IDENTIFYING GENETIC LOCI ASSOCIATED WITH FRUITING EFFICIENCY AND YIELD COMPONENTS IN AGS2000/NC06-19896 DH POPULATION UNDER POST ANTHESIS HIGH TEMPERATURE STRESS CONDITIONS

Muhsin Ibrahim Avci[1], Jahangir Khan[1], Sumit Pradhan Shrestha[1], Maksud Morshed Hossain[1], Dipendra Shahi[1], Jia Guo[1], Atik Rahman[1], Ann Blount[2], Paul Murphy[3], Md Ali Babar[1]

[1]Department of Agronomy, University of Florida; [2]North Florida Research and Education Center, Quincy, FL; [3]Department of Crop Science, North Carolina State University

Introduction

- The yield of wheat needs to be increased almost 60% in order to meet food needs of the 9.6 billion people expected in 2050.
- Global climate change effect especially stress due to high temperature at grain filling (terminal heat stress) has emerged as a major constraint to achieve that goal.
- Post-anthesis heat stress is a common yield-limiting factor in US wheat growing areas.
- High temperature with other abiotic stress can decrease potential crop yield by >50% (Wang, 2003).
- Increasing the fruiting efficiency (grains set per unit of spike chaff weight) is a promising option to meet the need in yield increase.

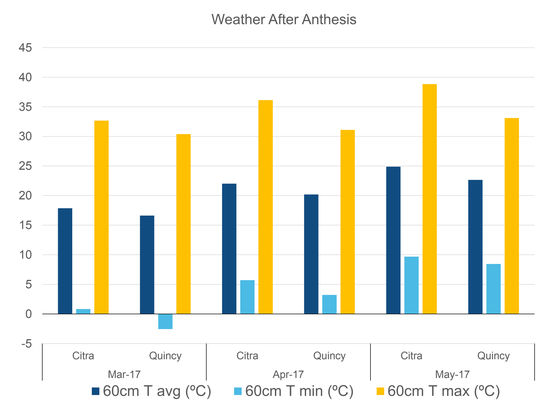
Objectives

- The objective of this study is to understand genetic mechanism of fruiting efficiency in AGS2000/NC06-19896 soft wheat double haploid population under terminal heat stress conditions.
- Identify genetic loci associated with fruiting efficiency and yield contributing traits in this population.
- Long-term objective is to develop heat tolerant wheat varieties by manipulating those QTLs.

Fig. 1 & 2: Citra,FL & Quincy, FL

Materials &Methods

- AGS2000/NC06-19896 DH wheat population with 152 sister lines developed by NCSU wheat breeding program was characterized for fruiting efficiency and yield components under heat stress conditions.
- The study was conducted in PSREU, Citra, FL and NFREC, Quincy, FL in 2016-17 wheat growing season.
- Both Citra and Quincy are characterized as high temperature prone environment with temperature above 30°C is common during early-April and on ward.



Environment	Period	>30ºC (hours)	Precip (mm)
Citra,FL	Jan-May 2017	259	282.702
Quincy,FL	Jan-May 2017	80	581.66

Fig. 3: Weather data for both locations. (Source: https://fawn.ifas.ufl.edu/)

Fruiting Efficiency

- Though the theoretical limit of harvest index in wheat is 60%, but only achieved 40-45% under stress conditions.
- Increasing fruiting efficiency (FE) is one of the promising methods. (Slafer et.al., 2015)
- Fruiting efficiency (grains set per unit of spike chaff weight at maturity) is basically the number of grains produced per chaff weight (grains /g chaff weight).

Results

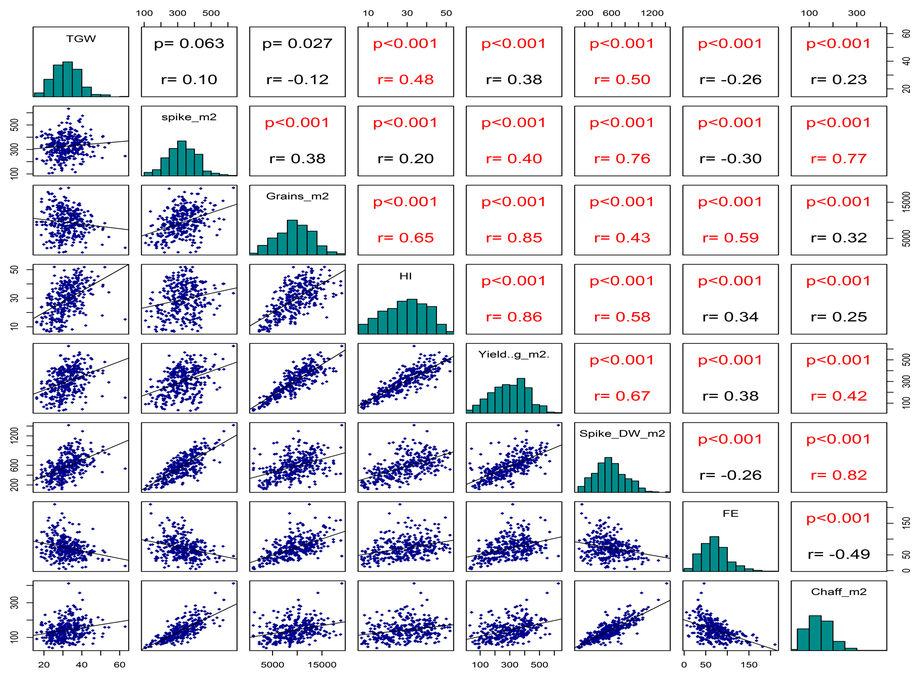


Fig. 4: Correlation matrix and frequency distribution.

Fig. 5 & 6 : Thrashing machines, for spike & total biomass.

- Data showed significant genetic variations for FE, harvest index, and yield and yield components in AGS2000/NC06-19896 population under high temperature stress conditions.
- FE showed positive correlation with grain yield and harvest index, and grain number, and negative correlation of chaff weight.

Conclusion

- The traits are under complex genetic mechanism.
- Genotyping of the population is currently ongoing.
- Identify noble alleles and QTLs related with FE in this population will help wheat breeders to develop heat tolerant variety with increased harvest index and yield for South and Southeastern US.

Bibliography

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