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Correlation and path coefficient analysis for seed cotton yield and its components in upland cotton (*Gossypium hirsutum* L.)

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ABSTRACT : The present study was conducted on correlation, path coefficient analysis and component of variance for seed cotton yield and its component traits in 3 cultivars of upland cotton grown in six environments. The results showed that plant height, bolls/plant, seeds/boll, ginning outturn and lint yield/plant had positive correlation with seed cotton yield/plant. Similarly path coefficient analysis revealed that monopods/plant, bolls/plant, seeds/boll, ginning outturn exerted high and positive direct effect on seed cotton yield. High heritability along with high genetic advance was observed for seeds/boll while intermediate heritability and moderate genetic advance was observed for bolls/plant and plant height. Lint index and monopods/plant was having low GCV and PCV.

Key words : Cotton, correlation, component of variance, genotypic, path coefficient, phenotypic, seed cotton yield

Cotton is an important commercial crop of India. It is grown in tropical and subtropical regions in more than 80 countries of the world. India has a pride place in the global cotton scenario due to several distinct features. India has the largest area under cotton representing about one third of the global cotton area. 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 in seed cotton yield. Hence, the present investigation was carried out to find the correlation among various characters and their direct and indirect influence on seed cotton yield. Path coefficients provide information on interrelations of complex characters and to develop selection criteria.

Keeping these objectives in view the present study was conducted to find out the interrelationships of seed cotton yield with its contributing characters and partitioned the observed correlations into their direct and indirect effects.

MATERIALS AND METHODS

The experiment was conducted during *kharif,* 2015 and 2016 having three cultivars H 1098-I, H 1300 and H 1316 of upland cotton grown at CCS Haryana Agricultural University, Hisar in randomized block design replicated six times. Each variety was grown in eight rows of 6 m length with a spacing of 67.5 x 30 cm in six environments that comprises of three sowings periods (Early: first fortnight of April, normal: first fortnight of May and late: end of May/early June) during both the years.

Observations were recorded on five competitive plants excluding border plants in each variety from each replication in each environment. Data were recorded for the traits *viz.,* days to first flower, plant height (cm), monopods/plant, effective bolls/plant, boll weight (g), seeds/boll, ginning outturn (%), lint index (g), seed index (g), seed cotton yield/plant (g), lint yield/plant (g). Genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV) was carried out. Phenotypic correlation and genotypic correlation, heritability and genetic advance (% mean) by the method of Allard (1960). Genotypic correlation coefficients were further partitioned into direct and indirect effects by path analysis.

RESULTS AND DISCUSSION

The analysis of variance revealed highly significant differences among the genotypes for all the characters studied. The genotypic and phenotypic correlation coefficients and the genotypic and path coefficients showing direct and indirect effects are presented in Table 1, 2, and 3, respectively. In general genotypic correlation coefficients were higher than the phenotypic correlation coefficients in the present study due to major role of genetic effects. This indicated the strong inherent association between characters governed largely by genetic causes and least role of environmental forces.

Computation of correlation between yield and its attributing traits is of considerable importance in plant selection. Seed cotton yield/ plant was positively correlated with plant height, bolls/plant, seed/boll, ginning outturn and lint yield/plant and negatively correlated with boll weight, seed index and lint index. So seed cotton yield can be improved by exercising selection on any of these traits. Similarly, significant positive association of seed cotton yield was observed by Erande *et al., (*2014), Farooq *et al.,* (2014) for bolls/plant. Thiyagu *et al.,* (2010) reported similar results for plant height and bolls/plant. The close association between yield and its attributing traits can be exploited in selection programme which might be helpful in evolving high yielding genotypes.

Number of seeds/boll was positively correlated with days to first flower and boll weight and negatively correlated with days to boll bursting, monopods/plant and bolls/plant. Boll weight was negatively correlated with plant height, monopods/plant and bolls/plant. Number of bolls/plant was positively correlated with days to first flower.

Lint index was positively correlated with boll weight, seeds/ boll, ginning outturn and seed index. Ginning outturn was positively correlated with boll weight and seeds/boll reported similar results. Lint index was positively correlated with boll weight, seeds/boll, ginning outturn and seed index. Days to boll bursting was positively correlated with days to first flower. Similar findings were reported by Abbas *et al.*, 2013.

Path coefficient analysis revealed that monopods/plant, bolls/plant, seeds/boll, ginning outturn exerted high and positive direct effect on seed cotton yield (Table 3). Days to boll bursting, boll weight, seed index, lint cotton yield/plant had positive direct effect on seed cotton yield.

The high indirect positive effect of ginning outturn, seed index and lint index seeds/boll on seed cotton yield/plant was noticed.

Table 1. Genotypic correlations coefficient among seed cotton yield and other characters in cotton

	Days to first flower	Days to boll bursting	Plant height (cm)	Mono-pods/ plant	Bolls/ plant	Boll weight (g)	Seeds/ boll	Ginning outturn (%)	Seed index (g)	Lint index (g)	Lint yield/ plant (g)
Days to first flower	1										
Days to boll bursting	0.575**	1									
Plant height(cm)	0.770**	-0.587*	1								
Monopods/plant	-0.578*	0.658**	0.302	1							
Bolls/plant	0.572*	-0.428	1.028**	0.464	1						
Boll weight (g)	0.084	-0.212	-0.797**	-0.961**	-0.834**	1					
Seeds/boll	0.500*	-0.542*	-0.454	-1.007**	-0.578*	1.008**	1				
Ginning outturn (%)	0.652**	-0.733**	-0.189	-1.094**	-0.445	0.997**	1.112**	1			
Seed index (g)	0.151	-0.306	-0.669**	-1.002**	-0.791**	1.100**	1.062**	1.064**	1		
Lint index (g)	0.046	-0.199	-0.757**	-0.981**	-0.911**	1.108**	1.058**	0.869**	1.123**	1	
Lint yield/plant (g)	-0.003	0.164	0.769**	0.892**	0.843**	-1.044**	-0.963**	-0.922**	-1.051**	-1.110**	1
Seed cotton yield/plant (g)	0.451	-0.440	1.030**	0.419	1.023**	-0.862**	0.598**	0.456**	-0.781**	-0.905**	0.844**

Table 2. Phenotypic correlations coefficient among seed cotton yield and other characters in cotton

	Days to first flower	Days to boll bursting	Plant height (cm)	Mono-pods/ plant	Bolls/ plant	Boll weight (g)	Seeds/ boll	Ginning out turn (%)	Seed index (g)	Lint index (g)	Lint yield/ plant (g)
Days to first flower											
Days to boll bursting	0.421**										
Plant height(cm)	0.411	-0.422									
Monopods/plant	-0.349	0.539*	0.245								
Bolls/plant	0.492*	-0.368	0.814**	0.333							
Boll weight (g)	-0.110	-0.049	-0.450	-0.562*	-0.785**						
Seeds/boll	0.060	-0.398	-0.331	-0.918**	-0.525*	0.686**					
Ginning outturn (%)	0.402	-0.563*	-0.327	-0.698**	-0.133	0.364	0.555*				
Seed index (g)	0.213	-0.334	-0.443	-0.696**	-0.543*	0.652**	0.687**	0.448			
Lint index (g)	-0.012	-0.100	-0.610**	-0.518*	-0.528*	0.680**	0.543*	0.740**	0.605**		
Lint yield/plant (g)	-0.028	0.125	0.587*	0.738**	0.790**	-0.846**	-0.789**	-0.505*	-0.769**	-0.633**	
Seed cotton yield/plant (g)	0.381	-0.329	0.810**	0.356	0.901**	-0.676**	0.435**	0.408**	-0.569*	-0.545*	0.778**

Table 3. Path coefficient among seed cotton yield and other characters in cotton

	Days to first flower	Days to boll bursting	Plant height (cm)	Mono-pods/ plant	Bolls/ plant	Boll weight (g)	Seeds/ boll	Ginning out turn (%)	Seed index (g)	Lint index (g)	Lint yield/ plant (g)
Days to first flower	**0.019**	-0.02134	0.01448	-0.01088	0.01077	0.00158	0.00941	0.01227	0.00285	0.00087	-0.00006
Days to boll bursting	-0.86244	**0.760**	-0.44597	0.50046	-0.32502	-0.16110	-0.41230	-0.55683	-0.23233	-0.15159	0.12460
Plant height(cm)	0.09293	-0.07084	**0.121**	0.03652	0.12413	-0.09626	-0.05487	-0.02282	-0.08075	-0.09145	0.09288
Monopods/plant	-0.85857	0.97732	0.44897	**1.484**	0.68942	-1.42587	-1.49494	-1.62403	-1.48750	-1.45667	1.32441
Bolls/plant	0.76365	-0.57055	1.37178	0.61973	**1.334**	-1.11289	-0.77125	-0.59324	-1.05485	-1.21622	1.12506
Boll weight (g)	0.05546	-0.13996	-0.52644	-0.63433	-0.55077	**0.660**	0.66575	0.65860	0.72631	0.73171	-0.68934
Seeds/boll	0.69815	-0.75744	-0.63458	-1.40632	-0.80711	1.40778	**1.396**	1.55231	1.48345	1.47784	-1.34409
Ginning outturn (%)	0.67066	-0.75353	-0.19439	-1.12539	-0.45731	1.02588	1.14347	**1.029**	1.09497	0.89356	-0.94853
Seed index (g)	0.08002	-0.16151	-0.35341	-0.52953	-0.41774	0.58120	0.56137	0.56251	**0.528**	0.59364	-0.55536
Lint index (g)	-0.04338	0.18620	0.70713	0.91622	0.85100	-1.03453	-0.98812	-0.81107	-1.04890	**-0.934**	**0.056**
Lint yield/plant (g)	-0.00226	0.11115	0.52161	0.60501	0.57173	-0.70784	-0.65269	-0.62529	-0.71266	-0.75278	**0.678**

Residual are 0.01347

Lint yield *via* monopods/plant and bolls/plant, seed index *via* ginning outturn, plant height *via* bolls/ plant and monopods/plant, bolls/ plant *via* lint index. Farooq *et al.,* 2014 also reported similar pattern of indirect effects for plant height. Effect of seed index and lint index *via* boll weight was in accordance with findings of Rao and Gopinath (2013).

The component of residual effect of path analysis in yield traits was 0.013. The lower residual effect indicated that the characters chosen for path analysis were adequate and appropriate. Thus, these studies revealed that, the traits which had positive and direct effect on seed cotton yield should be given due emphasis for making selection for yield improvement.

The direct and indirect effects of yield characters namely monopods/plant, bolls/plant, seeds/boll, ginning outturn, boll weight, seed index, lint yield/plant recorded as major yield contributing traits. Due importance should be given for yield improvement to these traits.

Phenotypic coefficient of variance was higher than genotypic coefficient of variance for all the traits indicating environmental influence on these traits. However, the magnitude of genotypic coefficient of variance and phenotypic coefficient of variance were almost equal for the traits namely boll weight and lint index.

High level of broad sense heritability (h^2b) was observed for seeds/ boll (88.1), boll weight (85.5), ginning outturn (83.8), seed index (81.3) and lint index (79.7).

High heritability along with high genetic advance was observed for seeds/boll while intermediate heritability and moderate genetic advance was observed for bolls/ plant and plant height. High heritability along with high genetic advance was reported.

Lint index and monopods/plant had low GCV and PCV indicated for effective selection and improvement in these characters needs widening of variability for these traits.

High heritability for seeds/ boll, boll weight, ginning outturn indicated the presence

Table 4. Components of variance and variability of seed cotton yield and other traits in cotton

	Herit-ability (%)	Genotypic coefficient of variations	Phenotypic coefficient of variations	Genetic advance	Genetic advance value per cent means
Days to first flower	41.342	4.147	6.450	3.742	5.493
Days to boll bursting	59.666	5.242	6.392	4.541	6.284
Plant height(cm)	52.539	5.154	7.816	6.939	8.535
Monopods/plant	35.290	2.447	4.259	2.440	5.831
Bolls/plant	63.855	5.331	7.958	4.987	7.911
Boll weight (g)	85.539	8.154	8.816	10.939	15.535
Seeds/boll	88.103	10.645	11.341	15.157	20.582
Ginning outturn (%)	83.765	9.339	10.204	10.910	17.608
Seed index (g)	81.290	7.447	8.259	8.440	13.831
Lint index (g)	79.666	1.242	1.392	2.541	3.284
Lint yield/plant (g)	62.103	4.645	6.341	3.157	6.582
Seed cotton yield/plant (g)	69.765	5.339	7.204	4.910	8.608

of additive genes effects, hence their improvement can be done through mass selection.

REFERENCES

Abbas, H. G., Mahmood A. and Ali, Q. 2013. Genetic variability, heritability, genetic advance and correlation studies in cotton (*Gossypium hirsutum* L.). *Int. Res. J. Microbiol.* **4** : 156-61.

Allard, R. W. 1960. *Principles of Plant Breeding.* John Willey and Sons, Inc. New York, London.

Anonymous, 2017. *"Annual Report 2016-2017"*. ICAR-All India Coordinated Research Project on Cotton.

Erande, C.S., Kalpande, H.V., Deosarkar, D.B., Chavan, S.K., Patil. V.S., Deshmukh, J.D., Chinchane, V.N., Anil, K., Utpal, D. and Puttawar, M.R. 2014. Genetic variability, correlation and path analysis among different traits in upland cotton (*Gossypium hirsutum* L.). *African J. Agril. Res.* **9** : 2278-86.

Farooq, J., Anwar, J., Riaz, M., Farooq, M., Mahmood, A., Shahid, A., Rafiq, M.T.H. and Ilahi, F. 2014. Correlation and Path coefficient analysis of earliness, fiber quality and yield contributing traits in cotton (*Gossypium hirsutum* L.). *The J. Animal Pl. Sci.* **24** : 781-90.

Farooq, J., Anwar, J., Riaz, M., Farooq, M., Mahmood, A., Shahid, A., Rafiq, M.T.H. and Ilahi, F. 2014. Correlation and path coefficient analysis of earliness, fiber quality and yield contributing traits in cotton (*Gossypium hirsutum* L.). *J. Anim. Plant Sci.* **24** : 2014

Rao, P.J.M. and Gopinath, M. 2013. Association analysis of Yield and Fibre quality Characters in upland cotton (*Gossypium hirsutum* L.). *Aust. J. Basic Appl. Sci.* **7** : 787-90.

Thiyagu, K., Nadarajan, N., Rajarathinam, S., Sudhakar, D., and Rajendran, K. 2010. Association and Path analysis for seed cotton yield improvement in interspecific crosses of Cotton (*Gossypium* spp). *Electronic J. Pl. Breeding.* **1** : 1001-05.

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