Summary & PowerPoint

The New Age of Wheat Research

Summary to follow.

Learning Objectives

Presenter
Aaron W. Harries

Presentation Time
Monday, February 25, 2019
1:30 pm - 2:05 pm

Session
Breakout 3

The New Age of Wheat Research

Aaron Harries
V.P. of Research and Operations
Kansas Wheat

Topics

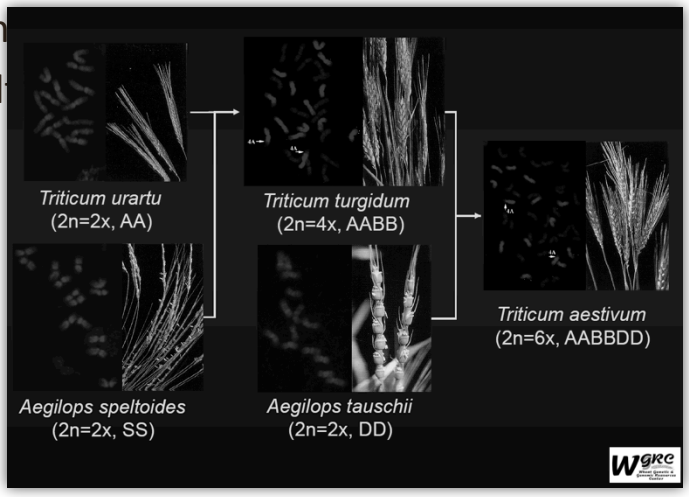
- The Complexity of Wheat
- Factors that Affect Wheat Quality
- The Birds and Bees of Wheat
- New Wheat Research Tools
- Imagine the Possibilities
- Questions

Kansas Wheat

- Established in 1957 when the Kansas Legislature approved the Kansas Wheat Act.
- KWC is a farmer funded entity. Funding comes from a 2 cents per bushel assessment at the first point of sale for all wheat sold in Kansas.
- Statutory mission of education, research and promotion.
- Promotes Kansas wheat through direct producer investment in:
  - Plant breeding: to improve wheat varietals yield, milling and baking quality
  - Increasing domestic consumption of wheat-based foods through educating consumers about the health benefits of eating more grain-based foods
  - Improving international utilization of Kansas produced wheat through farmer-funded market development offices worldwide.

Wheat Complexity

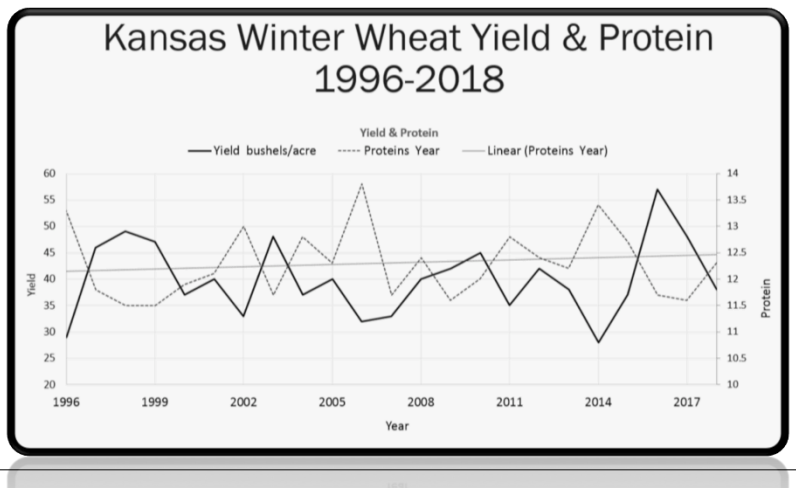
- Wh
- Cul

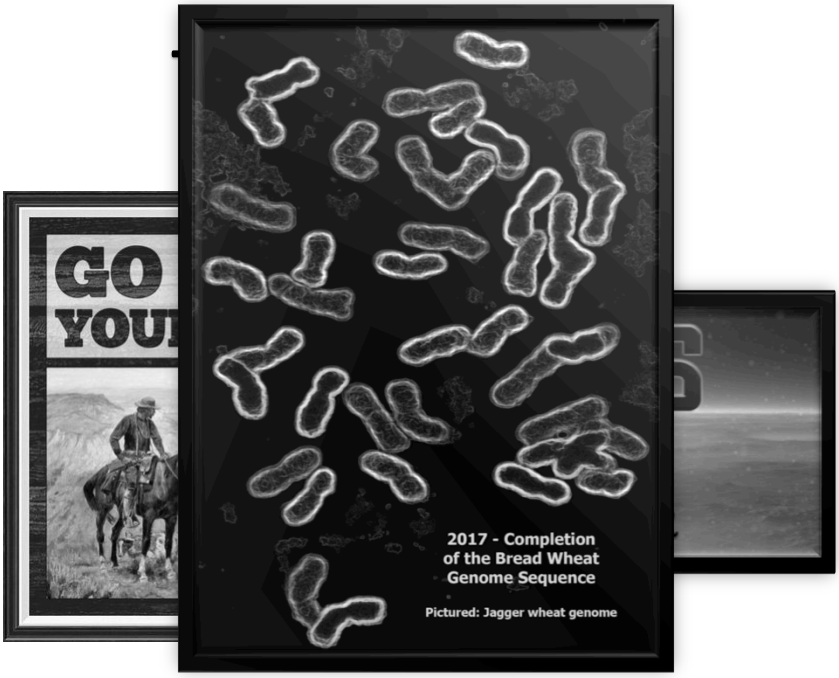


Wheat Complexity

- Size matters!
- The bread wheat genome is **5X larger** than the human genome.
- The human genome has 3 billion DNA letter. Bread wheat has **16 billion!**
- Hexaploid = 6 sets of 7 chromosomes
- One chromosome is larger than the entire soybean genome.

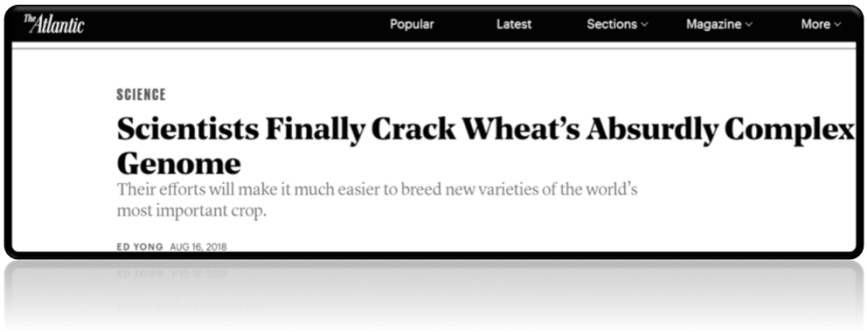
Factors Affecting Wheat Quality



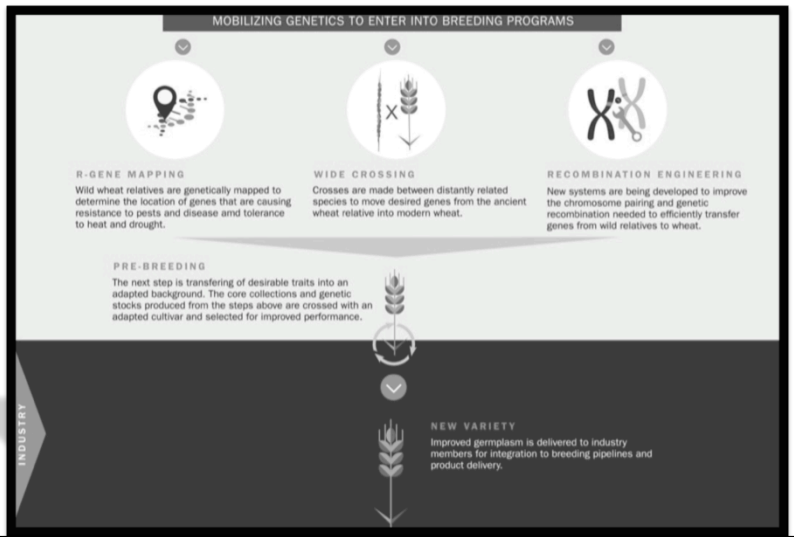


The New Frontier

- We have the map!

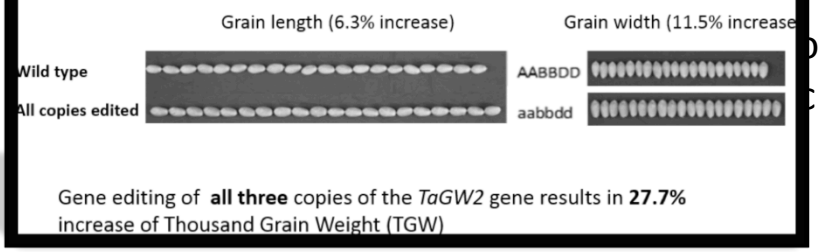


The New Frontier



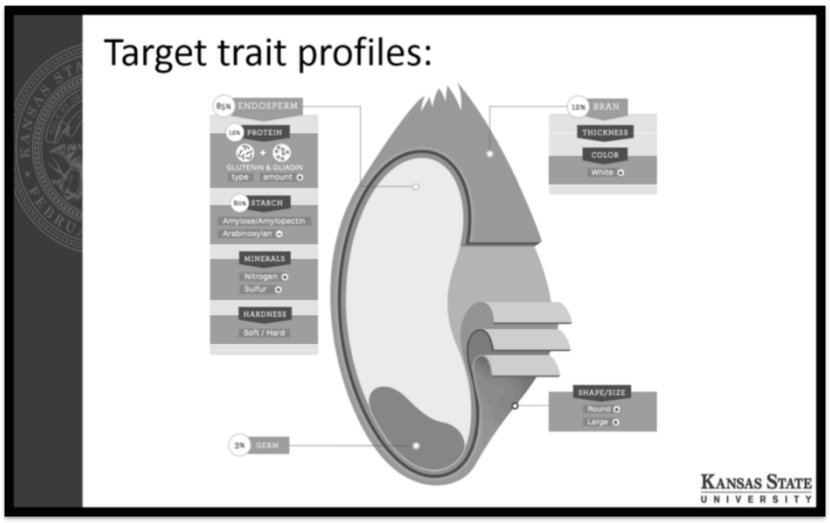
Gene Editing

- CRISPR/CAS9 knock-out of all three copies of the wheat TaGW2 gene resulted in substantial increase in seed size



- Gene editing of **all three** copies of the *TaGW2* gene results in **27.7%** increase of Thousand Grain Weight (TGW)

Predictive Genomics

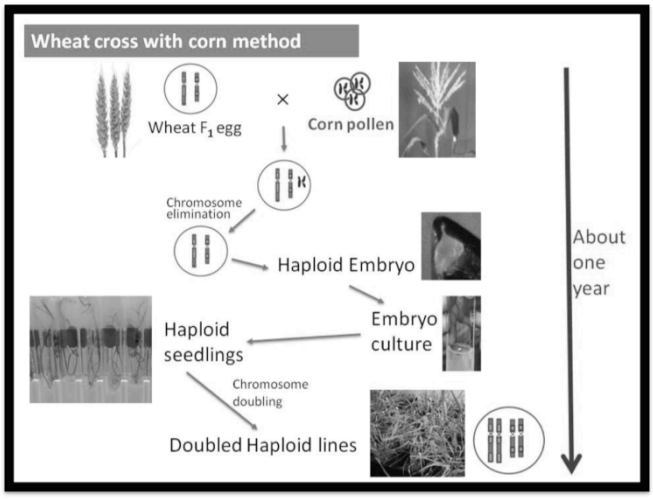


Fertilizer = Quality

Five Key Research Questions

1. How does S affect wheat growth and grain yield in environments with low/moderate/high available N?
2. How does S affect wheat grain quality, including asparagine concentration, in environments with low/moderate/high available N?
3. Can producers use N:S ratios in plant biomass and wheat grain to determine if the wheat is (or was) S deficient, and if S applications will (or would have) improve yield or quality?
4. Does late-season S application improve winter wheat grain yield and/or quality?
5. What is the occurrence of high asparagine wheat grain in typical varieties grown in Kansas field environments?

Doubled Haploids



What's Possible?

- Higher yield + better quality
- Enhanced flavor profiles = sweeter wheat
- Low glycemic index/high resistant starch
- Celiac-safe wheat??
- Drought tolerance
- Disease tolerance
- Higher photosynthesis efficiency

Research Challenges

- Re size
- nt.
- ay
- heat

Research Challenges

Thank You!
Questions?

Aaron W. Harries
aharries@kswheat.com
www.kansaswheat.org
@kansaswheat