Impact of SCN Resistance on Nematode Reproduction and Yield

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Overview

- SCN Regional Tests
  - Impact of resistance on yield.
- *Rhg1* allelic variation
  - Variation for *Rhg1* copy number and type.
  - Impact of this variation on resistance.
- *Rhg1* variation in

SCN Northern Regional Tests Value of Resistance

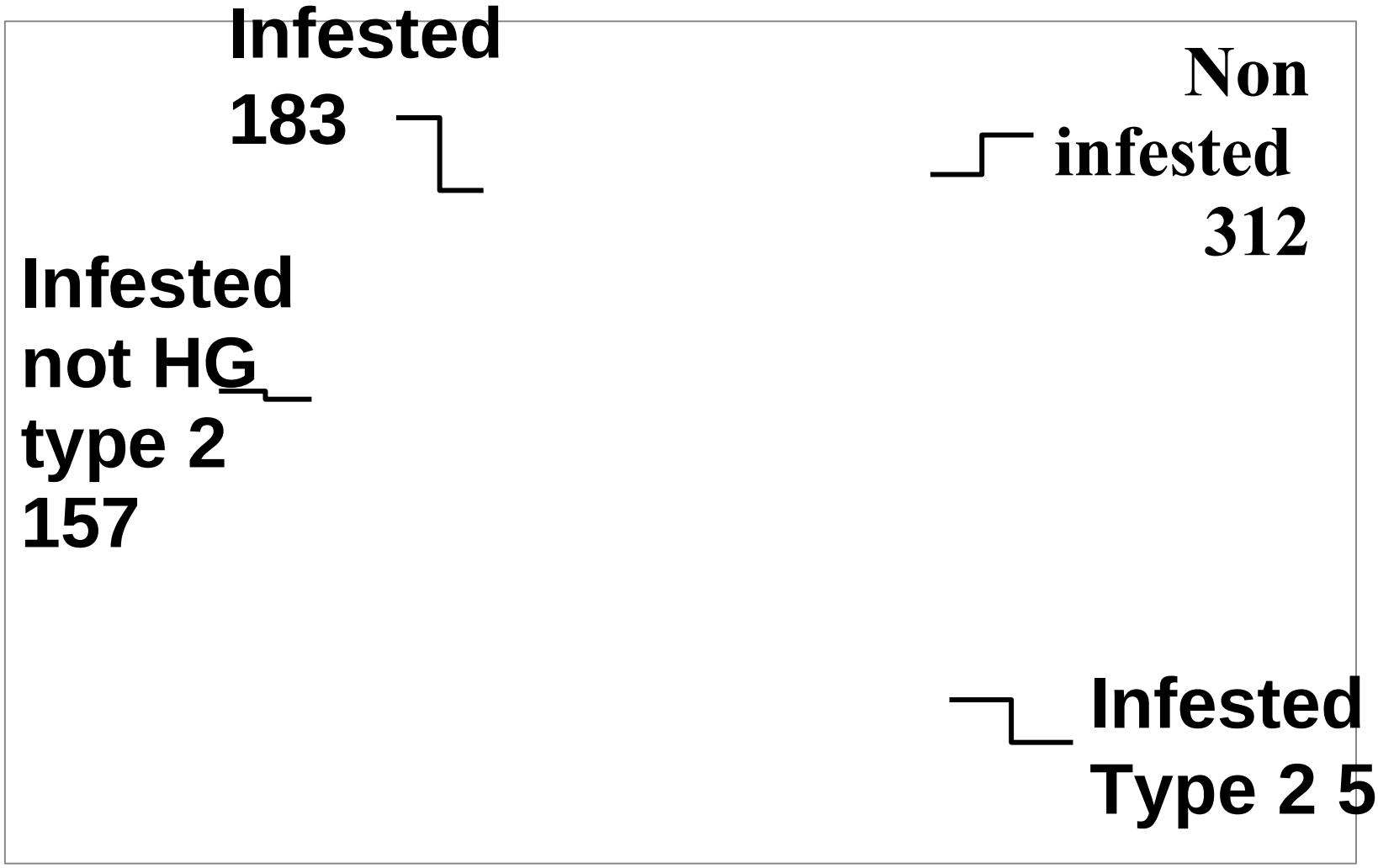
- Keith Rincker organized data from the tests from 2004 to 2014.
- Test coordinated by Troy Cary with funding from USB.
- MG 00-IV lines tested across environments for agronomic traits.
  - SCN resistance HG type 0 and 2.5.7.
  - Sources of resistance.
- Includes SCN data from soil at field

SCN Northern Regional Tests Value of Resistance

- Fit regression models to answer questions related to SCN resistance.
  - Is there evidence of yield drag associated with resistance?
  - At what SCN infestation levels does resistance provide a yield advantage?
  - Is there evidence of a benef t for PI 437654 or Peking resistance over PI 88788 resistance?

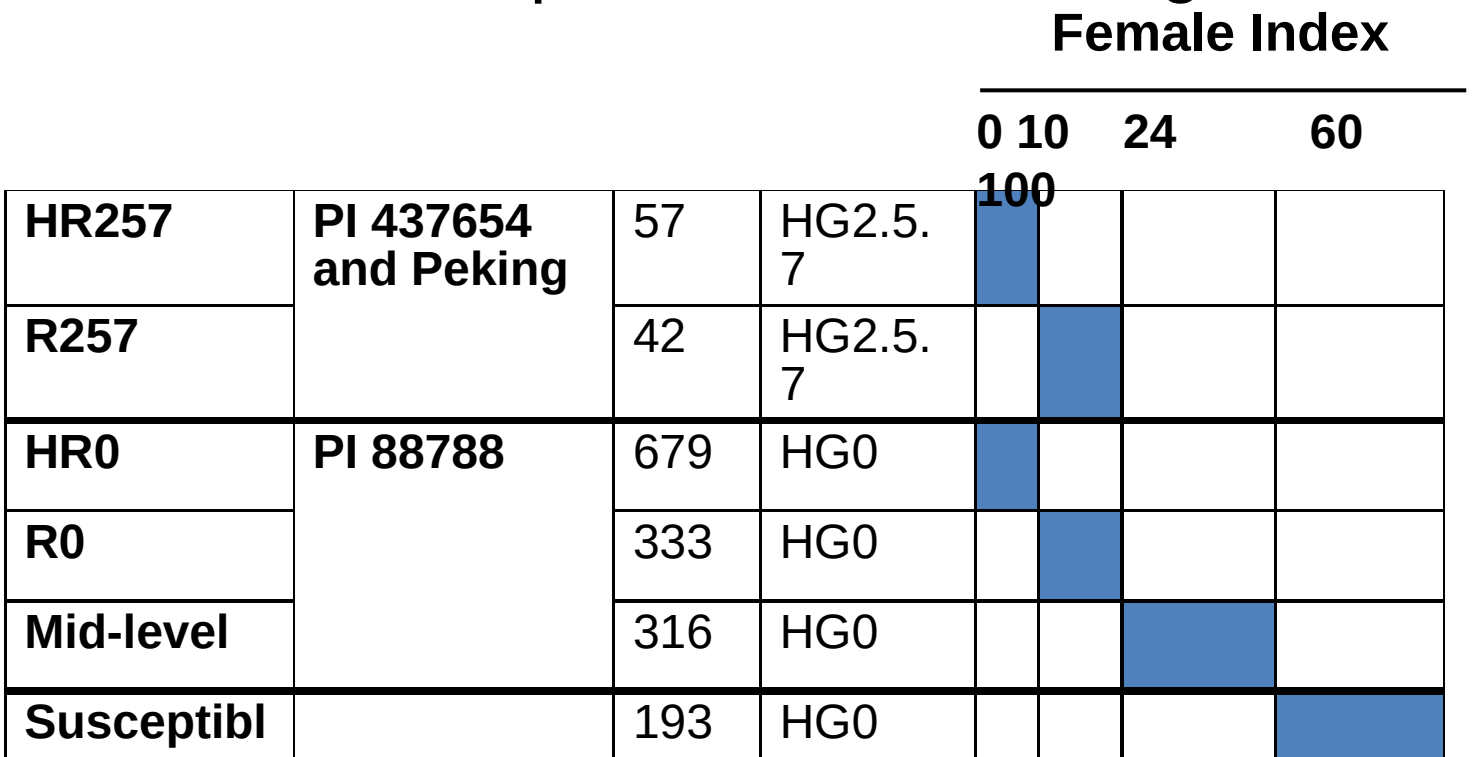
Number of Environment-Test Combinations (Total 1,247) by MG (408 Environments)

Infestation of Environment-Test Combinations



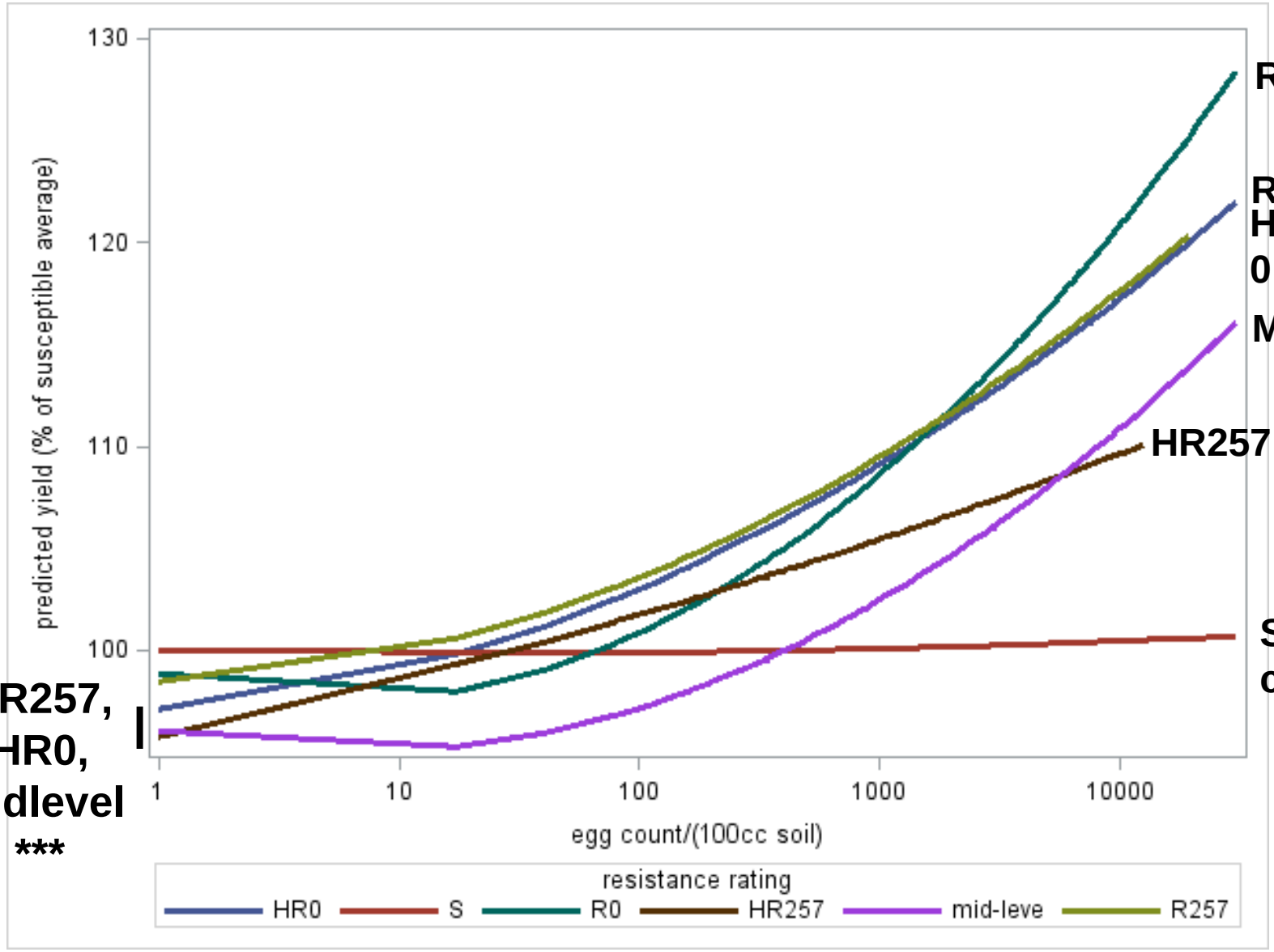
Resistance of Genotypes

- The 1,620 genotypes in tests were were greenhouse evaluated with HG type 0 and 2.5.7 isolates.
- The information from the two isolates were combined to develop a resistance rating.

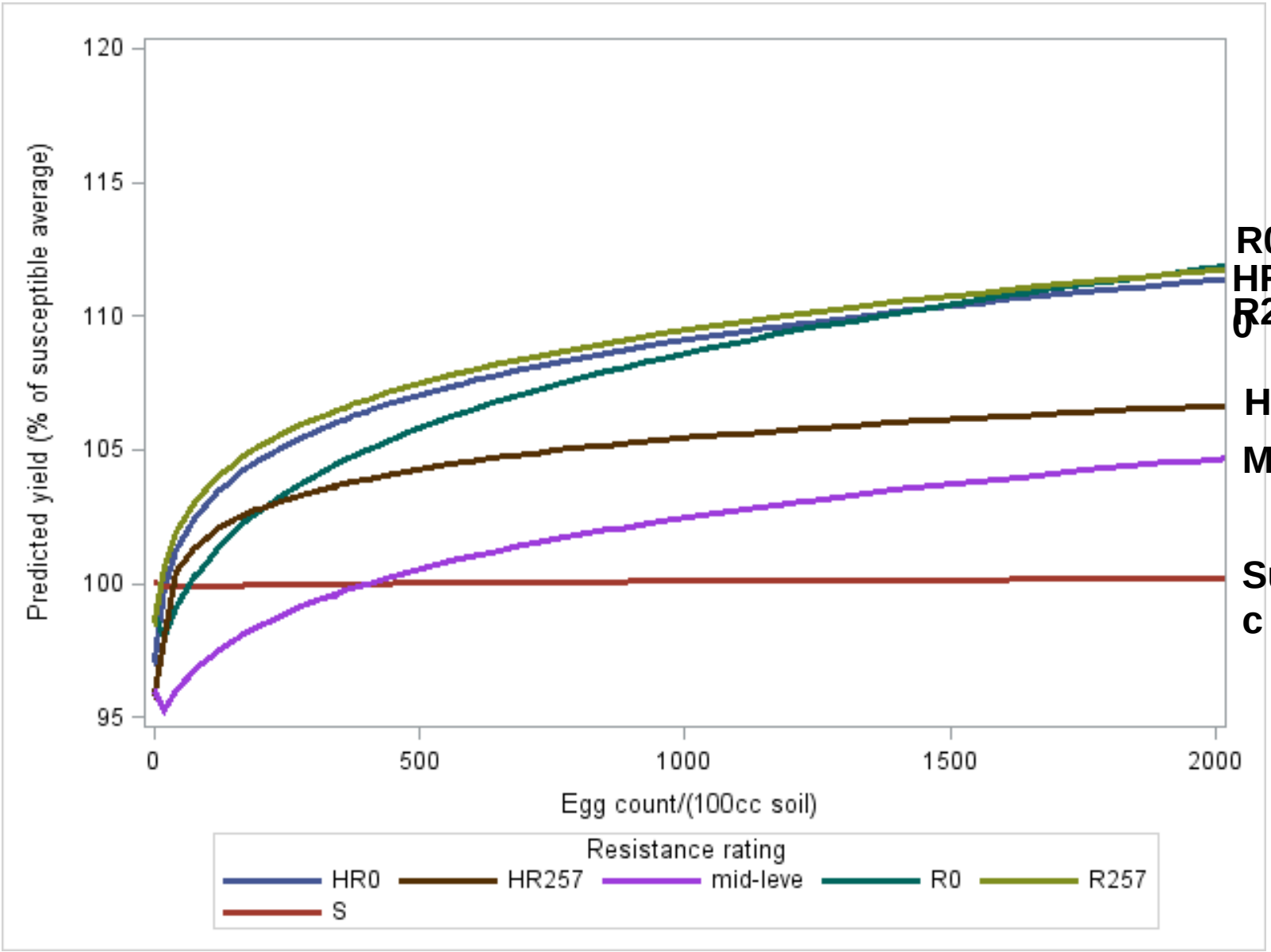


HR257	**PI 437654 and Peking**	57	HG2.5.7				
R257		42	HG2.5.7				
HR0	**PI 88788**	679	HG0				
R0		333	HG0				
Mid-level		316	HG0				
Susceptibl		193	HG0				

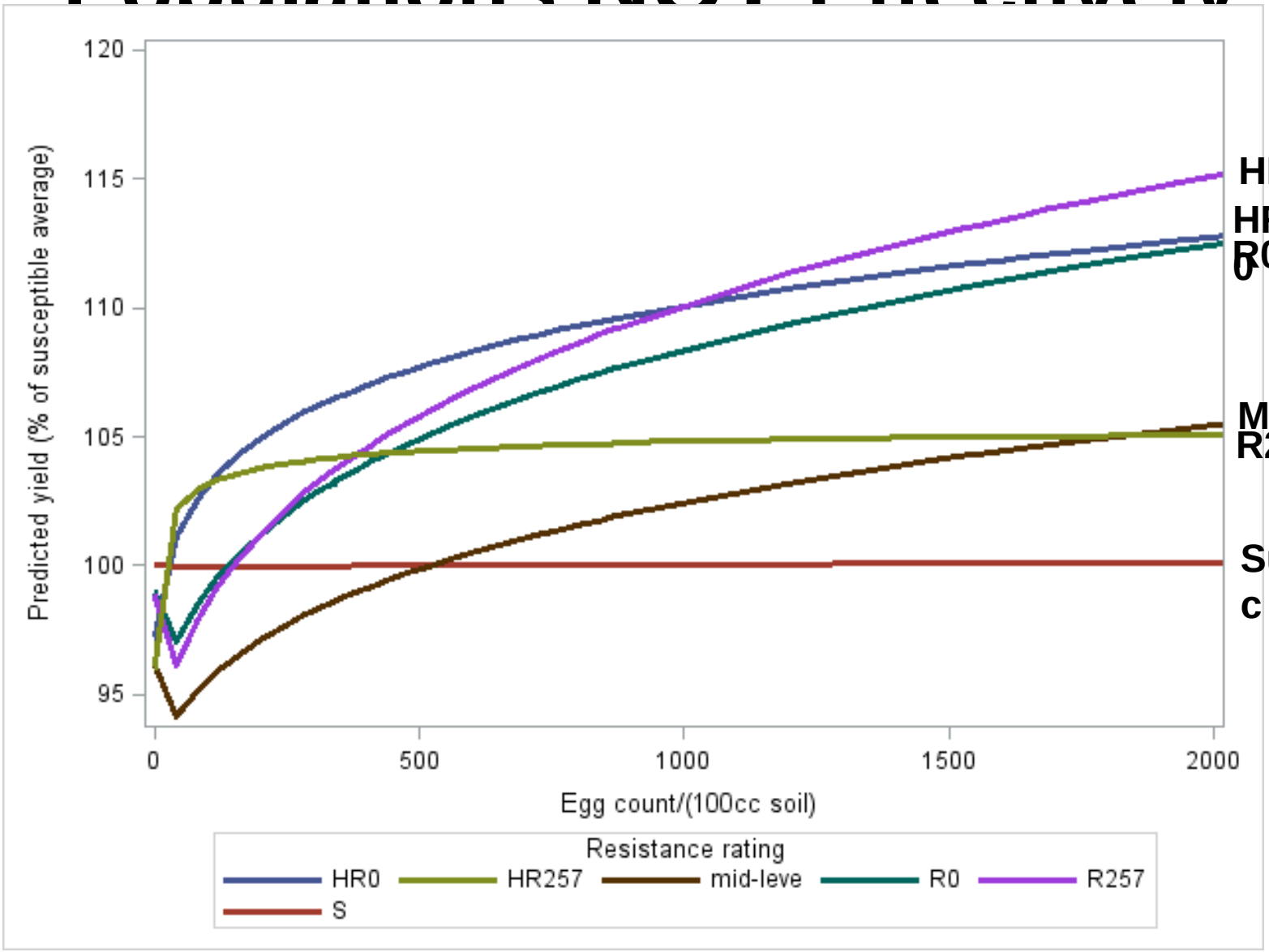
Yield Relative to Susceptible



All Tests and Genotypes



Only Tests with Field Populations NOT Effectively



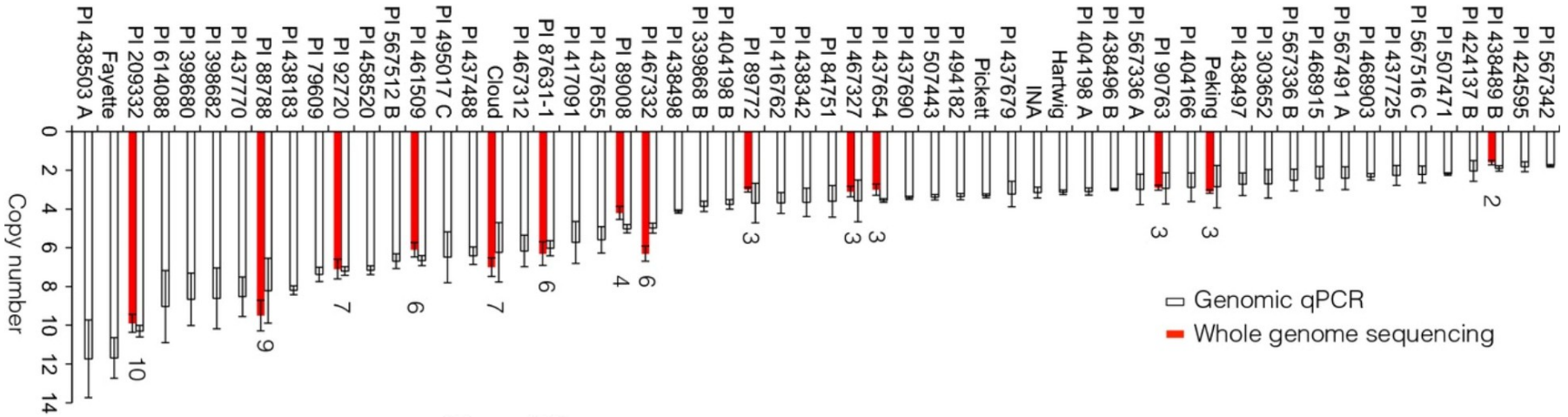
Impact of Resistance on Yield Conclusions

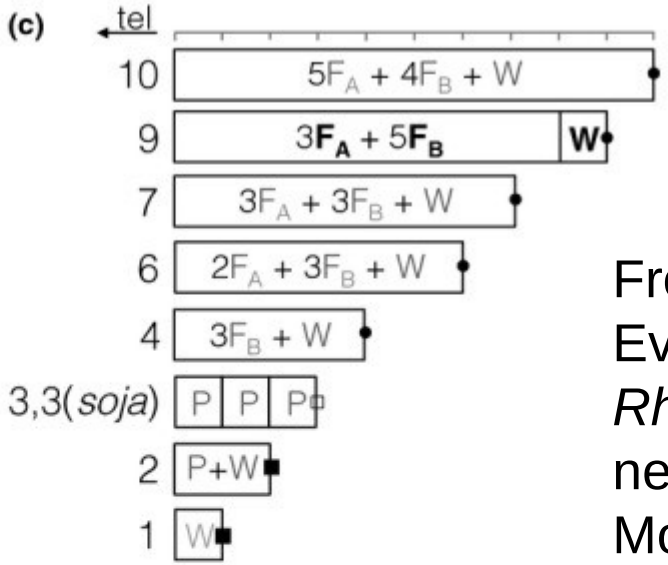
- PI88788 resistance gave yield protection greater or similar to PI 437654 resistance across environments.
- Resistant entries outperformed susceptible entries starting at low infestation levels.
- Locations with FI>20 on PI88788, genotypes with high resistance from PI 437654 resistance had the greatest yield.

Rhg1 Resistance

- *Rhg1* is a complex locus containing tandem repeats of a 31.2 kb unit (Cook et al., 2012).
- Four genes in the repeated unit.
  - Three shown to increase resistance when upregulated.
- One to ten repeats identified and there are three repeat subtypes based on SNPs within the interval.

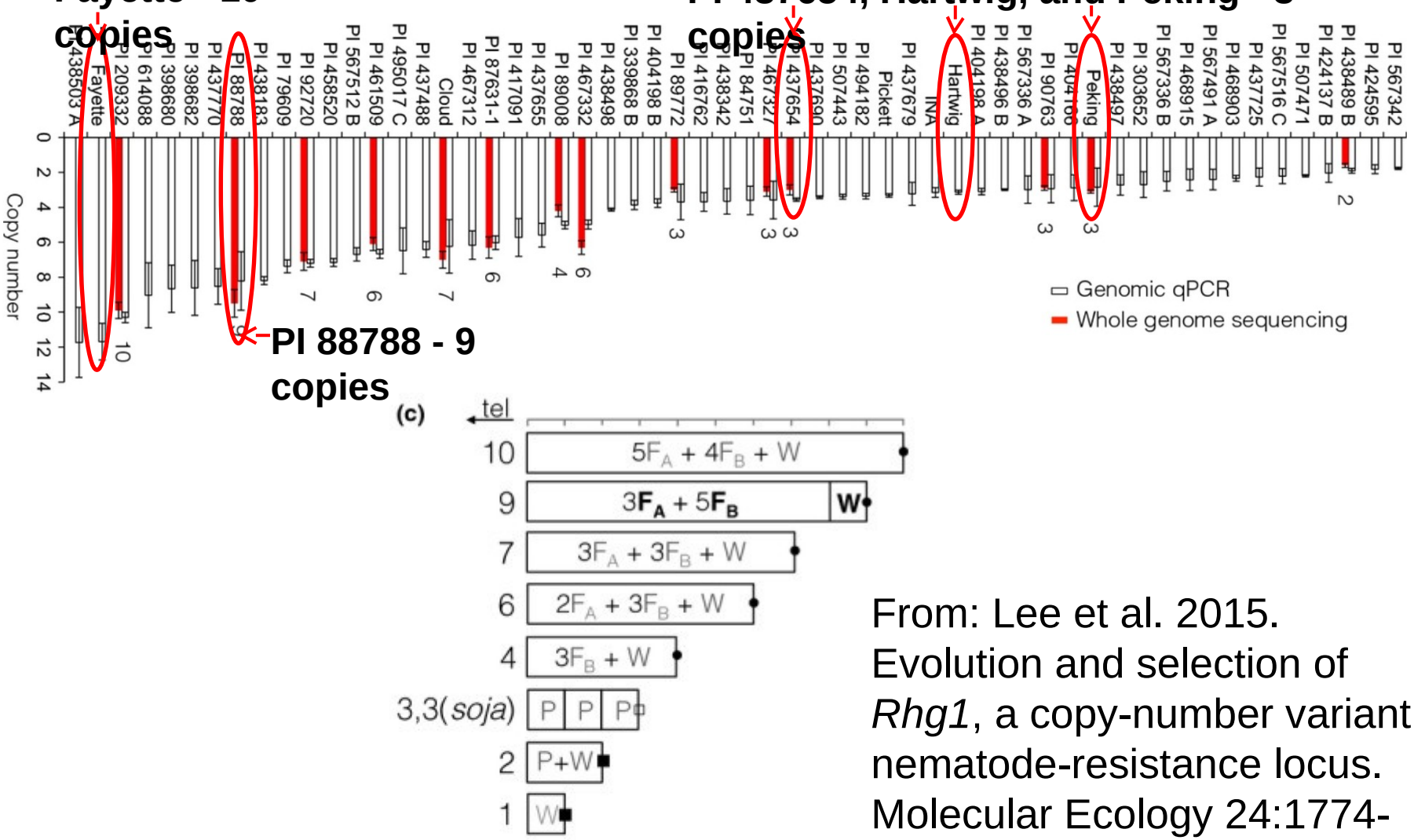
Copy Number for *Rhg1* is Continuous





From: Lee et al. 2015. Evolution and selection of *Rhg1*, a copy-number variant nematode-resistance locus. Molecular Ecology 24:1774-1991

Copy Number for *Rhg1* is Continuous



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Impact of Copy Number and Type

Neil Yu

- What is the importance of *Rhg1* copy number vs. type in conferring resistance?
- Brucker et al. (TAG 111:44-49) previously showed *Rhg1* from PI 88788 (9F+W and PI 437654 (3P) had significantly different impact on resistance.
- Differences caused by copy number or type?
- Tested populations from crosses from sources with different copy number and

Experiment 1

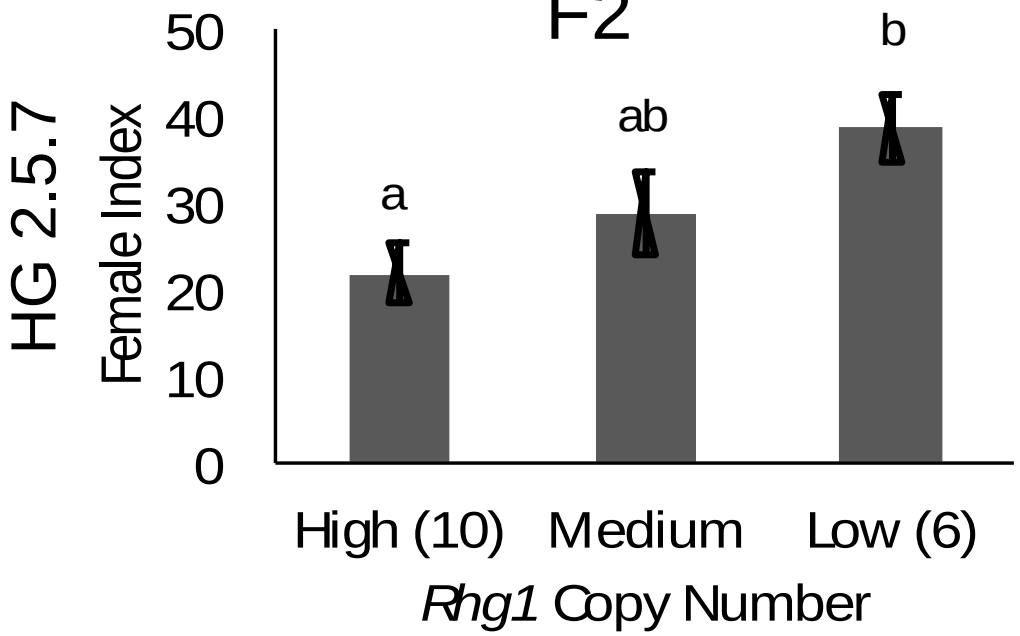
Fayette
10 copy F+W

X

Pl 87631-1
6 copy F+W

F1

F2



Experiment 2

LD00-2817
3 copy P, *Rhg4*

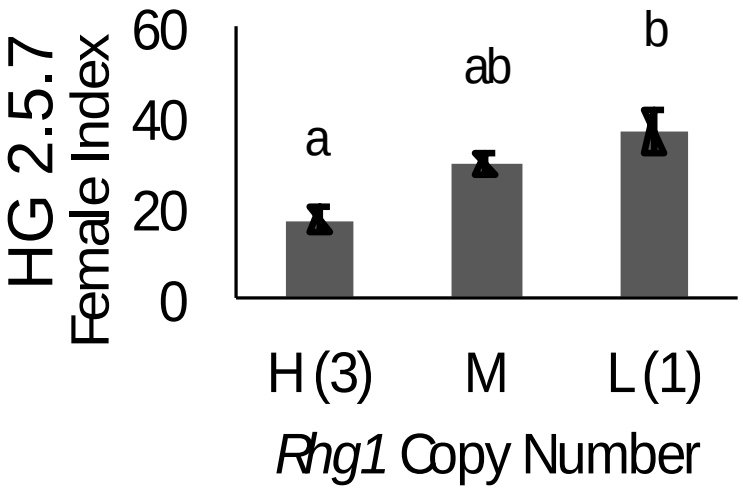
X

PI 567421
1 copy P, *rhg4*

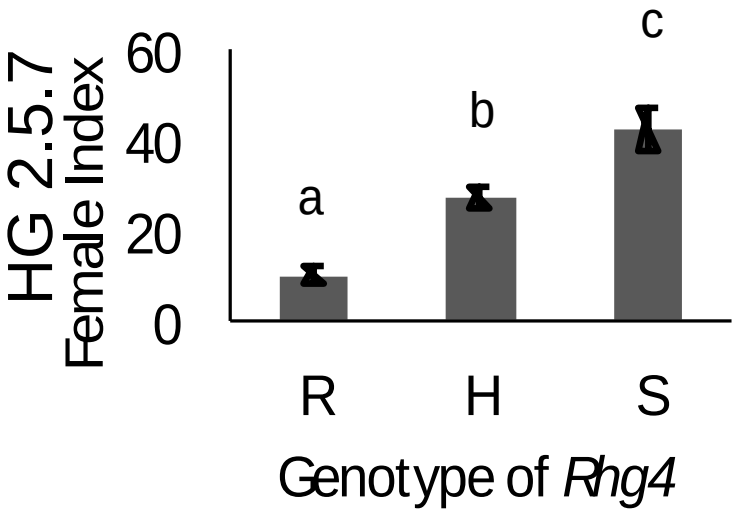
F1

F2

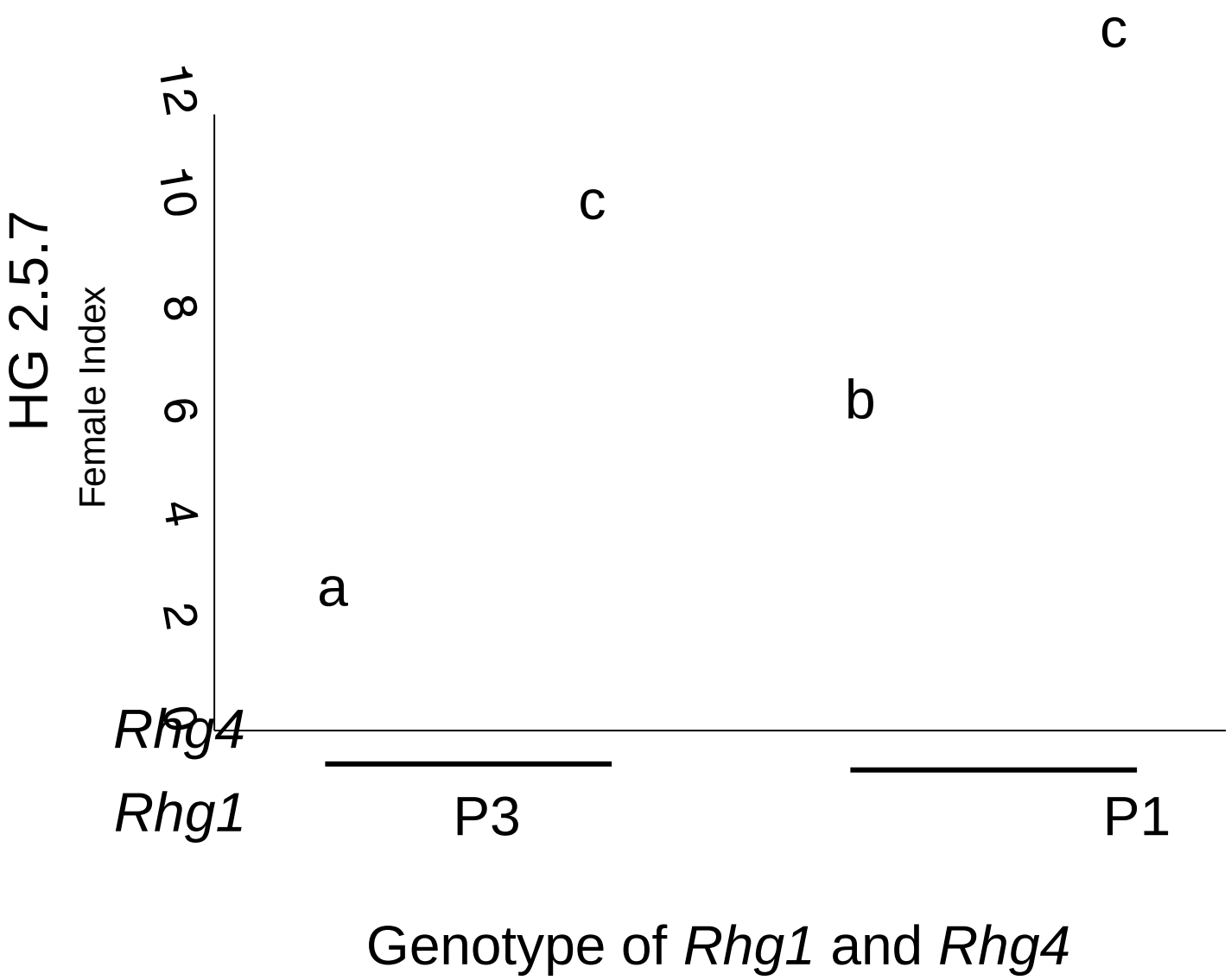
A



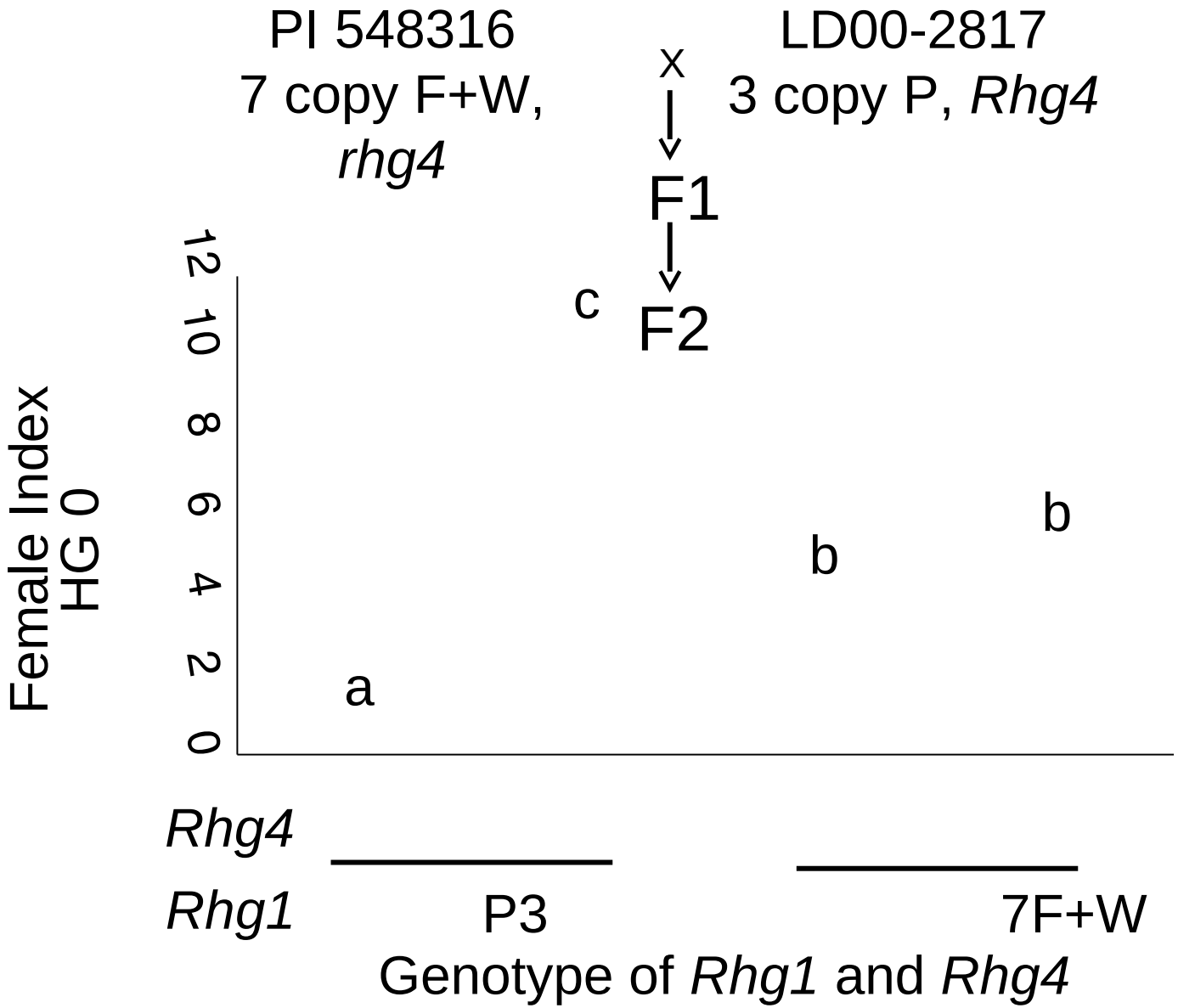
B



Experiment 2



Experiment 3



Copy Number and Type

- Within a copy type, increase in the number of repeats is associated with greater resistance.
- Copy type impacts resistance.
  - Peking type interacts with *Rhg4* but the Fayette+Williams type does not.
- Can genotypes with greater copy number be identified?

Acknowledgments

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  - United Soybean Board.
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