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ASSOCIATION AND PATH COEFFICIENT ANALYSIS OF VARIOUS COMPONENT TRAITS WITH SEED COTTON YIELD IN THE F_2 POPULATION OF *DESI* COTTON

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ABSTRACT
A study on association and path coefficient analysis for seed cotton yield and its component traits in an F_2 population of the cross *QTP 16 × ASa 151* was conducted at Botanical garden, University of Agricultural Sciences, Dharwad during *kharif* 2016. The segregating population was evaluated for eight quantitative characters. Seed cotton yield recorded significant positive association with number of bolls and number of sympodia per plant. Path coefficient analysis of seed cotton yield revealed the maximum direct contribution from number of bolls per plant and boll weight. The number of bolls per plant had maximum indirect contribution through number of sympodia per plant. These characters showing significant association with seed cotton yield are useful for indirect selection in segregating generations for improving seed cotton yield.

KEY WORDS: Seed cotton yield, its component traits, indirect selection, association and path coefficient analysis.

INTRODUCTION
Improvement of yield, the most important target in many crops can be achieved by indirect selection through other easily observable characters. But this needs a good understanding of the association of different traits with seed cotton and association among themselves. The association, direct and indirect effects of different traits vary with breeding material and environment. Therefore the information on the association of various traits among themselves and with seed cotton yield provides useful information for successful breeding programme. In plant breeding correlation studies pave the way to know the association prevailing between highly heritable characters with most economic characters and give better understanding of the contribution of each trait in building up the genetic makeup of the crop. Practically all the metric traits in plants are interdependent and interrelated, if selection is practiced considering only one trait, naturally the others also would be affected. In such cases the knowledge of association between characters is quite helpful to plant breeders to formulate their selection strategy based on two or more traits simultaneously. Since, seed cotton yield and fibre quality traits are complex quantitative characters, direct selection may not be a reliable approach as these traits are influenced by environmental factors. Therefore, it becomes essential to identify the component characters through which yield improvement could be obtained. Though correlation gives information about the contributing component of these complex characters, it does not provide an exact picture of relative importance of direct and indirect contribution of the component characters. Path coefficient analysis is an important tool for partitioning the correlation coefficient into direct and indirect effects. Thus, correlation in combination with path analysis would give better insight into the cause and effect relationship between different character pairs. Selection for a specific character is known to result in correlated response in certain other characters, generally plant breeders practice selection for one or two attributes at a time. Then it becomes important to know the effect of selection on other characters. Study of nature of association of component traits with seed cotton yield and among themselves in F_2 populations and study of the contribution of components towards seed cotton yield through path analysis provides an opportunity for indirect selection of these component traits to improve complex trait like yield.

MATERIALS & METHODS
The material for the present study was generated in the Botany garden, Department of Genetics and Plant Breeding, College of Agriculture, University of Agricultural Sciences, Dharwad during *kharif* 2015 by crossing two stabilized lines of *G. arboretum* species. The experimental material for the present study involved F_2 cross which was developed by selfing F_1 developed by crossing two genetically diverse genotypes *viz*. *QTP 16 × ASa 151.* The F_2 generation was raised during *kharif* 2016. The experiment was carried without replication as it was segregating material. The inter row spacing was 60 cm and inter plant spacing was 30 cm. Recommended package of practices (Anon, 2016) were followed to raise the crop. The observations were recorded on each plant in F_2 and 20 plants in each of the parents, F_1s and checks for seed cotton yield and its component traits *viz.* plant height, number of sympodia per plant, number of bolls per plant, boll weight, number of locules per boll, seed cotton yield per plant, ginning outturn, lint index and seed index. Simple correlations were computed by using the formula given by Weber and Moorthy (1952). Correlation coefficients were compared against Table 'r' values (Fisher and Yates, 1963) at (n-2) df at the probability

levels of 0.05 and 0.01 to test their significance. Path coefficient analysis was carried out using the simple correlation coefficient to know the direct and indirect effects of the yield components on seed yield as suggested by Wright (1921) and illustrated by Dewey and Lu (1959). Scales for path coefficients as suggested by Lenka and Mishra were followed in the current study.

RESULTS & DISCUSSION

Association of seed cotton yield with various seed cotton yield attributing traits

Amelioration of yield is the ultimate aim of a plant breeder in any crop improvement programme and this can be achieved through gaining an insight in the behaviour of component traits that are associated with yield. The pattern of association assumes significance when formulating selection strategies. Yield of genotype, is a function of number of characters. Therefore, direct selection for yield itself may not be effective in improving the productivity potential of the crop. The genetic correlation between traits having less environmental influence is often used to assess the consequences of selecting for one or more characters. Hence, association analysis was done for seed cotton yield and yield contributing traits in segregants of two F_2 populations and discussed as follows. The phenotypic correlation of seed cotton yield with various component traits in this population are presented in Table 1.

At phenotypic level, seed cotton yield per plant was positively and significantly associated with number of bolls per plant (0.9316), number of sympodia per plant (0.2377) and boll weight (0.1693) whereas seed cotton yield per plant was negatively and significantly associated with seed index (-0.1007). Similar results were reported by Neelima (2002), Kaushik *et al.* (2006), Ladole and Meshram (2000), Gururaj (2006) and Leela Pratap *et al.* (2007). Number of bolls per plant exhibited significant positive association with seed cotton yield in the population under consideration. It indicated the possibility of yield improvement by selection of genotypes with high number bolls. Sympodial branches are fruiting branches and are very crucial in deciding the seed cotton yield capacity of cotton.

TABLE 1: Correlation analysis in the F_2 population of cross QTP 5 × *ASa 151*

	PH	NS	NB	BW	NL	GOT	SI	LI	SCY
PH	1.0000	0.2792**	0.0689	0.0148	0.0232	0.1085	-0.0104	0.0833	0.0764
NS		1.0000	0.2350 **	0.0294	-0.0452	-0.0298	0.0164	-0.0216	0.2377**
NB			1.0000	-0.1685 *	0.0387	0.0990	-0.0788	0.0414	0.9316**
BW				1.0000	0.0503	-0.0510	-0.0283	-0.0612	0.1693*
NL					1.0000	-0.0014	-0.0064	0.0011	0.0550
GOT						1.0000	-0.0422	0.8162 **	0.0808
SI							1.0000	0.5358 **	-0.1007*
LI								1.0000	0.0128
SCY									1.0000

TABLE 2: Path analysis in the F_2 population of cross QTP 16 × *ASa 151*

	PH	NS	NB	BW	NL	GOT	SI	LI	PCC with SCY
PH	0.0049	0.0014	0.0003	0.0001	0.0001	0.0005	-0.0001	0.0004	0.0764
NS	-0.0016	-0.0057	-0.0013	-0.0002	0.0003	0.0002	-0.0001	0.0001	0.2377**
NB	0.0681	0.2323	0.9882	-0.1665	0.0382	0.0978	-0.0778	0.0409	0.9316**
BW	0.0050	0.0098	-0.0565	0.3355	0.0169	-0.0171	-0.0095	-0.0205	0.1693*
NL	0.0000	0.0000	0.0000	0.0000	-0.0005	0.0000	0.0000	0.0000	0.0550
GOT	-0.0001	0.0000	-0.0001	0.0001	0.0000	-0.0011	0.0000	-0.0009	0.0808
SI	0.0001	-0.0002	0.0010	0.0004	0.0001	0.0006	-0.0132	-0.0071	-0.1007*
LI	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0001	-0.0001	-0.0001	0.0128

Residual effect = 0.1494

PH – Plant height
NS – Number of sympodia per plant
NB – Number of bolls per plant
BW - Boll weight
SCY – Seed cotton yield
NL- Number of Locules per boll
GOT – Ginning outturn
SI – Seed index
LI – Lint index

* - Significant at 5 per cent level of probability
** - Significant at 1 per cent level of probability

Association among the various seed cotton yield attributing traits:

Plant height exhibited positive and significant association with number of sympodia per plant (0.2792). Number of sympodia exhibited positive and significant association with number of bolls per plant (0.2350). Boll number showed negative and significant association with boll weight (-0.1685). Ginning Outturn (0.8162) and seed index (0.5358) had exhibited positive and significant association with lint index.

Direct and indirect effects of various components traits on seed cotton yield per plant:

Mere estimation of correlation coefficient does not give an idea about the real contribution of an independent character to the yield. Path coefficient is a tool, which provides an effective measure of direct and indirect cause of association and depicts the importance of each factor involved in contributing towards yield. In order to obtain such developmental relations, the cause and effect relationship between seed cotton yield *per se* and yield components were studied in cotton through path coefficient analysis, the results of which are discussed below. The direct and indirect effects of various components traits on seed cotton yield per plant are presented in Table 2 and depicted in Fig. 1.

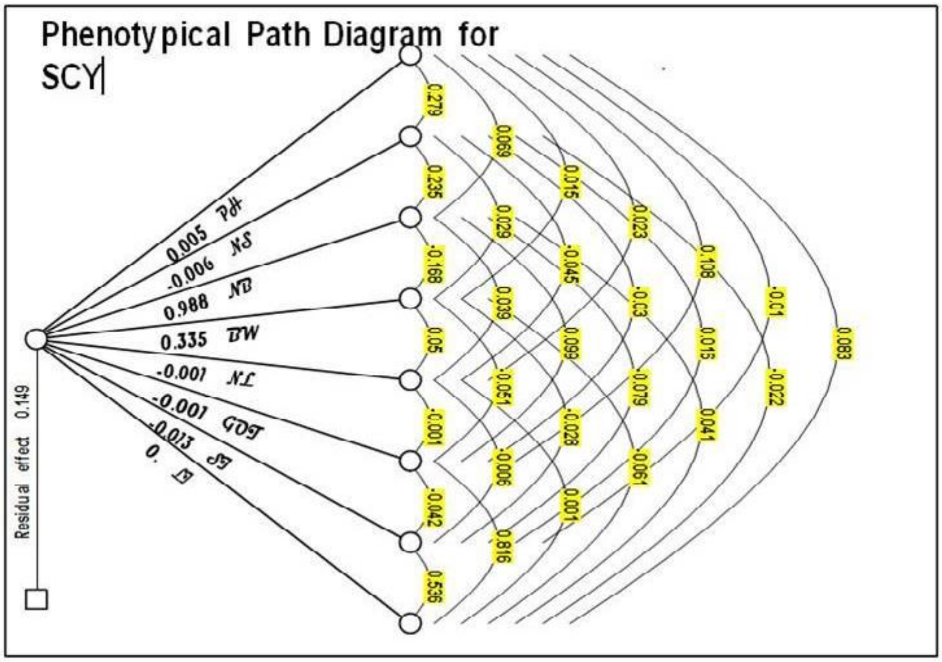

FIGURE 1

The direct effect of number of bolls per plant on seed cotton yield per plant was positive and high (0.9882). The indirect contribution of number of bolls per plant *via* number of sympodia was moderate (0.2323) and number of bolls per plant exhibited low negative indirect via boll weight (-0.1665)**.** The trait boll weight exhibited high positive direct effect on seed cotton yield per plant (0.3355). The direct and indirect effects of all other component traits on seed cotton yield were negligible. Similar reports were reported by Rahul *et al.* (2009), Pujer *et al.* (2014), Srinivas *et al.* (2015), Bayyapu *et al.* (2015) and Muhammad *et al.* (2016).

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