Asian Journal of Plant Sciences

ISSN 1682-3974

science alert

ANSInet
an open access publisher
http://ansinet.com

Asian Journal of Plant Sciences 5 (2): 341-344, 2006
ISSN 1682-3974

Correlation and Path Coefficient Analysis for Earliness and Yield Traits in Cotton (*G. hirsutum* L.)

[1]Muhammad Iqbal, [1]Khezir Hayat, [1]Rao Sohail Ahmad Khan, [1]Attiq Sadiq and [2]Noor-ul-Islam
[1]Cotton Research Station, Multan
[2]Cotton Research Institute, Faisalabad, Pakistan

Abstract: The objective of this study was to get information about a character that is useful for selection in segregating generations for improving seed cotton yield. The present study was conducted to determine correlation and path coefficient analysis of earliness and yield components of upland cotton. The results showed that node of first fruiting branch, monopodial branches/ Plant, boll number and boll weight was positively and significantly correlated with yield in present genetic material understudy. Similarly path coefficient analysis revealed that node of first fruiting branch, monopodial branches/ Plant, boll number and boll weight had maximum direct positive effect on seed cotton yield, whereas the traits ginning out turn percentage (GOT%) and staple length had the direct negative effect on seed cotton yield. The results indicated that for evolving a superior genotype possessing all the three basic characteristics i.e., earliness, high yield and improved fiber quality of international standard, breeder had to use reciprocal recurrent selection method or modified back cross or three- way cross within genetic material under study. The result of present study indicated that for evolving a superior genotype possessing earliness, high yield, breeder should focus on improving no. of bolls and boll weight with lower no. of monopodial branches and node of first fruiting branch.

Key words: Correlation, path coefficient, cotton, earliness, yield traits, *Gossypium hirsutum* L.

INTRODUCTION

Expression of various traits is oftenly changed as the changing breeding material and environment. Therefore, the information of character associations between the traits themselves and with the yield is important for the breeding material subjected to selection for high yielding genotypes. Considerable emphasis has been given placed upon the inter relationships between yield and yield components in cotton. Fonseca and Paterson (1968) found that 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. The true picture of correlation between seed cotton yield and traits is reflected from direct effect of that trait which will help for identifying the traits that contribute directly to improve seed cotton yield. Tyagi *et al.* (1998) reported that boll number and weight contributed directly towards seed cotton yield. Baloch *et al.* (1992) revealed that phenotypic correlation coefficient between boll number and seed cotton yield was strong and positive. Weijun (1998) showed that earliness is very significantly and positively correlated with first sympodial node, which can be used to select for earliness in cotton. Godoy and Palomo (1999) reported that the least determinate and slowest maturing type had the highest lint yield. Yield generally decreased as determinacy increase and rate of maturity accelerated. Iqbal *et al.* (2003) concluded that NFB, monopodial branches/ plant, bolls/ plant and boll weight were positively and significantly correlated with yield while no. of bolls/plant and boll weight had maximum direct positive effect on yield of seed cotton. The present studies were conducted to investigate the direct and indirect effect of various yield components on seed cotton yield through path coefficient analysis for identification of traits that will be helpful for selection in segregating generations for high seed cotton yield. Bhatt (1972) stated that only correlation studies not clearly reveal such sort of information and inadequate knowledge of inter-relationship of heritable traits may lead to negative results.

MATERIALS AND METHODS

The experiment was conducted at Cotton Research Station, Multan. The ninety number of cross were made in 2003 involving parent having wide genetic diversity. The F1 generation was raised during 2004 in non-replicated

Corresponding Author: Muhammad Iqbal, Cotton Research Station, Multan, Pakistan

design in experimental farm at Cotton Research Station, Multan. The F1 populations of each cross-occupied 8 rows with 30 feet long keeping plant to plant distance 30 cm and row to row 75 cm. The sowing was done on furrow beds manually. All the recommended/agronomic practices were adopted and pesticides/ chemicals were used for the management of insects as required after pest scouting. The data was recorded of 160 guarded plants in each cross for the following traits (a) node of fruiting branch, (b) monopodial branches/ plant (c) No. of bolls/plant (d). Boll weight (g), (e) yield/plant (g), (f) GOT% and (g) Staple length (mm). The interrelationships among these traits were analysed by computing simple correlation coefficient by using the computer programme Excel- 98. The correlations were further analysed by the path coefficient method given by Dewey and Lu (1959).

RESULTS AND DISCUSSION

Correlation: The simple correlation coefficients were determined for all the possible character combinations with the objective to drive information about the relationship and intensity among different character combinations (Table 1).

Node of first fruiting branch was positively and significantly correlated with the number of monopodial branches and boll number. Weijun (1998) working on upland cotton also found similar results. Significant positive correlation was observed for monopodial branches per plant with boll number and seed cotton yield /plant while No. of bolls/plant is negatively correlated with boll weight and positively correlated with the seed cotton yield/plant and GOT (Table 1). These results were confirmatory by Baloch *et al.* (1992) who reported strong and positive phenotypic correlation between boll number and seed cotton yield. Tariq *et al.* (1992) found highly positive and significant correlation of boll number and boll weight with seed cotton yield.

Path coefficient

Node of First Fruiting Branch Vs Seed Cotton Yield: The correlation of NFB with seed cotton yield per plant (Table 2) was positive and significant and its direct effect on yield of seed cotton was also positive (0.12). The positive indirect effects were contributed through monopodial branches/plant (0.033), No. of bolls/plant (0.004), boll weight (0.0003) and GOT (0.162). The negative indirect effects were produced via staple length (-0.125). The positive indirect effect via NFB, GOT was maximum while other characters are negligible. The negative indirect effect (-0.125) via staple length indicated that for improving the seed cotton yield breeder should also be conscious for the quality of fiber (Table 2). Therefore, positive correlation and direct effect of NFB on seed cotton yield indicated that selection based on this trait will be helpful for improving seed cotton with earliness in segregating generation of breeding material under study. The results are in accordance to Weijun (1998).

Number of monopodial branches / plant vs seed cotton yield: Although the correlation of monopodial branches/plant with the seed cotton yield was significantly positive (Table 1), but its direct effect on seed cotton yield/plant was very small (0.067). It was further observed that positive indirect effect contributed by node of first fruiting branch, No. of bolls/plant, boll weight and GOT. The contribution of node of first fruiting branch (0.007) and boll weight (0.004) was negligible (Table 2). The negative indirect effects were produced via staple length (- 0.12). The positive indirect effect of No. of bolls/plant showed that this traits can be helpful in selection of genotypes with improved seed cotton yield/plant from present genetic material. Godoy and Palomo (1999) also provide same results.

Number Of Bolls / Plant Vs Seed Cotton Yield: An examination of Table 1, it is clearly indicated that positive correlation (0.211) exists between No. of bolls/plant and seed cotton yield/plant. The direct effect of No. of bolls/plant was positive (0.034). The positive indirect effect was contributed through node of first fruiting branch and no of monopodial branches/plant. Negative indirect effects were produced via boll weight, GOT, staple length (Table 2). The positive indirect effect via NFB and M.B showed that as the NFB lies at lower level, then No. of sympodial branches which bear bolls directly will be recorded earlier, due to he reason the lower NFB value of genotype might bear more No. of bolls and contributed for seed cotton yield. The positive correlation (0.211) of No. of bolls/plant with seed cotton yield/plant and the value of its direct effect in seed cotton yield indicated a picture of association between these two characters. Therefore, the positive direct effect of No. of bolls/plant on seed cotton yield reflected that selection for No. of bolls/plant for the improvement of seed cotton yield in material under study is possible. Iqbal *et al.* (2003), Tyagi *et al.* (1998) also provide same results.

Boll Weight Vs Seed Cotton Yield: The correlation of average boll weight with seed cotton yield (Table 1) was positive (0.211) and the direct effect of boll weight was also positive (0.021) Table 2. The positive direct effect were contributed through node of first fruiting branch,

Table 1: Correlation among different characters

	Monop./plant	Boll No.	Boll wt.	Yield/Plant	GOT(%)	Staple length
NFB	0.897*	0.141*	0.015	0.194*	-0.094	0.067
Monopodial		0.199*	0.022	0.244*	-0.098	0.119
Boll No.			-0.320*	0.211*	0.161*	0.074
Boll wt.				0.211*	-0.049	-0.136
Yield/plant					-0.033	-0.002
GOT						0.054

* = Significant

Table 2: Direct (Bold) and indirect effect of six characters towards seed cotton yield

	NFB	Monopodial Branches/Plant	Boll No.	Boll Weight	GOT	Staple length	Correlation with seed cotton yield
NFB	0.120	0.033	0.004	0.0003	0.162	-0.125	0.194
Monopodial branches/plant	0.007	0.067	0.271	0.0040	0.015	-0.120	0.244
Boll No.	0.015	0.017	0.034	-0.0060	-0.025	-0.130	0.211
Boll wt.	0.001	0.008	-0.017	0.0210	0.007	0.191	0.211
GOT	-0.011	-0.003	0.245	-0.0010	-0.160	-0.100	0.033
Staple length	0.008	0.005	0.007	-0.0160	0.002	-0.008	-0.002

No. of monopodial branches/plant, GOT and staple length. The negative indirect effects were produced via No. of bolls/plant. The positive direct effect of average boll weight reflected its effectiveness in a selection. On the basis of greater boll size in the present research material for improving seed cotton yield will not be useful as the negative association between bolls No. and boll weight exist and both these traits has direct positive effect on seed cotton which indicated that selection for these traits should be made carefully. Tyagi *et al.* (1998) and Iqbal *et al.* (2003) also found that boll weight contributed directly to improve seed cotton yield.

Ginning outturn vs seed cotton yield: The correlation of GOT with seed cotton yield/plant was negative but not significant and its direct effect on yield of seed cotton was negligible (-0.16) Table 2. The only positive indirect effect produced via No. of bolls/plant (0.245) indicated that No. of bolls can be helpful in direct selection to improve GOT. Negative indirect effects were produced through node of first fruiting branch, No. of monopodial branches/plant, boll weight and staple length (Table 2). On the basis of GOT, direct selection in the segregating material using parents studies will not be useful. It was further concluded that seed cotton yield/plant and GOT were not effected each other and either trait could be considered in breeding material under study. The results suggested that genotype could be selected with high GOT with other economic traits i.e., seed cotton yield and fiber quality character. Godoy and Palomo (1999) reported same results.

Staple length vs of seed cotton yield: A critical view revealed that the simple correlation of staple length with seed cotton yield (Table 1) was negative. The direct effect of staple length on seed cotton yield was also negative (-0.08). The indirect effect via node of first fruiting branch/plant (0.005), number of bolls/plant (0.007) and GOT (0.002) was positive but negligible. The staple length has its major influence via negative effect of GOT (-0.016). The correlation and the direct effect of staple length on seed cotton yield was negative which indicated true relationship between these traits and selection through this trait will affect the seed cotton yield negatively, under genetic material to be studied. Waldia *et al.* (1979) also provided same results.

The traits node of first fruiting branch, number of monopodial branches/plant, number of bolls/plant and boll weight contributed directly toward seed cotton yield. As they have direct and positive effects on it where as the staple length is being important component of quality traits of fiber has negative direct effect. The progress in breeding by selection for components of seed cotton yield/plant may be limited due to the strong negative association of quality traits of fiber with seed cotton yield and yield components. As the fiber traits should be at acceptable level of textile industry. From this study, it is concluded that for improving, the yield of cotton, breeder should focus for improving the boll number per unit area and boll weight with earliness. The NFB at low node and less number of monopodial branches/plant for selection of genotype having earliness.

REFERENCES

Baloch, M.T., A.R. Lakho and M.Y. Salangi, 1992. Unidirectional and alternate pathway impacts of yield components on seed cotton yield of *G. hirsutum* L. The Pak. Cotton, 36: 107-114.

Bhatt, G.M., 1972. Significance of path coefficient analysis in determining the nature of character association. Euphtica, 22: 338-343.

Dewey, D.R. and K.H.Lu, 1959. A correlation and path coefficient analysis of components of erects wheat grass production. Argon. J., 51: 515-518.

Fonseca, S. and F.L. Paterson, 1968. Yield components habitability's and interrelation ship in winter wheat. Crop Sci., 8: 614-617.

Godoy, A.S. and G.A. Palomo, 1999. Genetic analysis of earliness in upland Cotton (*G. hirsutum* L.). II yield and lint percentage. Euphytica, 105: 161-166.

Iqbal., M.M.A. chang, M.Z. Iqbal, M. Hussain, A. Nasir and N. Islam, 2003. Correlation and path coefficient analysis of earliness and agronomic characters of upland cotton in Multan. P. J. Agron., 2: 160-168.

Tariq, M., M.A. Khan and G. Idrees, 1992. Correlation and path coefficient analysis in upload cotton. Sarhad J. Agric., 8: 335-341.

Tyagi, A.P., B.R. Mor and D.P. Singh, 1998. Path analyses in upland cotton (*G. Hirsutum* L). Ind. J. Agric. Res., 22: 137-142.

Waldia, R.S., D.S. Jatasra and B.N. Dahiya, 1979. Correlation and path coefficient analysis of yield components in *G. arboreum* L. Ind. J. Agric. Sci., 49: 3- 34.

Weijun, S., 1998. Research on the correlation between earliness and agronomic characters of upland in Xinjiang. China Cotton, 25: 17-18.