Identifying Flower Characteristics for the Production of Hybrid Winter Wheat (*Triticum aestivum* L.) Seed in Nebraska Germplasm

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Introduction

- Wheat ranks third for global crop production (FAOSTAT, 2015) but genetic gains have been slow.
- Hybrid wheat offers an answer to improving grain yields.
- But how can we overcome the obstacles which plagued hybrid wheat in the past? We need to find traits that improve cross pollination success.
- Our objective was to identify germplasm which exhibited high anther extrusion which is a visual measure of anthers being exerted from the floret (see Figure 1).

Materials and Methods

Visual Evaluation

- Ratings were taken on a 1 to 9 scale with 1 being no anthers extruded and 9 being many anthers extruded (anthers covering the wheat spike).
- Ratings were taken on 290 genotypes encompassing 4 experiments in 2014 and 2015.
  - Some genotypes were replicated more than others.
- All experiments were alpha lattice designs.
- Analysis was done in R using the Agricolae package.

Production Evaluation

- A 25x25 diallel experiment was created consisting of 13 Nebraska and 12 Texas lines.
- Female parents were emasculated with the chemical hybridizing agent (CHA) Croisor® 100.
- Visual ratings were taken for anther extrusion, floral gape, and phytotoxicity due to CHA application.
- Female plots were harvested.
- Data analyzed using R.

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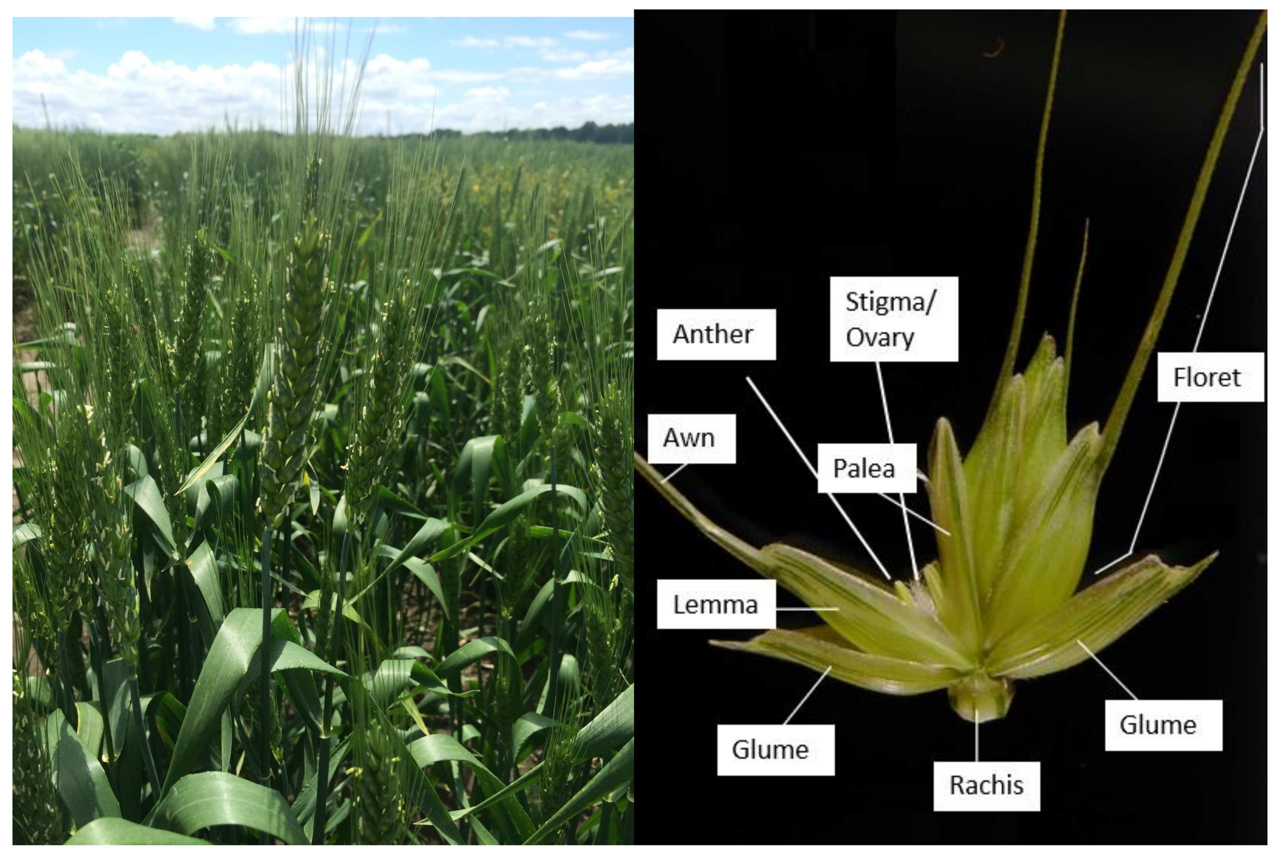
Figure 1. A field example of high anther extrusion and a diagram of a wheat flower



http://www.castonline.ilstu.edu/ksmick/150/150lablink.htm

Visual Evaluation

Figure 2. Shows the distribution of genotypes based on the means for anther extrusion. The green bar represents the top 5% of genotypes.

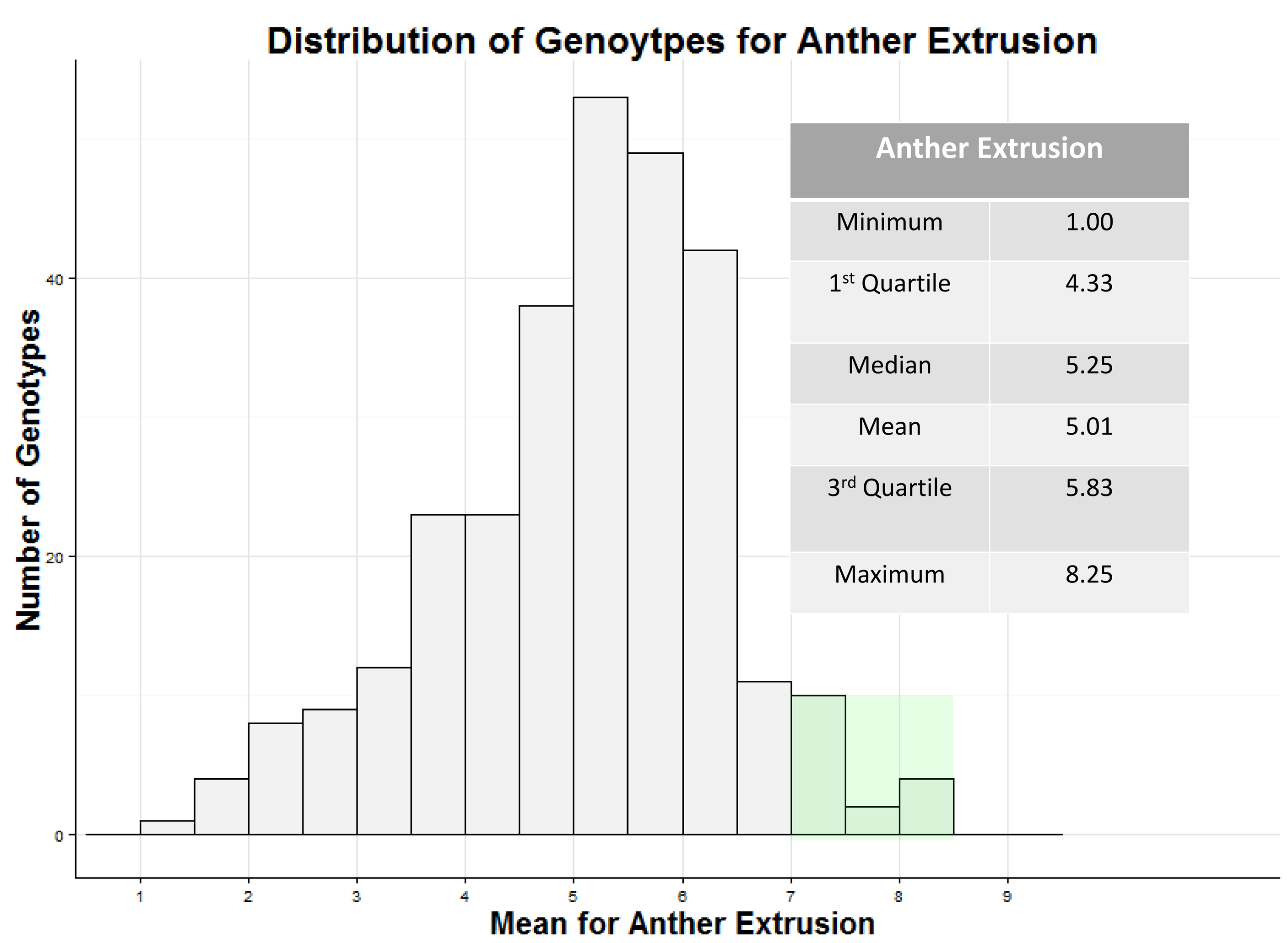
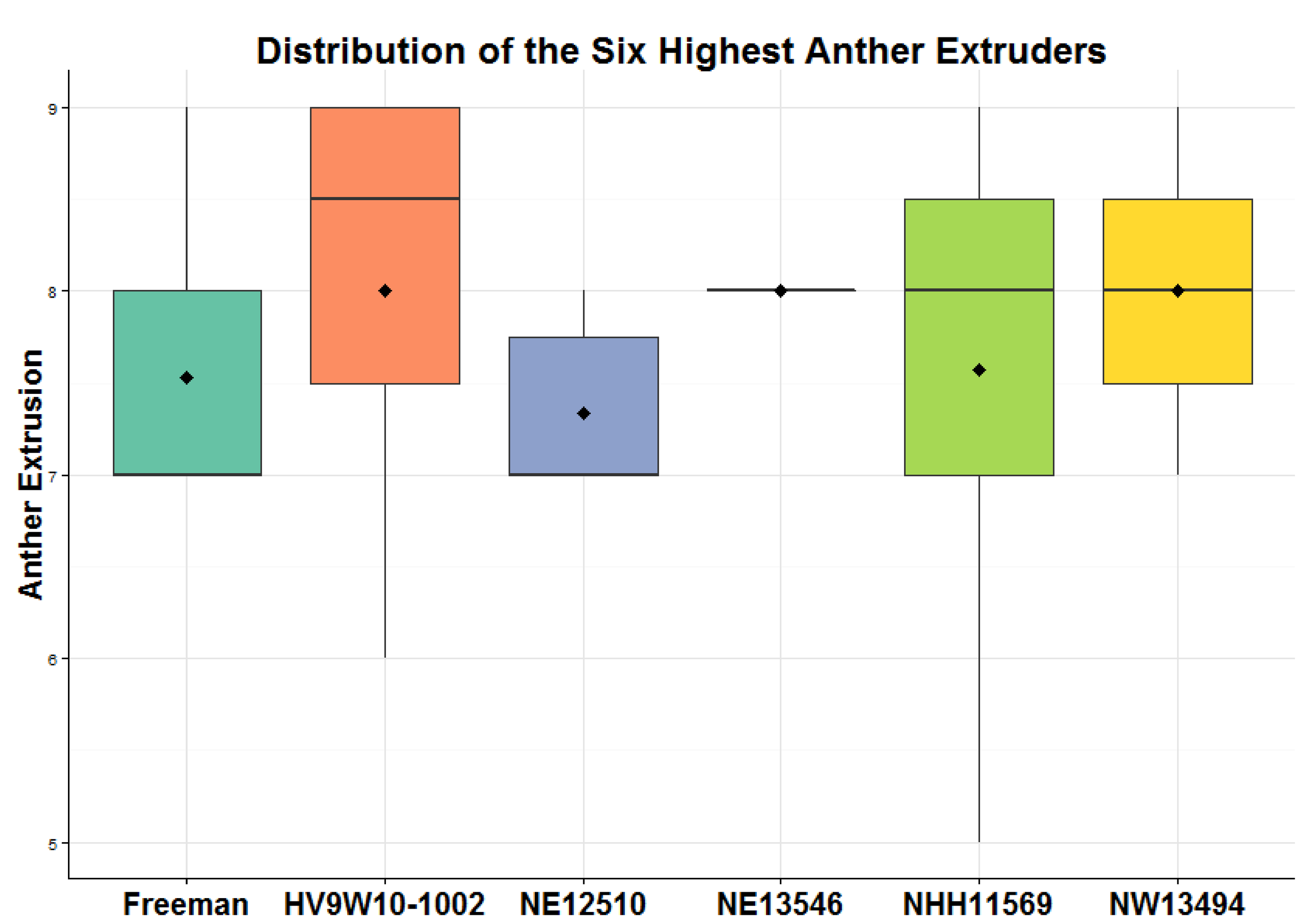


Figure 3. Illustrates that the six best genotypes differed over replicates and that environment has an effect on anther extrusion. The number of replicates ranged from 3 to 20 in these genotypes.



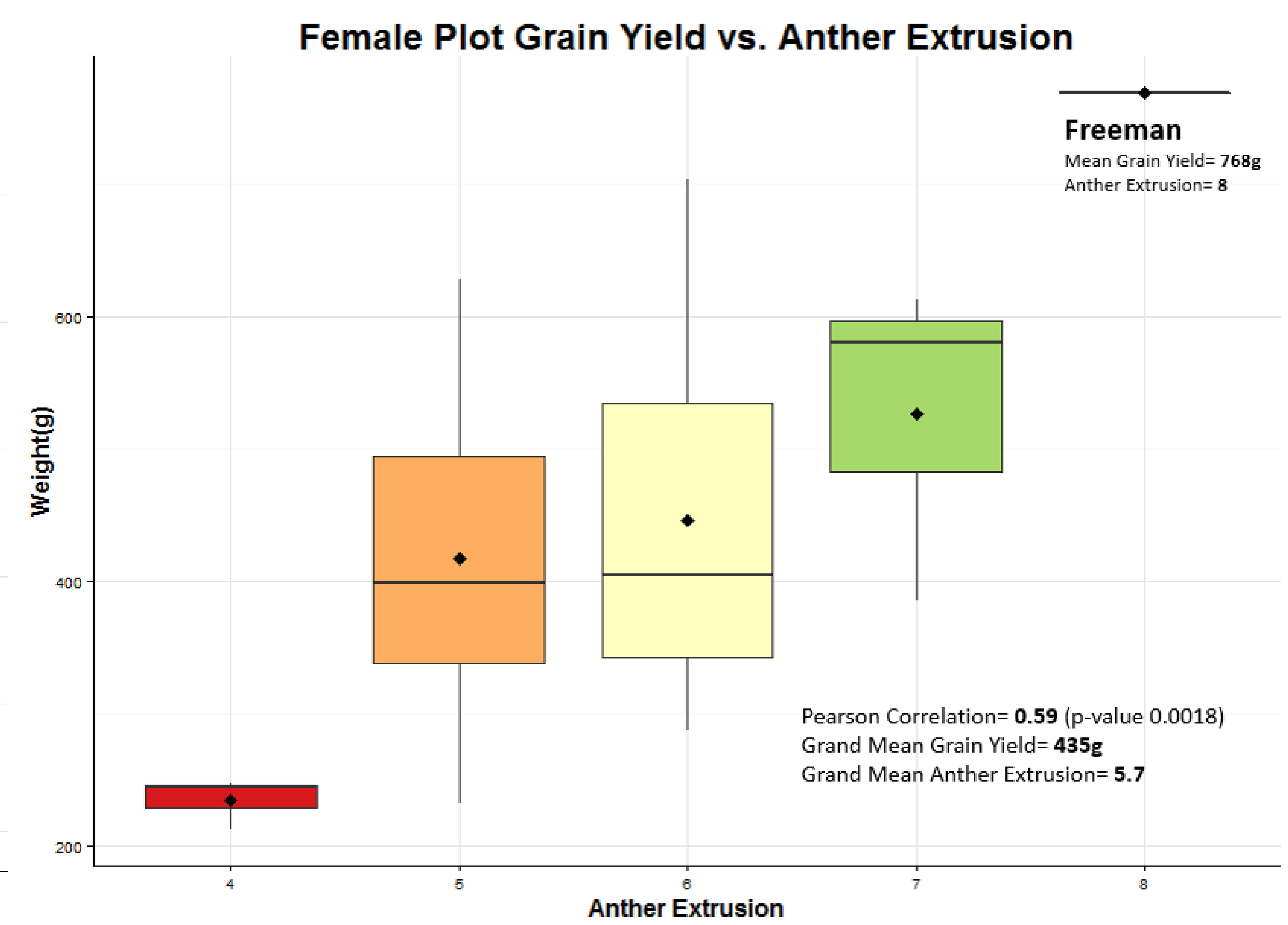
Results:

- Genotypes differed significantly in all experiments for anther extrusion.
- On average, we were able to detect a 1.5 difference for anther extrusion between genotypes.

Key Finding: Genetic differences for anther extrusion exist. Freeman and Camelot were the consistent high and low performers having adjusted means of 7.8 SE 0.8 and 1.1 SE 0.8 respectively in 2014.

Production Evaluation

Figure 4. Illustrates the relationship between seed set and anther extrusion



Conclusion: The correlation between anther extrusion and grain yield shows that anther extrusion plays a key role in successful cross pollination but also that other factors need to be considered. Future work should look into anther size and weight, pollen travel distance, and pollen viability.

References:

Faostat Retrieved from http://faostat3.fao.org/browse/T/*/E

Illinois state university AGRO 150 principles of agronomy lab. (2015). Retrieved from http://www.castonline.ilstu.edu/ksmick/150/150lablink.htm