Genetic Influences on the Inheritance of Sorghum With a Black Pericarp

Brian K. Pfeiffer & William L. Rooney

Soil & Crop Sciences, Texas A&M University, College Station, TX

Introduction

- The black pericarp trait is a novel trait with complex inheritance.
- Black sorghum contains high levels of phenolic compounds.
- **Rationale:** Increased knowledge of the trait will improve breeding efforts

Alleles	Epicarp
R_Y_	
R_Yy rryy	
rrY_	
R_Y_	

Research objectives:

1. Estimate the relative genetic effects
2. Estimate the number of genes
3. Determine the heritability

Material and Methods

Plant Material

P_1 Red B.Tx378 × P_2 Black RTx3362

F_1 B.Tx378ms3 × Tx3362

BC_1P_1 (A3.Tx378 × Tx3362) × Tx378 ***Male Sterile***

BC_1P_2 (A3.Tx378 × Tx3362) × Tx3362 ***Male Sterile***

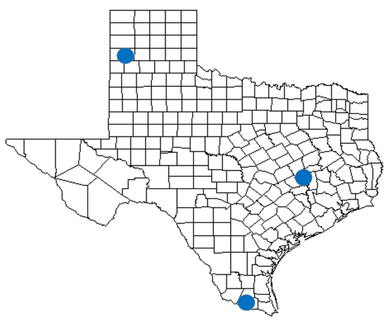
F_2 (B.Tx378 × Tx3362)-F1

Phenotyping

FOSS NIR

K-M Colorimeter

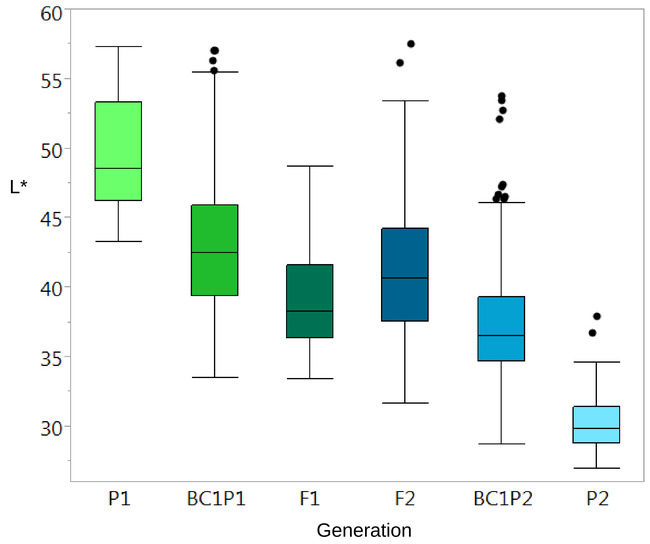
Environments



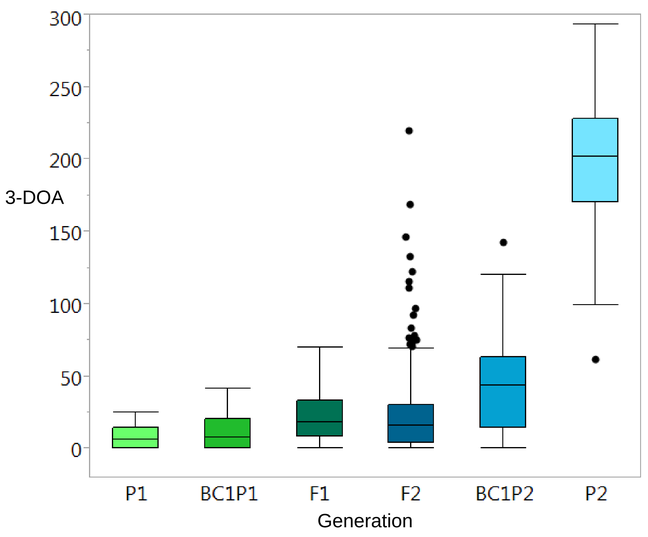
Generations	Evaluations
P_1	25
P_2	25
F_1	25
F_2	75
BC_1P_1	75
BC_1P_2	150

Results and Discussion

L Generation Means*



3-DOA Generation Means



Gene Effects

Six parameter model: $\mu_i = m + [a]x_{i1} + [d]x_{i2} + [aa]x_{i1}^2 + [dd]x_{i2}^2 + [ad]x_{i1}x_{i2}$

Effect / Trait	Midparent	Additive	Dominance	*a x a* Epistasis	*a x d* Epistasis	*d x d* Epistasis
Visual score	2.66	-2.00	-2.57	0.34	1.50	1.91
*L**	43.68	9.60	-5.71	-3.69	-8.30	1.19
*a**	10.40	4.19	11.15	0.55	-2.93	-6.80
*b**	20.03	9.80	0.95	-3.42	-5.46	-1.41
Phenols	8.09	-1.64	-2.23	-0.96	2.68	8.28
Tannins	10.19	-1.59	2.52	0.25	7.72	17.47
3-DOA	81.36	-95.07	-177.56	21.43	126.05	117.92

Blue – significant at P <0.01
White – non-significant, P >0.01

Heritability and Minimum Number of Genetic Factors

Trait	H^2	h^2	# Genes
Visual score	1.00	0.33	1.01
*L**	0.55	0.25	1.66
*a**	0.42	0.00	2.16
*b**	0.54	0.00	2.10
Phenols	0.82	0.03	0.04
Tannins	0.80	0.00	0.01
3-DOA	0.77	0.24	5.46

Conclusions

Genetic Effects
- Trait controlled by additive, dominance, epistatic effects

Number of Genes
- Trait is not highly quantitative
- Estimated 1-6 genes

Future Work
- QTL analysis
- Explore biochem pathway