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Association Studies Between Boll Weight and Within Boll Yield Traits in Upland Cotton (*Gossypium hirsutum* L.)

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ABSTRACT

Several yield components within boll are the most basic contributor of lint yield and fiber quality throughout the world. The present study is undertaken to assess the nature of association among within-boll lint yield components and boll weight. Desirable genotypic and phenotypic correlations were identified between boll weight with the boll size, lint mass per boll, seed mass per boll, seeds per boll and seed mass per seed respectively indicating simultaneous improvement of multiple within-boll yield components.

Keywords Correlation, Boll weight, Fiber, Within-boll yield components.

INTRODUCTION

Cotton is one of most important commercial crop supplying lint as a raw material to the textile industry and generates employment opportunity for billions of people (Kumar *et al.* 2017). Boll is the main component of yield and fiber quality in cotton spp. (Tangand Xiao 2013). Within boll multiple components were associated with yield such as lint weight, seed per boll, seed weight, a little selection pressure has been exerted for decades due to difficulties in their measurements. Number of boll per unit area was the huge contributor to lint yield accompanied by number of seeds per boll and seed weight (Worley *et al.* 1974). The main object of cotton breeder is development of high yielding varieties and hybrids. Selection for lint yield resulted in increased seed number and smaller boll size (Bridge *et al.* 1971) Understanding the nature of individual trait on yield is important criteria in selection of high yield potential genotypes and also till to date only little information is available on association within boll yield components. Hence the present investigation is undertaken to establish the nature of association between boll weight and within boll yield components.

MATERIALS AND METHODS

45 intra *Gossypium hirsutum* hybrids were developed during *kharif* 2011-12 by involving 10 parents in half diallel manner whose performance found to be consistent across the cotton growing zone of India (viz., GSHV 99/307, Pusa 9127, ARB 904, Surabhi, CCH 510, BS 277, BS 2170, H 1462, TSH 0250 and TCH 1728). All the 45 hybrids along with their 10 parents were evaluated at Agricultural research station, Siruguppa (UAS, Raichur) during *kharif* 2012-13 in Complete Randomized Block De-

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Table 1. Descriptive statistics of within boll yield components and boll weight traits. BS : Boll size, LP : Lint percentage, LM/B : Lint mass per boll, S/B : Seeds per boll, SM/B : Seed mass per boll, SM/S : Seed mass per seed, BW : boll weight.

Characters	Range	Mean	SD	CV%
BS	0.05–0.11	0.09	0.01	11.31
Lint %	33.98–41.11	37.23	1.65	4.43
LM/B	0.02–0.04	0.03	0.004	13.33
S/B	3.68–8.08	5.93	0.12	2.02
SM/B	0.34–0.85	0.54	0.02	3.70
SM/S	0.05–0.20	0.09	0.004	4.44
B WT	3.12–5.42	4.3	0.46	10.70

sign in two replications with spacing of 60 cm within and 90 cm between rows with length of 6 meters.

Observations were recorded on five randomly selected healthy plants in each replication per treatments and samples were ginned in laboratory to separate lint and seed fractions while remaining measurements were calculated in accordance with formulae given by Tang and Xiao (2013).

RESULTS AND DISCUSSION

The presence of wide variability for a character is important to achieve success in plant breeding. Estimates of range, mean, standard deviation and coefficient of variation (CV) for all 45 F_1 generation hybrids evaluated under rainfed conditions were presented in Table 1. The maximum standard deviation is exhibited by lint percentage (1.65) then, followed boll weight (0.46) and seeds per boll (0.12). Measurements on CV for lint mass per boll (13.33%), boll size (11.31%), boll weight (10.70%), seeds mass per seed (4.44%), lint percentage (4.43%), seed mass per boll (3.70%) and seeds per boll (2.02%) had a lowest and highest (lint mass per boll) phenotypic variations, respectively.

Correlation coefficient's estimated for both phenotypic and genotypic levels were presented in Table 2. In our study, calculated correlation phenotypic coefficients were approximately equal to genotypic correlation coefficients. Boll weight recorded significant and positive associations with boll size, lint mass per boll, seed mass per boll, seeds per boll and seed mass per seed had a negative associations with lint percentage indicating cultivars with large sized bolls are prone to have lower lint percentage[2].

Lint percentage had a positive and significant association with lint mass per boll, nevertheless negative associations with seed mass per boll and seed mass per seed suggests selection for lint yield results increase in lint mass but proceeds towards decrease in seed mass and boll weight (Bayles *et al*. 2005) and alsonegative association among LP and SM/B have been noticed by Zengand Meredith (2009).

Advantageous positive correlations between within-boll lint yield components (lint mass per boll) and within-boll seed yield components (seeds per boll, seed mass per seed) were observed except for seed mass per boll both at genotypic and phe-

Table 2. Genotypic (G) and phenotypic (P) correlation coefficients between boll weight and within-boll yield components. Significant at * 0.05 and ** 0.01 probability levels, respectively.

Characters	BS	LP	LM/B	SM/B	S/B	SM/S
LP	0.091^{NS}					
	0.174^{NS}					
LM/B	0.726**	0.482**				
	0.947**	0.579**				
SM/B	–0.404**	– 0.309**	– 0.455*			
	– 0.581**	–0.521**	– 0.639**			
S/B	0.770**	0.021^{NS}	0.575**	0.581**		
	0.845**	0.205^{NS}	0.799**	0.679**		
SM/S	–0.649**	–0.337**	0.544**	0.902**	0.832**	
	–0.787**	–0.311**	0.740**	0.907**	0.886**	
B WT	0.228**	–0.223**	0.257**	0.280**	0.332**	0.221*
	0.373**	–0.227**	0.312**	0.286**	0.367**	0.224*

notypic levels. The positive correlation among these traits suggests improvement of one trait would result in simultaneous selection of other traits.

CONCLUSION

Positive genotypic and phenotypic correlation was observed among within-boll lint yield components (LM/B) and within-boll seed yield components (S/B, SM/S) suggesting concurrent improvement of several within-boll yield traits by the breeders for enhancing yields under rainfed conditions.

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