Update on Host Plant Resistance Studies of Sunflower Moth and Banded Sunflower Moth

Anitha Chirumamilla[1], Larry Charlet[2], Brent Hulke[2], Janet Knodel[1],& Rob Aiken[3]

[1]North Dakota State University
[2]ARS-USDA, NCSL
[3] KSU Northwest Res & Ext Center

Research Objectives

- Screen various sunflower accessions and new crosses for resistance to banded sunflower moth and sunflower moth
- Determine the mechanisms of resistance such as *antixenosis, antibiosis*, and *tolerance*
- Determine the plant factors (physical and chemical) contributing for antixenosis and antibiosis

Screening for Resistance Mechanisms-2008

- Research plots were established at Prosper, ND
- 4 resistant accessions- *PI 170415*, *PI 170386*, PI 431542 and Res 834-1 were evaluated with PAR 1673-2 and Hybrid 894 as checks
- Experimental design- Randomized Block Design with 3 replications

(Cont….)

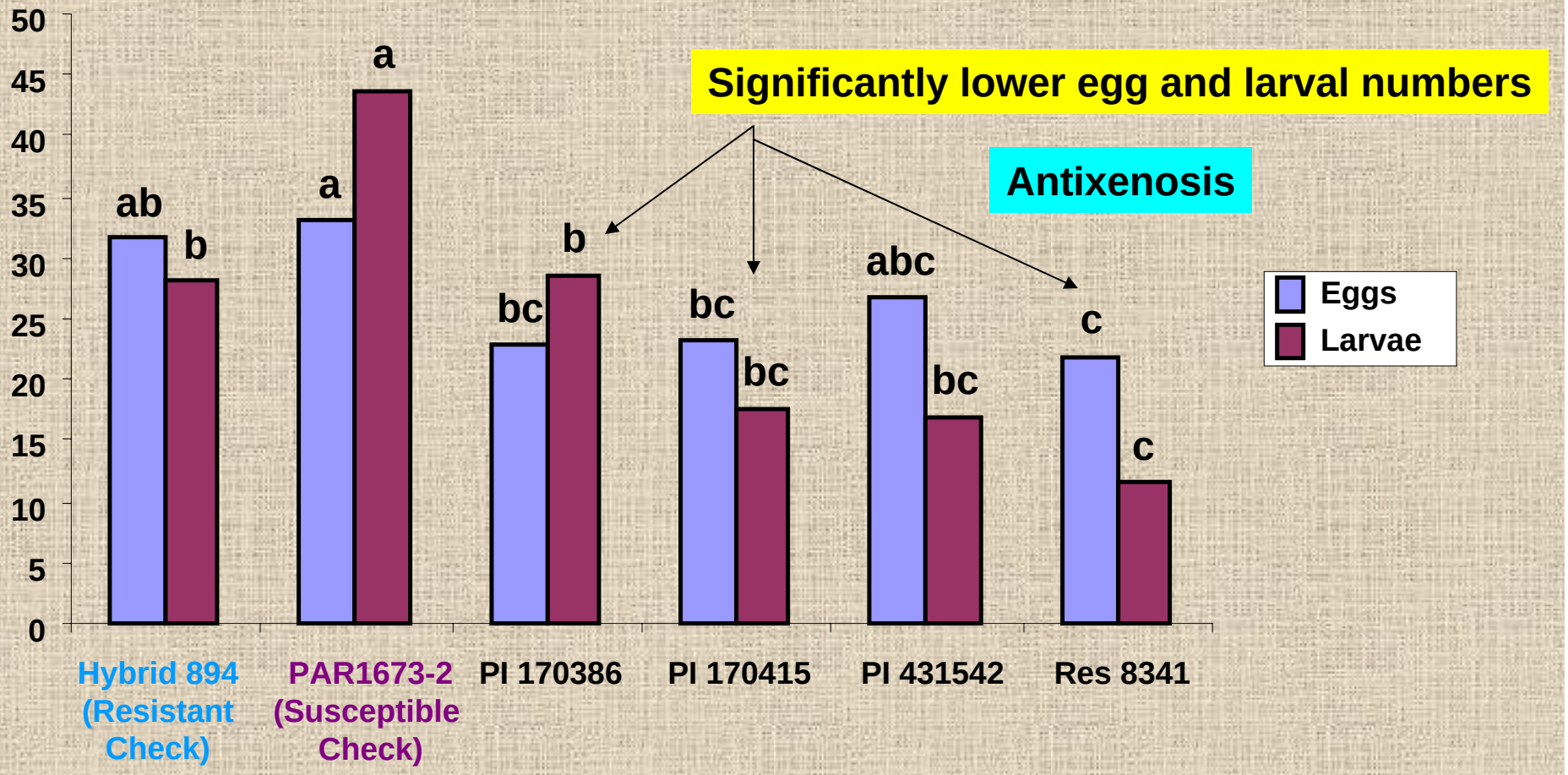
- At R3-R4 stage number of eggs were counted on outer whorl of bracts using a head-mounted 3.5X magnifier (4 heads per row)

- Individual heads were color coded and bagged at R6 stage

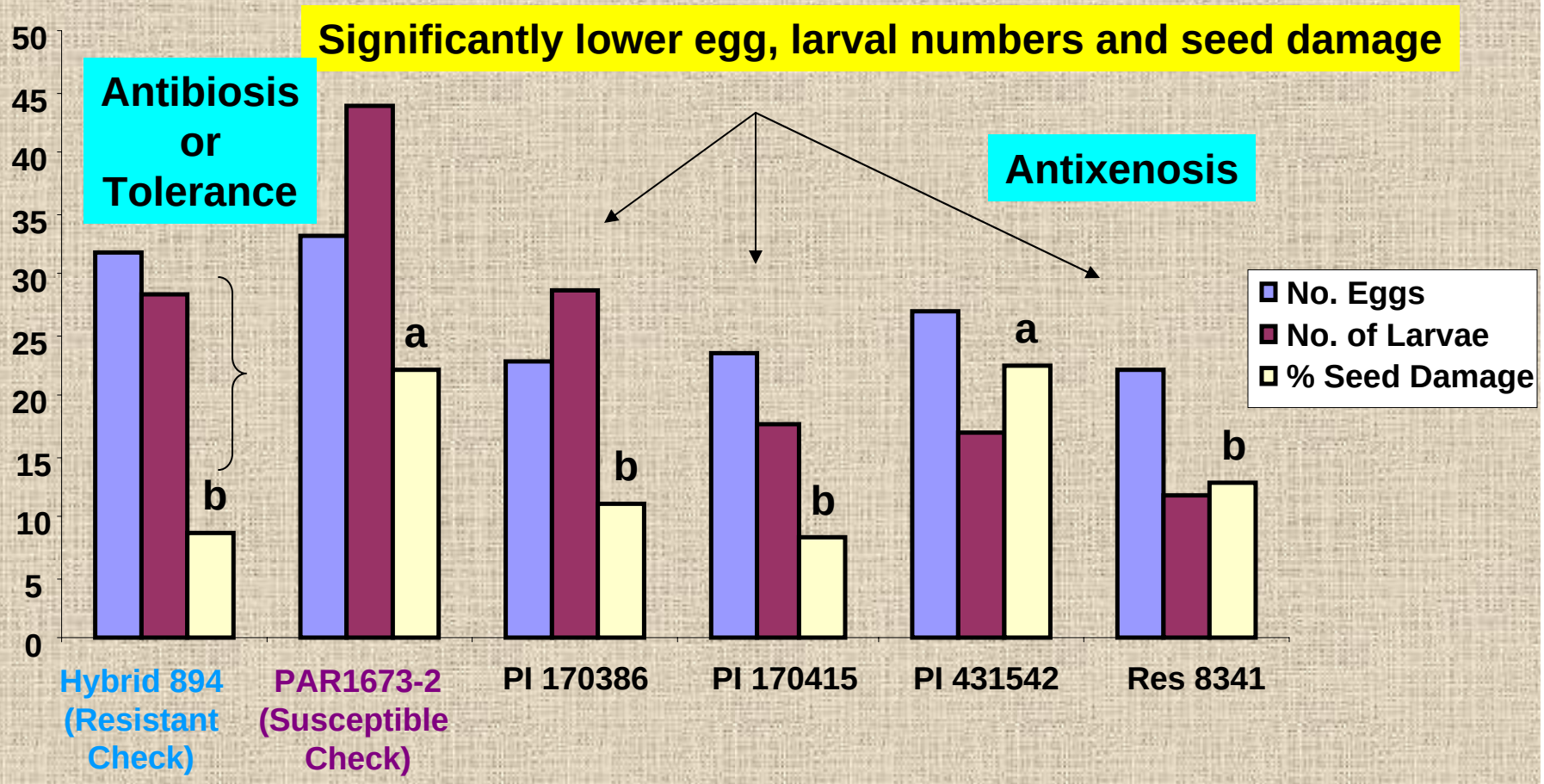
(Cont..)

- Bagged heads were harvested (1-2 October) and taken to Fargo for evaluation
- Each head was evaluated for total number of larvae, damaged seed, and total number of seed
- A minimum of 30 larvae from each head were dissected for the presence and absence of parasites

Mechanisms of resistance for banded sunflower moth Prosper- 2009



Mechanisms of resistance for banded sunflower moth Prosper- 2009



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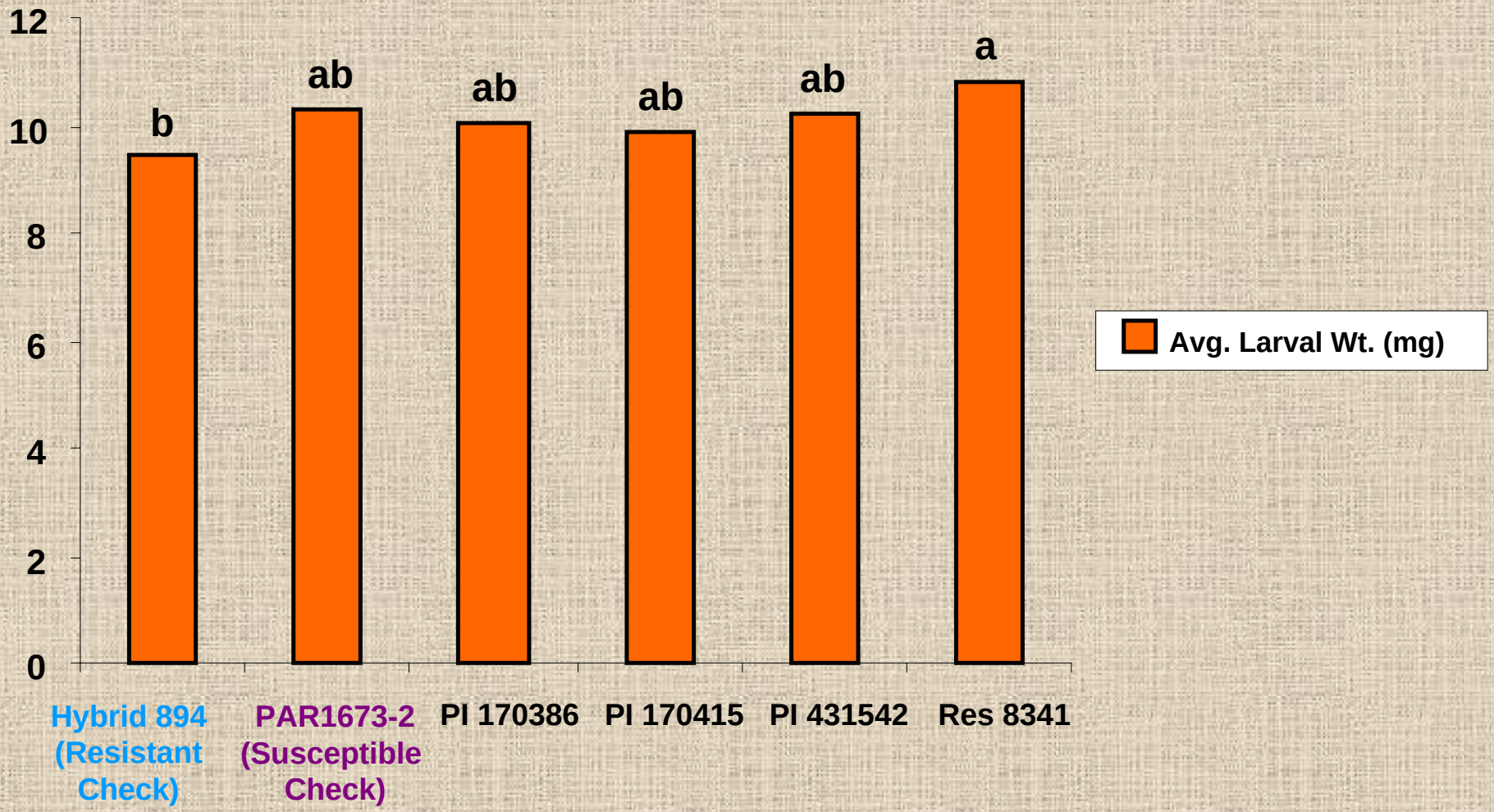


Mechanisms of resistance for banded sunflower moth Prosper- 2009

Sunflower bract hairiness *Vs* Egg laying preference of banded sunflower moth

Larvae in rearing rooms

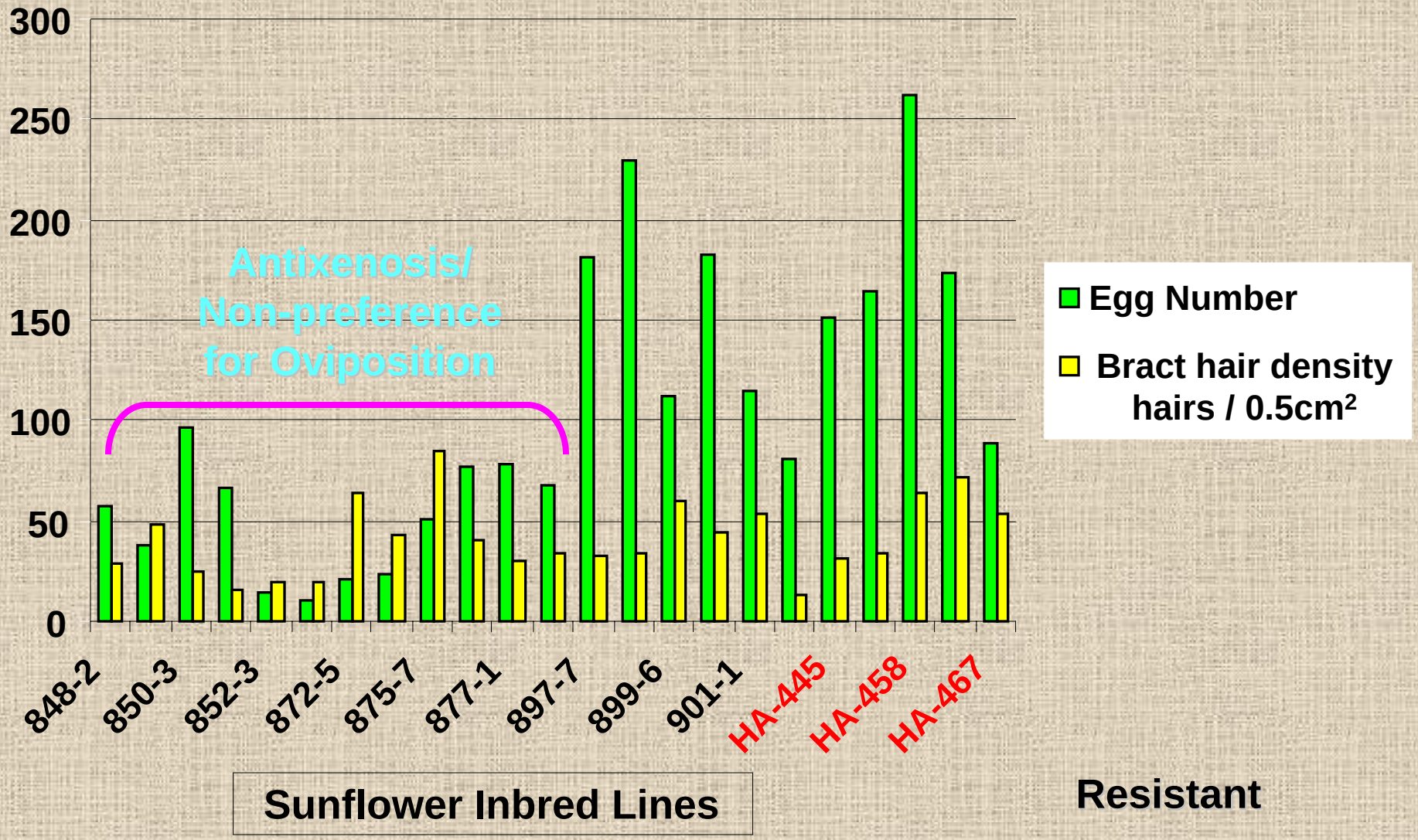
Tested lines in Greenhouse

Cage studies with sunflower heads and adult moths

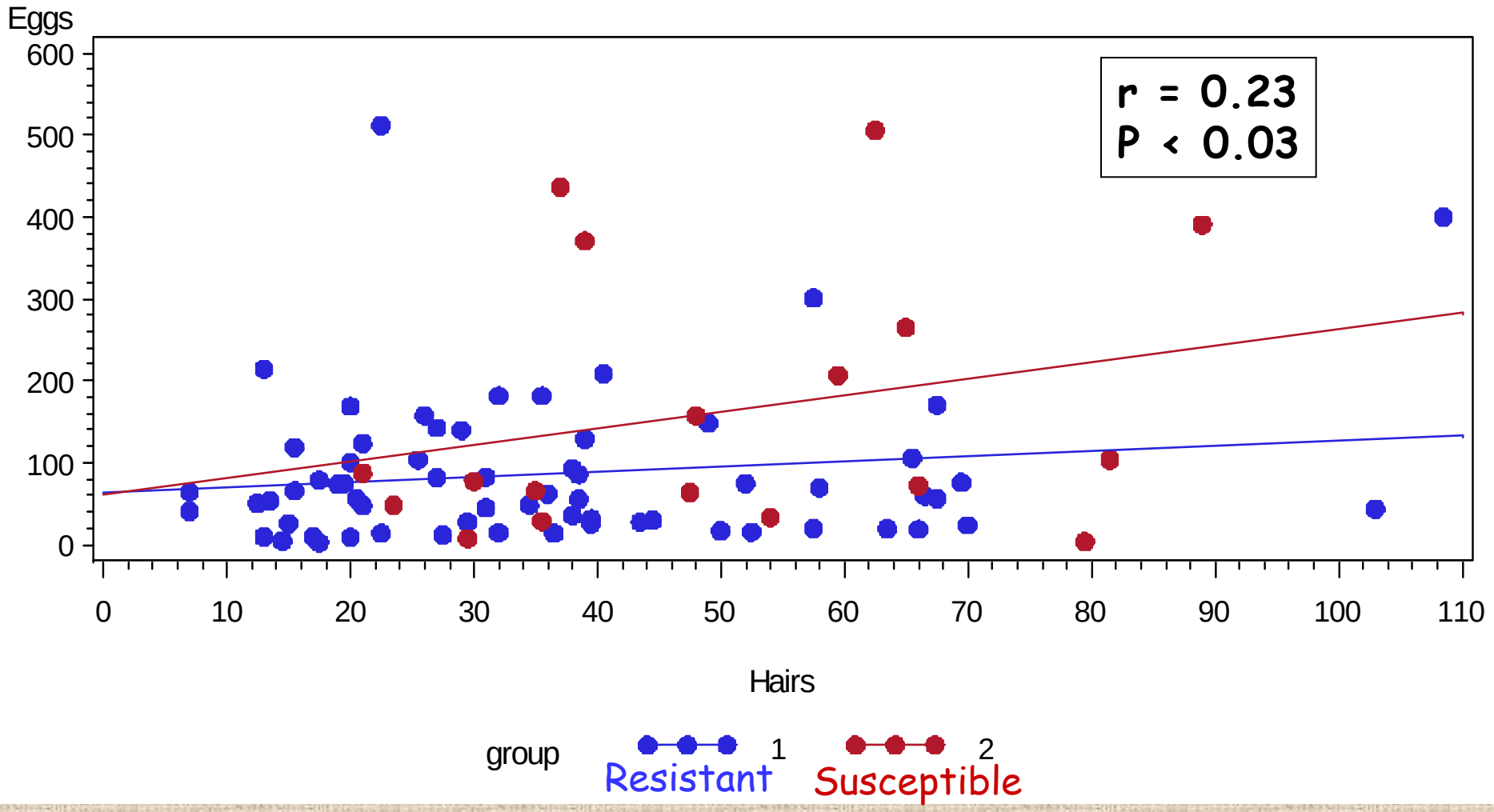
Procedures

- ✓Approximately 20,000 banded sunflower moth larvae were collected from mature sunflower heads in 2008
- ✓Adult moths were reared in rearing chambers
- ✓Resistant and susceptible sunflower lines were grown in greenhouse in spring 2009
- ✓4 sunflower heads (R3) were offered to freshly emerged female moths and male moths (15 female and 10 male) randomly in a 2x2 ft cage
- ✓Heads removed after 5 days and counted for eggs and bracts from the same heads are used to count the hair density in 0.5 cm^2

Resistance Mechanisms for BSM-Greenhouse Study 2009
Effect of Bract hair density on BSM oviposition



BSM Oviposition *vs.* Bract Hair Density Correlation



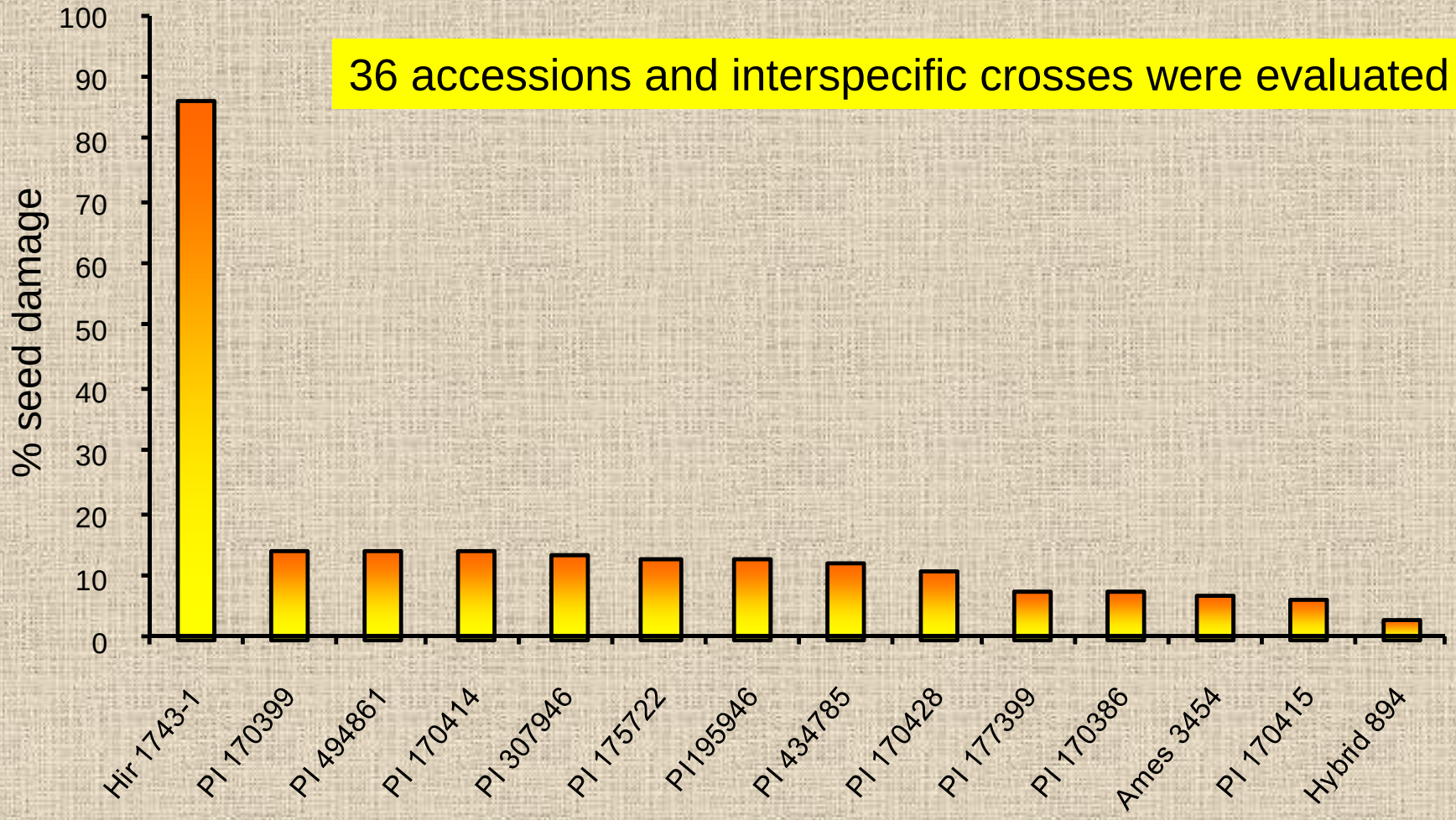
Screening for Sunflower moth Resistance-2008




- **Plots were established at Northwest Research Extension Center, Kansas State University, Colby, Kansas**
- **Evaluated 36 accessions, 25 S1s, and 43 new crosses with Hybrid-894, Str 1622-2 and Hir 1734 as checks**
- **5 heads from each row were harvested and shipped to Fargo for evaluation**

Screening for Sunflower moth Resistance-2008

36 accessions and interspecific crosses were evaluated



Screening for Sunflower moth Resistance-2008

S1's

- 25 S1's were evaluated along with checks
- Seed damage ranged from 1.2% to 84.4
- 8 S1s had lower than 15% seed damage

$F_{2:3}$

- 43 new crosses were tested along with checks
- Seed damage ranged from 1% to 53%
- 24 crosses showed less than 15% seed damage

Head Moth Damage with Bird Damage -2008

Summary and Future Research

- Results of 2008 sunflower head moth study were not satisfactory because of heavy bird damage
- Promising germplasm has been identified for both the insects and some of these are used in new crosses whose $F_{3:4}$ generation crosses were evaluated in 2009
- $F_{4:5}$ generation will be tested as 1st generation hybrids in 2010
- Screening of sunflower germplasm (new and retested) for resistance to banded sunflower moth and sunflower head moth was continued in 2009 and 2010

Summary and Future Research

- It appears that the physical factor of sunflower bract hairiness plays an important role in banded sunflower moths preference for laying eggs
- Greenhouse study to determine the effect of bract hair density on oviposition preference of banded sunflower moth will be repeated in spring 2010
- Studies for determining the mechanisms of resistance will be continued

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