Correlation of Some Morphological Traits in Upland Cotton (*G. hirsutum L.*)

Shahid Nawaz[1*], Tanwir Ahmad Malik[2], Furqan Ahmad[3], Hafiz Muhammad Imran[4]
[1,2]Department of Plant Breeding & Genetics, University of Agriculture, Faisalabad Pakistan
[3]Institute of Plant Breeding & Biotechnology, MNS University of Agriculture, Multan Pakistan
[4]Cytogenetics Section, Central Cotton Research Institute, Multan Pakistan

*Corresponding Email: shahidfaizpbg@yahoo.com

DOI: 10.29322/IJSRP.9.03.2019.p8725
http://dx.doi.org/10.29322/IJSRP.9.03.2019.p8725

Abstract- Correlation is the analysis to determine mutual linkage among various traits of plants. The present research was conducted in the experimental area of University of Agriculture, Faisalabad to estimate the correlation coefficient among the nine yield and fiber quality traits. The F_2 population of two crosses 30m x Arizona queen and 30m x Lss along with parents were subjected to simple correlation analysis. The results revealed that ginning out-turn had a positive correlation with the fiber length. Number of sympodial branches had positive association with number of bolls per plant and ginning out-turn while had the negative association with the boll weight. Boll weight had the negative correlation with the ginning out turn in both the crosses. Number of bolls per plant had a positive correlation with ginning out turn. Fiber strength had a positive association with the fiber length in both the crosses. Plant height had positive correlation with number of sympodial branches, number of bolls per plant and negative correlation with boll weight in both the crosses.

Index Terms- Cotton, Correlation, Morphology, Traits, upland, fiber length

I. INTRODUCTION

Cotton is a fluffy and soft fiber that develops around the seed in boll of cotton plant. Cotton is 2nd very important oil seed and textile fiber crop. Historically, cotton belongs to Indus civilization.Pakistan is an agricultural country. Its economy depends on cotton and other agricultural products. Cotton is a major cash and fiber crop for earning the foreign exchange of the country. Pakistan's textile industry totally depends on cotton. The total production of cotton was 23.7 million tons during the year 2014-15. Cotton account for 6.9 % to value added in agriculture and 1.6% to GDP in 2013-14. Cotton was cultivated on an area of 2.96 million hectares during the year 2014-15. Production cost of the cotton is increasing due to increasing plant protection against insect pests, diseases and the crop nutrition needs [1] and results in the low return to growers. Cotton production is also affected by the abiotic stresses [2] especially on the germination and maturity stages of crop [3].

Genetic linkage is an analysis to determine mutual linkage among various traits of plants. Study of gene linkage is very useful for improving yield and fiber quality traits in cotton. Pakistan has made a remarkable progress in cotton breeding however, further improvement is possible. Correlation analysis is a suitable method for obtaining the most suitable combinations among the studied quantitative traits [4]. Correlation analysis also determines the correlation of one character with another, thus predicting the proportionate change in on character and its effects on the counterpart trait [5]. Correlation studies helps cotton breeders to develop high yielding cotton with quality fiber traits. The present study was initiated to estimate genetic linkage among various traits in cotton such as number of sympodial branches and monopodial branches per plant, plant height, number of bolls per plant, boll weight, ginning out-turn, fiber fineness, fiber strength and staple length. The information generated from this study would be helpful for plant breeders for developing high yielding varieties of cotton with quality fiber.

.

II. MATERIAL AND METHODS

The F_2 population of two crosses 30m x Arizona queen and 30m x Lss along with parents were sown in randomized complete block design with three replications in separate experiments. The experiment was conducted in the experimental area of the Department of Plant Breeding and Genetics, University of Agriculture, Faisalabad during the normal growing season 2011. Each replication contained a single row for each of the parents and twenty rows for each of the F_2 population. In each row there were 10 plants. All the recommended agronomic practices will be followed from sowing till harvest.

At maturity the data were collected from 5 guarded plants in each row on the traits (plant height, number of bolls per plant, boll weight, number of sympodial and monopodial branches, fiber fineness, staple length, fiber strength and GOT%). Fiber characteristics including staple length, fiber fineness and fiber strength from the cotton samples of the selected plants would also be recorded by using Spin lab HVI-900 from the Department of Fiber Technology, University of Agriculture, Faisalabad.

The data collected were subjected to analysis of variance in order to determine the significant differences in plant characters among the parents and F_2 generation in each cross [6]. The characters showing significant genotypic differences among the hybrids and their parents were further analyzed for correlation coefficients, calculated by the formula as outlined by Dewey and Lu (1959) using Minitab.

III. RESULTS AND FINDINGS

Data were subjected to the analysis of variance technique [6]. All the accessions showed significant differences among them. Mean values of all traits and Correlation coefficient means are illustrated in the table1 and table2.

Table 1: Mean of the parents and F_2 population for traits of crosses

30M x Arizona Queen									
Genotype	**PH**	**SB**	**MB**	**NB**	**BW**	**GOT%**	**FF**	**FS**	**FL**
30 M	90.33	8.47	1.40	19.33	3.03	37.15	4.40	22.44	29.27
Arizona Queen	91.33	8.67	1.33	18.47	2.97	36.97	4.49	23.01	29.90
30M X Arizona Queen	95.79	10.29	2.07	17.28	2.91	35.34	4.47	21.43	26.34
30M × LSS									
30M	90.33	8.47	1.40	19.33	3.03	37.15	4.42	22.44	29.27
LSS	96.07	8.60	1.40	18.53	3.04	37.23	4.44	22.71	29.28
30M x LSS	91.59	10.00	1.73	17.53	2.90	35.39	4.20	19.70	26.46

Plant height (PH, cm), number of sympodial branches (NS), number of monopodial branches (NM) number of bolls per plant (NB), boll weight (BW), ginning out-turn (GOT %), fiber fineness (FF, ug/inch), staple length (SL, mm) and fiber strength (FS, g/tex).

Plant height had positive correlation with number of sympodial branches, number of bolls per plant and negative correlation with boll weight in both the crosses. While it had positive correlation with ginning out-turn in the cross 30M x LSS and negatively correlated with monopodial branches in the cross 30M x LSS and with fiber length in the cross 30M x Arizona Queen. The results showed that due to increase in plant height, number of fruiting branches and number of bolls, ginning out-turn would be increase while monopodial

branches, boll weight and fiber length would be decreased.[7] reported the positive association of plant height with seed cotton yield. Plant height was positively associated with number of bolls and number of fruiting branches [8].

Table 2. Correlation matrix among the traits of crosses

PHSB	MB	NB	BW	GOT%	FF	FS		
SB	0.443**							
	0.810**							
MB	0.054	0.101						
	-0.292**	- 0.301**						
NB	0.757**	0.405**	-0.012					
	0.809**	0.821**	-0.303**					
BW	-0.447**	-0.243**	0.010	-0.607**				
	-0.701**	-0.699**	0.250**	-0.753**				
GOT%	0.111	0.115	-0.066	0.231**	-0.161*			
	0.239**	0.158*	-0.196**	0.273**	-0.246**			
FF	0.001	-0.000	0.084	0.076	-0.052	0.074		
	0.037	0.108	- 0.027	0.056	-0.046	0.042		
FS	-0.055	0.028	-0.209**	0.101	0.072	0.103	-0.093	
	-0.018	-0.074	-0.138*	0.096	0.080	0.131	0.186**	
FL	-0.144*	0.013	-0.210**	0.028	- 0.010	0.206**	-0.033	0.354**
	0.046	-0.051	-0.152*	0.101	0.065	0.205**	0.038	0.328**

Plant height (PH), number of sympodial branches (SB), number of monopodial branches (MB), number of bolls per plant (NB), boll weight (BW), ginning out-turn (GOT%), fiber fineness (FF), fiber length (FL) and fiber Strength (FS) in two crosses 30M x Arizona Queen (upper) and 30M x LSS (lower).

* = $p < 0.05$

** = $p < 0.01$ ns = non-significant

Number of sympodial branches had positive correlation with number of bolls per plant and negatively correlated with boll weight in the both crosses. While it had positive correlation with ginning out-turn and negative with monopodial branches in the cross 30M x LSS. The results revealed that with the increase of sympodial branches, bolls numbers and ginning out-turn are expected to increase while boll weight would decrease. Sympodial branches showed positive relationship with number of bolls and ginning out-turn [9]. Findings also proved the sufficient increase in the yield through sympodial branches[10].

Number of monopodial branches had negative correlation with fiber strength in the both crosses and also showed negative correlation with fiber length in the cross 30M x Arizona Queen. While it had positive correlation with boll weight and negatively correlated with number of bolls per plant and ginning out turn in the cross 30M x LSS. The results revealed that due to increase in number of monopodial branches, number of bolls per plant, ginning out-turn, fiber length and fiber strength is expected to decrease while boll weight was increase. Vegetative branches had negative association with plant height, fiber length and strength [11].

Number of bolls per plant had positive correlation with ginning out-turn and negative correlation with boll weight in the both crosses. The results revealed that due to increase in number of bolls, lint percentage is increase but boll weight is expected to decrease. The number of bolls had a positive association with the ginning out-turn and negative correlation of no. of bolls with boll weight [12].

Boll weight had negative correlation with ginning out-turn in both the crosses. The results showed that when boll weight is increased, ginning out turn is expected to decrease. Boll weight had negative relationship with Ginning out-turn and seed index. Ginning out-turn had positive correlation with fiber length in the both crosses. The results showed that when ginning out-turn increase, fiber length would also increase. Ginning out-turn had positive correlation with fiber length and yield of seed cotton [13]. Fiber fineness was not correlated with any of the traits in cross 30M x Arizona Queen while it had positive correlation with fiber strength in the cross 30M x LSS. Fiber fineness was positively associated with fiber strength. Fiber strength had positive correlation with fiber length. So that with increase in fiber strength than would be simultaneous in fiber length. Fiber strength had positive association with staple length and also a positive linkage with fiber length.

IV. CONCLUSION

It can be concluded from the study of such morphological traits of cotton would be helpful in improving the crop. In present study, all the morphological traits were measured carefully and efficiently and then analyzed through Pearson correlation technique. Plant height had positively correlated with other morphological traits for example number of monopodial and sympodial branches, number of bolls and ginning out turn etc. So the plant height for improving such desired traits of the plants which would help us improving yield of the crop.

REFERENCES

[1] Puspito AN, Rao AQ, Hafeez MN, Iqbal MS. Transformation and evaluation of Cry1Ac+Cry2A and GT Gene in *Gossypium hirsutum* L. Front. Plant Sci. 2015; 6(2); 24-29.

[2] Mohamed BB, Sarwar MB, Hassan S, Rashid B, Aftab B and Husnain T. Tolerance of Roselle *(Hibiscus Sabdariffa* L.) Genotype to Drought Stress at Vegetative Stage. Advancements in Life Sciences, 2015;2(2), 74-82.

[3] Afzal I, Noor MA, Bakhtavar MA, Ahmad A and Haq Z. Improvement of spring maize performance through physical and physiological seed enhancements. Seed Sci. Technol. 2015; 43:238-249.

[4] Ali MA, Nawab NN, Abbas A, Zulkiffal M and Sajjad M. Evolution of selection criteria in *Cicer arietinum*L. using correlation coefficient and path analysis. Aust. J. Crop. Sci. 2009; 3:65-70.

[5] Ahmad W,Khan NU, Parveen A, Umm-e-Aiman, Saeed M, Samiullah and Shah SA. Genetic variability and correlation analysis in Upland Cotton. Sarhad. J. Agric. 2008; 24(4): 573-580.

[6] Steel RGD, Torrie JH and Dickey DA. Principles and procedures of statistics. A biometrical approach. Singapore: 3rd Ed. McGraw Hill Book Co. Inc.

[7] Shahzad MT, Ijaz F, Khan O, Saleem B and Hassan U. Correlation, path analysis and heritability among some yield and fiber related traits of Gossypium hirsutum L. Cotton Genom. and Genet. 2015; Vol.6, No.4, 1-7.

[8] Channa HM and Ahmad M. Correlation studies in some economic and morphological characters of *Gossypium hirsutum* L. The Pak. Cottons, 1982; 26: 79-91.

[9] Natera MJR, Rondon A, Hernandez J and Pinto JFM. Geneticstudies in upland cotton. III. Genetic parameters, correlation and pathanalysis. SABRO J. Breed. Genet. 2012; 44: 112-128

[10] Hussain SS, Azhar FM and Mahmood I. Path coefficient and correlation analysis of some important plant traits of *Gossypium hirsutum* L. Pak. J. Biol. Sci. 2000; 3(9): 1399-1400.

[11] Ahuja SL, Dhayal LS and Parkash R. A correlation and path coefficient analysis of components in *G. hirsutum* L. hybrids by usual and fiber quality grouping. Turk. J. Agric. 2006; 30: 317-324.

[12] Karademir C, Karademir E, Ekinci R and Genecer O.Correlation and path coefficient analysis between leaf chlorophyll content, yield and yield components in cotton. Not. Bot. Hort. Agrobot. Cluj. 2009; 37: 241-244.

[13] Khan MA and KhanAK. Correlation between certain economic characters in cotton. Pak. J. Agric. Sci. 1996; 3: 226-233.