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Association studies between seed cotton yield and its component traits

SUMAN SANGWAN, OMENDER SANGWAN*, S.R. PUNDIR AND KULDEEP JANGID
Department of Genetics and Plant Breeding, CCS Haryana Agricultural University, Hisar - 125004
****E-mail : osangwan@gmail.com***

ABSTRACT : The experiment was conducted in the experimental area of the Cotton Section, Department of Genetics and Plant Breeding, CCS Haryana Agricultural University, Hisar in *kharif,* 2015 in a randomized block design with three replications. The character seed cotton yield/ plant had low GCV, low PCV, high heritability and moderate genetic advance as per cent of mean. High GCV means variability present in a population is of heritable nature and selection will be effective while large difference between PCV and GCV means trait is influenced by environment to a greater extent. Seed cotton yield is dependent character for correlation studies in this investigation which is of economic value. Seed cotton yield was significantly positively associated with plant height, monopods/ plant, bolls/ plant, boll weight, lint index, ginning outturn and seed index at both the genotypic and phenotypic levels. Seed cotton yield had significant negative correlation with days to 50 per cent flowering and seeds/ locule at both genotypic and phenotypic levels.

Key words : Correlation, *desi* cotton, GCV, heritability, PCV

Cotton (*Gossypium* spp*)* is one of the most important commercial cash crops and plays a key role in economic, political and social affairs of the world. Cotton enjoys a pre-eminent status among all the cash crops in the country, being the principal material for flourishing textile industries. The ultimate objective of any breeder is to increase the yield which is normally a complex trait governed by polygenes. Hence, it is desirable for plant breeder to know the extent of relationship between yield and yield components which would facilitate in selecting desirable characteristics for yield improvement. Correlation coefficient analysis measures the magnitude of relationship between various plant characters and determines the component character on which selection can be based for improvement of seed cotton yield.

The present investigation was carried out in the experimental area of the Cotton Section, Department of Genetics and Plant Breeding, CCS Haryana Agricultural University, Hisar during *kharif* 2015. The experimental material included forty elite lines of *desi* cotton which were grown in randomized block design with three replications. Five randomly selected plants were used for recording data for 10 characters *viz.*, {Days to 50 per cent flowering, plant height (cm), monopods, bolls/ plant, boll weight (g), seed index (g), lint index (g), ginning

outturn (%), seeds/locule and seed cotton yield (g)}. Mean data were subjected to correlation analysis. Information on the nature and magnitude of variability for both quantitative and qualitative traits in any crop species plays a vital role in formulating an effective breeding programme and its success. Superior genotypes can be isolated by selection if considerable genetic variation exists within the population. The success in breeding programme for economic traits, which are controlled by polygenes and highly influenced by environment, depends on nature and magnitude of their genotypic variability. It is therefore essential to partition the overall variability into heritable and non-heritable components.

Knowledge on the magnitude of heritability coupled with nature and extent of variability in the breeding material gives an idea for effective genetic improvement through selection. High PCV and GCV for a character indicate high variability in that population for that character.

Low GCV and PCV, high heritability and low Genetic advance were observed for 50 per cent flowering. Similar results were elaborated by Rai *et al.* (2016).

Moderate PCV, GCV and high heritability and genetic advance as per cent of mean was recorded for boll weight and lint index. These results were similar to the results of Gopikrishnan *et al.* (2013).

Plant height had moderate PCV, low GCV with high heritability and genetic advance. Plant height studies revealed that plant height possessed moderate PCV and low GCV (Dhivya *et al.,* 2014). The traits ginning outturn (%) and seed index had low GCV and PCV with high heritability and moderate genetic advance as per cent of mean. Similar results were reported by Gopikrishnan *et al.* (2013) and Dhivya *et al.* (2014).

Seeds/ locule had moderate PCV with low GCV, heritability and genetic advance as per cent of mean. The monopods/ plant had high PCV but low GCV, heritability and genetic advance caused due to increase in environmental influence on genetic factor of genotype.

Number of monopods had high GCV, PCV, heritability and genetic advance which higher variability for the character. This may be due to additive gene action. High heritability and high genetic advance indicated that heritability was due to additive gene effect Pushpa *et al.* (2014).

Number of bolls per plant had moderate GCV and PCV with high heritability and genetic advance indicating inherent but not significant variability. Similar results observed by Pushpa *et al.* (2014). Large difference between PCV and GCV leads to presence of environment influence

Table 1. Analysis of variance

S.V.	d. f.	Mean sum of squares									
		1	2	3	4	5	6	7	8	9	10
Replications	2	0.93	47.48	0.01	13.56	0.01	0.72	0.86	5.59	1.63	1.216
Genotypes	39	83.75**	1791.74**	2.25**	221.37**	0.03**	1.34**	2.59**	50.45**	0.74	9.813**
Error	78	13.99	6.00	0.03	1.10	0.01	0.12	0.21	6.33	0.63	0.952

Table 2. Mean, range, pcv, gcv, heritability and geneticadvance as percent of mean

Trait	Mean ± SE	Range	Coefficient of variation (%)		Heritability (%) (b. s.)	Genetic advance as per cent of mean (%)
			Genotypic	Phenotypic		
Days to 50 per cent flowering	57.56	51-68	8.38	10.60	62.43	13.63
Plant height (cm)	180.32	98-240	13.13	13.60	89.00	27.73
Monopods of plant	1.53	1-4	55.20	57.15	86.69	113.83
Bolls/ plant	40.24	22-58	20.29	22.45	78.53	43.54
Boll weight (g)	1.94	1.10-3.45	24.70	26.83	84.50	51.46
Lint index	3.40	2-5.3	18.75	21.23	77.97	34.10
Seed index	5.73	3.7-8.00	15.57	17.46	79.53	28.61
Ginning outturn (%)	37.25	30.10-47.57	10.30	12.32	69.90	17.74
Number of seeds/ locule	5.77	5-7	3.25	14.18	5.24	1.53
Seed cotton yield (g)	14.99	10.86-19.99	11.46	13.18	75.62	20.53

to a great extent.

The character seed cotton yield/ plant had moderate GCV and low PCV with high heritability and moderate genetic advance as per cent of mean. These results are in accordance with Kalpande *et al.* (2014) and Pujer *et al.* (2014).

Seed cotton yield was positively correlated with plant height, monopod per plant, bolls/ plant, boll weight, lint index, ginning outturn at both the levels while, significantly negative correlation with seed index, days to 50 per cent flowering and seeds/ locule was observed. These results are in agreement with Bhailume *et al.* (2016). Significant negative correlation of days to 50 per cent flowering at both phenotypic and genotypic levels with plant height, boll/ plant, boll weight, lint index, ginning outturn and seed cotton yield/ plant was observed. Similar results were found by Rai *et al.* (2016).

Plant height exhibited significant positive correlation at both genotypic and phenotypic levels with bolls/ plant, seed cotton yield/ plant, lint index, boll weight and ginning outturn (Venkateswaralu *et al.*, 2010). This trait showed non-significant positive correlation with seed index at genotypic and phenotypic level while significant negative genotypic correlation with days to 50 percent flowering monopods and seeds/ locule. Similar results were observed by Asha *et al.* (2015).

Number of monopods per plant possessed significant positive association at both genotypic and phenotypic levels with bolls/ plant, boll weight, ginning outturn and seed cotton yield/ plant while significant negative association with seed index and nonsignificant negative association with days to 50 per cent flowering, plant height (Pujer *et a*l., 2014). Strong positive association of bolls/ plant with lint index, ginning outturn, monopods/ plant, plant height and seed cotton yield/ plant was observed at both the levels and the results are in accordance with Patil *et al.* (2017).

Boll weight showed significant positive association with seed cotton yield/ plant, lint index, plant height and number of monopods at both level. Ginning outturn (%) showed

Table 3. Phenotypic correlation coefficient above diagonal and genotypic correlation coefficient below diagonal

Characters	Days to 50 per cent flowering	Plant height (cm)	Monopods	Bolls/ plant	Boll weight (g)	Lint index	Seed index	Ginning outturn (%)	Seeds/ locule	Seed cotton yield (g)
Days to 50 per cent flowering		-0.366**	-0.045NS	-0.247**	-0.503**	-0.401**	0.017NS	-0.443**	0.141NS	-0.360**
Plant height (cm)	-0.468**		-0.083NS	0.234*	0.208*	0.311**	0.101NS	0.239**	-0.148NS	0.263**
Monopods	-0.033NS	-0.086NS		0.443**	0.243**	0.065NS	-0.219*	0.280**	-0.249**	0.442**
Bolls/plant	-0.334**	0.236**	0.451**		0.069NS	0.226*	-0.314**	0.508**	-0.202*	0.487**
Boll weight (g)	-0.686**	0.211*	0.255**	0.072NS		0.316**	-0.013NS	0.374**	-0.184*	0.477**
Lint index	-0.508**	0.353**	0.067NS	0.261**	0.397**		0.454**	0.639**	-0.186*	0.362**
Seed index	0.078NS	0.119NS	-0.251**	-0.346**	-0.001NS	0.503**		-0.385**	0.008NS	-0.254**
Ginning outturn (%)	-0.637**	0.281**	0.331**	0.609**	0.479**	0.618**	-0.363**		-0.223*	0.596**
Number of seeds/locule	0.971**	-0.661**	-1.122**	-0.902**	-1.003**	-0.838**	0.096NS	-1.032**		-0.239**
Seed cotton yield (g)	-0.599**	0.305**	0.509**	0.557**	0.555**	0.478**	-0.298**	0.791**	-1.050**	

significant positive relationship with seed cotton yield/ plant, plant height, monopods, bolls/ plant and lint index (Pujer *et al.*, 2014) at both the levels, while significant negative correlation with number of seeds per locule, seed index and days to 50 per cent flowering at both phenotypic and genotypic level.

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