Relationships of Cotton Yield Components with Lint Yield and Fiber Properties

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Introduction

Knowledge regarding the nature of relationships between yield components, fiber traits and lint yield is essential for formulating efficient breeding strategies for cotton improvement.

Objective

Study the relationships between ten yield component traits and four HVI fiber quality traits with lint yield in cotton.

Materials and Methods

- 12 diverse cotton germplasm were grown in two locations at Stoneville, MS, during 2011 and 2012.
- Materials were planted in a randomized complete block design in three replications.
- Boll weight, number of bolls/plant, plant height, number of seeds/boll, boll width, boll length, and number of locs/boll were measured from ten random plants in each plot
- Seed surface area was measured using the WINSEEDLE^{TM} 2011, a seed scanner and software program. This was used in conjunction with lint weight, weight of delinted seed, number of seeds in sample, AFIS Ln and fineness to calculate number of fibers/seed, and fiber density.

Genotypes Included in the study and their characteristics.

Genotypes	PI/PVP	Source	Characteristics
FM 966	PVP 200100209	Commonwealth Sci. & Ind. Res. Org.	Many small bolls and good yield
PHY 72	PVP 200100115	Phytogen	High-yielding, good quality Acala Variety
DP 555 BG/RR	PVP 200200047	Delta and Pine Land	Small seeds, good yield
SG 747	PVP 9800118	Sure-Grow Seed, Inc.	Good Yield
MD 25ne	PI 659508	Meredith & Nokes, 2011	Good strength, good quality and high SI, nectariless
JJ 1145ne			Good quality, good yield, nectariless
TAM 182 34-ELS	PI 654362	Texas A&M	Large bolls, many seeds/boll
Hammer	PVP 200500115	Bayer Crop Sci., AG.	High fibers/seed
MD 52ne	PI 634930	Meredith, 2005	High fiber quality, nectariless
FM 832ne	PUP 200500137	Commonwealth Sci. & Ind. Res. Org.	Good quality, Okra leaf, nectariless
MD 15	PI 642769	Meredith, 2006	Superior quality, Okra leaf.
AR 9317-26		University of Arkansas	Semi-naked seed, good ginning efficiency.

Mean square values for lint yield, its components and quality traits.

Source	DF	Lint Yield	Turn-Out	Boll Wt.	No. of bls/plt	No. Sds/bol	Boll width	Boll length	Fibers/ seed	Fiber density	No of Locs/bol	Seed Index	Fiber Stren.	Fiber length
Genotypes (G)	11	$4.8 \times 10^{5**\dagger}$	72.2^{**}	1.25^{**}	46.2^{**}	44.9^{**}	5.4^{**}	53.8^{**}	$2.8 \times 10^{7**}$	2481.7^{**}	0.13^{**}	9.19^{**}	128.9^{**}	0.03^{**}
Location (L)	1	$9.2 \times 10^{5**}$	128^{**}	12.3^{**}	55.1^{*}	86.7^{**}	0.3	34.3^{**}	1.0×10^{5}	382.7	0.04	8.89^{**}	0.96	0.03^{**}
G X L	11	5.6×10^{4}	2.15	0.3	4.6	4.6	0.3	1.05	5.1×10^{6}	305.8	0.04	0.4	1.34	0.005
Rep	2	8.1×10^{4}	1.04	2.53^{**}	25.1	4.9	0.2	9.7^{*}	6.8×10^{6}	73.1	0.001	0.8	3.15	0.04
Error	46	3.1×10^{4}	1.30	0.24	12.0	7.8	0.4	2.2	4.8×10^{6}	512.4	0.02	0.3	1.43	0.001

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

Results

- Mean square values were significantly different among the twelve genotypes for all traits.
- Number of bolls/plant and number of seeds/boll had the most significant positive relationships with lint yield (0.50** and 0.32**, respectively.
- Plant height, boll weight, and number of locs/boll had also positive and significant relationship with lint yield.
- Fiber length (-0.20*) and fiber strength (-0.36**) had significant and negative relationship with lint yield.
- Fibers/seed and fiber density had negative but non-significant impact on lint yield but significant and positive relationship with lint turnout.

Pearson's correlation coefficients between lint yield and yield components .

	Lint Yield	
Traits	**Positive and Significant**	**Negative and Significant**
Number of Bolls	$0.4963^{**\dagger}$	
Seeds per boll	0.3209^{**}	
Plant height	0.2924^{*}	
Boll weight	0.2939^{*}	
Number of locs/boll	0.2510^{*}	
Days to maturity		-0.5891^{**}
Boll length		-0.2860^{*}
Micronaire	0.5668^{**}	
Fiber Strength		-0.3551^{**}

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

Traits included in the study.

Lint Yield	No. of locs/boll*
Lint turnout	No. of fibers/seed
Days to maturity	Fiber density
Boll weight (gm)*	Fiber length
No. bolls/plant*	Fiber strength
Plant height (cm)*	Uniformity
No. of seeds/boll*	
Boll width (mm)*	
Boll length (mm)*	
Seed Index (Wt. of 100 fuzzy seeds)	
* Average of 10 bolls/plant	

Conclusion

- Number of bolls/plant in conjunction with number of seeds/boll can be used as an indirect selection criteria for lint yield.
- Breeders need to continue working on reducing the negative relationships between fiber strength, fiber length and lint yield.

References

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