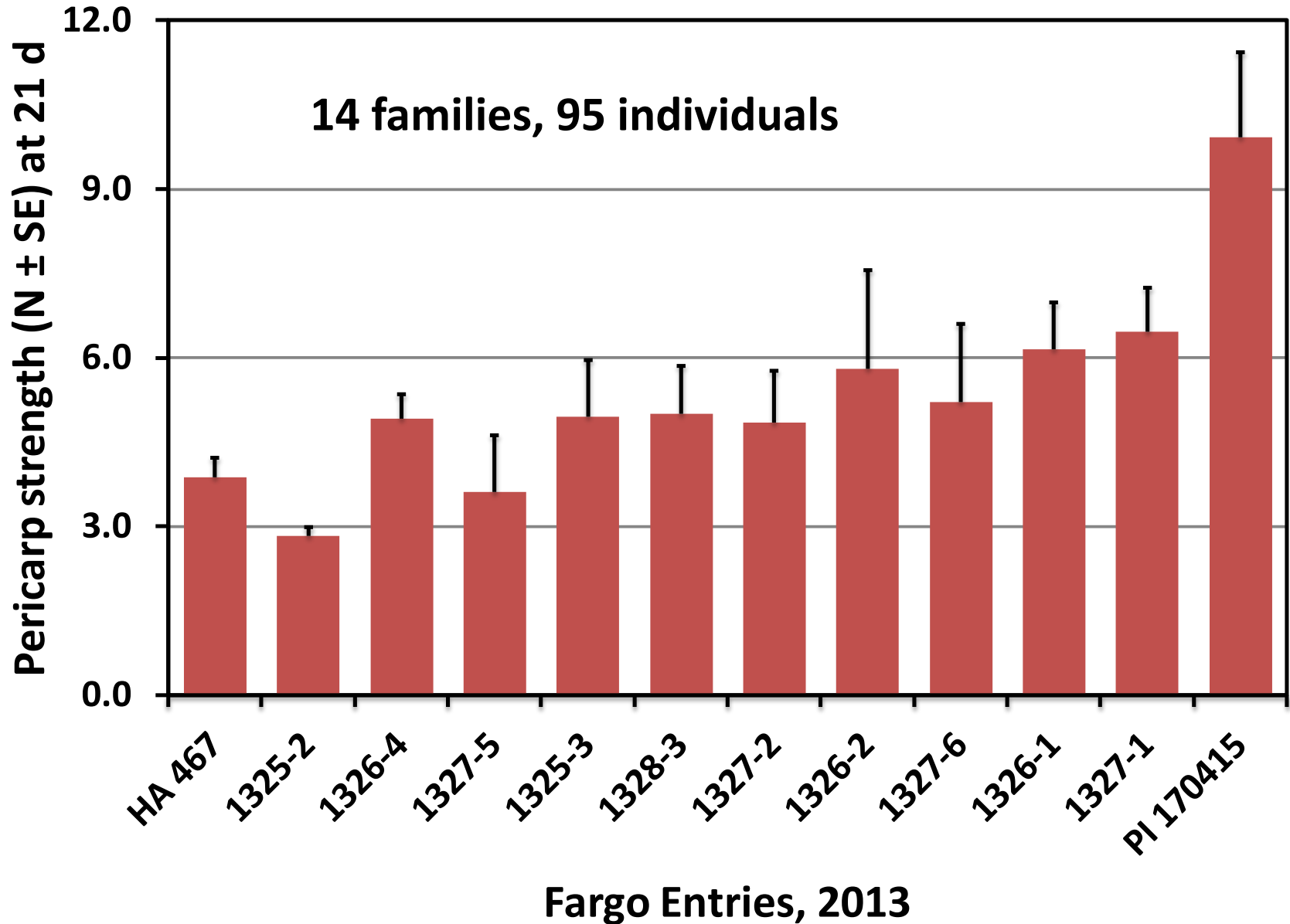
- **Lower attraction for oviposition**
  - No active projects
- **Early larval mortality**
  - Glandular trichomes and terpenoids
- **Resistance to late larval feeding**
  - HA 467 × PI 170415 -----> F2:3



# Sunflower Moth – Pericarp Strength



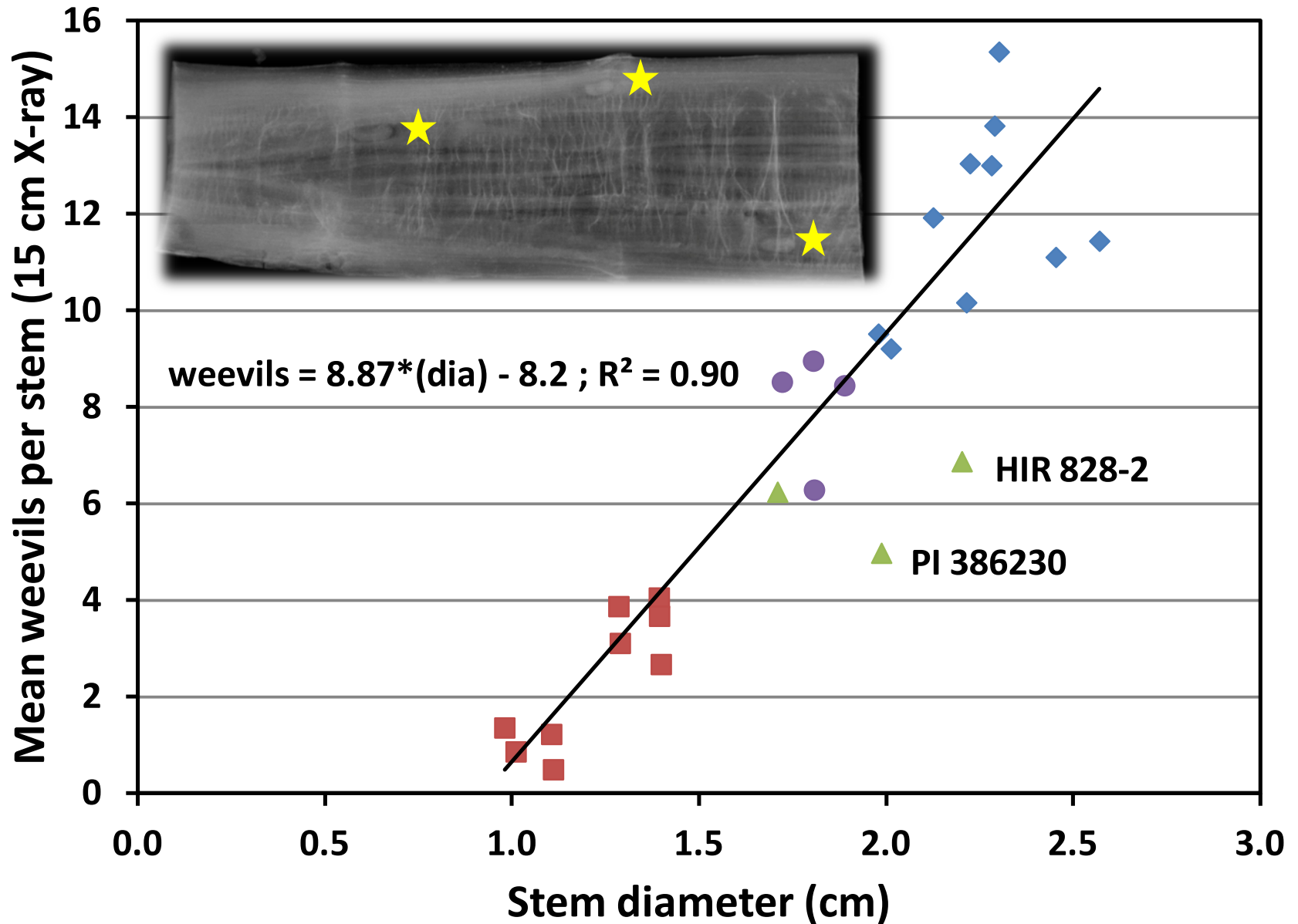
# Sunflower Moth – Pericarp Strength



# **Banded Sunflower Moth – PI 494859**

- **Potential value of PI for breeding**
  - Evidence of differences in terpenoid compounds
- **Confounding effects of seed dormancy**
  - 60 DAP, range from V8 to R2 plants
  - Ongoing efforts to assess public inbreds
  - Future efforts on chemical resistance factors?

# Sunflower Stem Weevil – X-rays





# Red Sunflower Seed Weevil – PI 431542

- In-field % damage, transfer to hybrids

Entry	inbred-07	inbred-08	inbred-10	hybrid-10
RSSW-Exp-227	1.4	1.6	2.0	1.6
RSSW-Exp-231	4.4	7.7	6.0	1.0
RSSW-Exp-237	2.4	7.8	6.6	2.2
PI 431542	0.6	1.9	1.4	*
HA 89	8.0	13.2	*	*
HA 445	*	18.2	11.8	*
HA 445 / RHA 377	*	*	*	8.0
HA412HO / RHA 377	*	*	*	9.5

# Red Sunflower Seed Weevil – PI 431542

- **Test-crosses with good yields (Onida, 2013)**

entry	lb/ac	% oil	ht (in)	% lodging
Exp-227 / RHA 464	2022	43.0	67	8
Exp-227 / RHA 468	1985	41.7	67	17
Exp-231 / RHA 464	1944	43.1	63	27
Croplan 3080	1445	39.6	57	35
Pioneer 63ME80	1789	40.2	70	32
Syngenta 3733 NS/DM	1158	38.4	54	52
<b>TRIAL MEAN</b>	<b>1648</b>	<b>40.0</b>	<b>60</b>	<b>28</b>

# Conclusions, Future Directions – Moths

- **Sunflower moth**
  - Glandular trichome characterization, mapping
  - Pericarp work ongoing with PI 170415
  - Confection work in NE via Specialty Crops
  - Planning preliminary work on plant attraction
- **Banded sunflower moth**
  - Evaluation of public inbreds still underway
  - Potential to start mechanism-specific work

# **Conclusions, Future Directions – Weevils**

- **Sunflower stem weevil**
  - **Stem size confounding factor in previous work**
  - **Potential resistance in PI or interspecific sources**
  
- **Red sunflower seed weevil**
  - **Resistance consistent, not understood**
  - **Ongoing work on plant volatiles**
  - **Potential germplasm release in 2014**