GENETICS OF GINNING EFFICIENCY IN AN UPLAND COTTON CROSS

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Introduction

- **Number of studies on ginning rate and ginning energy requirements are very limited.**
- **Estimates of genotypic correlations among characters are useful in planning and evaluating breeding materials.**
- **The genetic correlation values offer a measure of the genetic inter-relationship between characteristics.**
- **The genetic mechanisms for genetic correlations are either pleiotropic or linkage or both (Miller and Rawlings, 1967b; Scholl and Miller, 1976; Falconer and Mackey, 1996).**

Objectives

- **To estimate the magnitudes of variance components, and genotypic correlations between ginning energy requirements, ginning rate and fiber properties.**

Material and Methods

- F4 segregant population of AR 9317-26 X FM 832ne was used in the study.
- AR 9317-26 is a semi-naked genotype with low net ginning energy requirement (7.5 Wh kg^{-1} lint) whereas FM 832 is a nectariless, okra leaf genotype with high net ginning energy requirement (10.5 Wh kg^{-1} lint) (Bechere et al., 2011).
- F_2 plants were bulked from which 64 individual plants were randomly harvested in 2009 to produce$F_{3:4}$ progeny rows.
- The progeny rows were planted in two replications at two locations at Stoneville, MS during 2010.

Material and Methods (Contd.)

- Fifty randomly selected bolls were hand picked from each entry.
- The cotton was ginned on 10-saw laboratory gin stand to evaluate ginning energy requirements and ginning rates.

. Power consumed by the gin stand was measured and recorded with a Yokogawa power meter (Yokogawa Corp. America, Newman, GA).

. Data on HVI and AFIS fiber quality, lint yield, lint %, seed index, and fuzz % were collected.

. Estimates of genetic and phenotypic correlations were calculated using the restricted maximum likelihood (REML) method with SAS Proc Mixed as described by Holland (2006).

Result

- **Significant amounts of variations were observed for net ginning energy and ginning rate between cotton genotypes (Table 1 and 2).**
- **Contributions of genotypic variances to the total phenotypic variances for both ginning rate and net ginning energy were high (Table 2).**
- **Significant and positive genotypic correlations were observed between ginning rate and lint % (rg=0.43**), micronaire (rg=0.46**), Fineness (rg=0.55**), and maturity ratio (rg=0.31*).**
- **Significant and negative genotypic correlations were observed between ginning rate and fuzz % (rg=-0.69**) and nep count (rg=-0.48**).**

Result (Contd.)

- **Net ginning energy had significant and positive genotypic correlation with seed index (*rg*=0.50**), fuzz % (*rg*=0.84**), fiber strength (*rg*=0.49**), and nep count (*rg*=0.30*).**

. Net ginning energy had significant and negative genotypic correlation with lint % (*rg*= -0.33**), and fineness (*rg*=-0.31**) (Table 3).

Conclusion

- **The high genotypic variances for ginning rate and net ginning energy indicate that these traits can be manipulated with relative ease.**
- **Lint % and fuzz %, because of their ease in measurement, might serve as good indicators of the best ginning efficient genotypes.**

References

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Table 1. Least square means for gross ginning energy, net ginning energy, and ginning rate for some cotton genotypes.

Genotypes	Gross Ginning energy	Net ginning energy	Ginning Rate	Fuzz %
	(Wh kg^{-1} lint)	(Wh kg^{-1} lint)	(gm lint sec^{-1})	
AR 9317-26	44.3	7.5	3.09	6.4
FM 832ne	45.5	10.5	3.15	12.4
PHY 72	53.3	11.8	2.72	12.4
FM 840B2R	52.8	11.1	2.68	12.9
SG 747	45.5	9.7	3.02	14.7
LSD (0.05)	5.6	0.4	0.4	1.3

Table 2. Mean squares and estimates of variance components for AR 9317-26 X FM 832ne.

Source	DF	Gross Ginning energy	Net ginning energy	Ginning Rate
		(Wh kg^{-1} lint)	(Wh kg^{-1} lint)	(gm lint sec^{-1})
Location	1	564**	4.29**	4.53**
Blocks/Loc.	1	115 **	0.15	1.64**
Genotypes	61	37**	2.19**	0.26**
Genotypes X Loc.	61	4	0.07	0.03
Error (σ^2_e)	123	4	0.06	0.04
Variance Components :				
σ^2_g		8.33	2.12	0.23
σ^2_l		-0.05	0.02	0.01
σ^2_p		12.75	2.18	0.35
σ^2_e		4.41	0.06	0.04

Values followed by ** are significantly different at p<0.01 in t test.

Table 3. Genotypic and phenotypic correlations between some agronomic, ginning rate, ginning energy and quality traits for AR 9317-26 X FM 832ne

	Lint yield	Lint %	Seed index	Fuzz %	Fiber Leng.	Unif.	Fiber Stren.	Mic	Nep cnt.	SFCw	SFCn	Fine	MR
Ginning Rate													
rg	-0.14	0.43**	0.01	-0.69**	0.15	0.07	-0.21	0.46**	-0.48**	-0.11	-0.08	0.55**	0.31*
rp	-0.23	0.48**	0.01	-0.71**	0.13	0.1	-0.24	0.43**	-0.41**	-0.10	-0.05	0.55**	0.31*
Net gin. energy													
rg	0.14	-0.33**	0.50**	0.84**	0.26	0.3	0.49**	-0.2	0.30	-0.03	0.06	-0.31**	0.10
rp	0.16	-0.35**	0.48**	0.82**	0.25	0.30*	0.49**	-0.21	0.31*	-0.01	0.07	-0.31**	0.11

rg = genotypic correlation

Rp = phenotypic correlation

Values followed by *, and ** are significantly different at p<0.05 and p<0.01, respectively, in t test.