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Research Note

Trait association and path coefficient analysis for yield and yield attributing traits in sesame (*Sesamum indicum* L.)

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Abstract:
Correlation and path coefficient analysis was performed in one hundred and twenty F_4 families of sesame, during *kharif*, 2010 on ten quantitative traits: days to 50 per cent flowering, days to maturity, plant height, distance from ground to first capsule, number of branches per plant, number of capsules per plant, capsule length, number of seeds per capsule, 1000 seed weight and seed yield per plant. Seed yield per plant showed significant positive association with number of capsules, number of seeds, number of branches per plant, plant height and 1000 seed weight. The magnitude of correlation was the highest in case of number of capsules per plant(r=0.7302). Number of capsules per plant, number of seeds per capsule and 1000 seed weight had high and positive direct effect on seed yield. The indirect effect of number of capsules per plant via days to 50% flowering, plant height, number of branches per plant on seed yield was high and positive. Selection for these characters may be useful in increasing seed yield in sesame.

Key words: Sesame, correlation, path coefficient analysis, yield components

Sesame (*Sesamum indicum* L.) is one of the important oilseed crops. It is described as the "Queen of oil crops" because of its high oil content (38-54%). Although sesame is widely used for different purposes, the productivity has been miserably low compared to other oilseed crops. Sesame growing area is shrinking due to several reasons (Yoll *et al*., 2010). Ironically, the demand for sesame seed is increasing year after year. Selection for high yielding types with wider adaptability shall be not only very useful but shall help in increasing the production both locally and globally (Ashri, 1998). Genetic improvement of seed yield, alone, is not possible through phenotypic selection because of polygenic nature and low heritability. Hence, resorting to selection through correlated response entailing several contributing factors which influence seed production both directly and indirectly shall be most appropriate (Rauf *et al.*, 2004).

Correlation between different characters is an important aspect required for better planning of selection programme. Pleotrophy and linkage are the major causes for the basic association of two traits. But it is not easy to determine the contribution of these causes to the association. Although the estimates of correlation coefficient are helpful in determining the components of complex traits such as yield they do not provide an exact picture of the relative importance of direct and indirect influence of each of them. But the techniques of path analysis introduced by Wright (1921 &1923) appears to be helpful in elucidating pattern of association through direct and indirect effect.

The understanding of the relationship between yield and its components is crucial for selection process and this relationship can be explained by means of correlation and path coefficient analyses. With this in view, a study was conducted to determine the interrelationship and contribution of certain yield components towards seed yield in sesame.

The material for the study consisted of 120 F_4 progenies of sesame (*Sesamum indicum* L.) derived from straight and reciprocal crosses involving RT-273 and Gulbarga local black (GLB). Of 120 F_4 families, 78 families were straight cross (RT273 X GLB) and 42 families were from reciprocal cross (GLB X RT273). The experiment was conducted at UAS Raichur campus during *kharif*-2010 in an augmented design. Seeds of F_4 progenies along with 9 checks viz., GLB, RT-273, W-II, TKG-370, DSS-9, SSD-4, JTS-8, Gouri-173 and Subhiksha were dibbled in each row at a depth of about 2 cm

with spacing of 45 cm between rows and 20 cm between the plants. Recommended cultural practices and plant protection were fallowed throughout the crop period. Data on ten quantitative characters: days to 50 per cent flowering, days to maturity, plant height, distance from ground to first capsule, number of branches per plant, number of capsules per plant, capsule length, number of seeds per capsule, 1000 seed weight and seed yield per plant were recorded from a minimum of five plants in each family. The estimates of correlation coefficient and path coefficient analysis were calculated by analyzing data using INDOSTAT statistical package. A positive correlation was recorded between seed yield with all the characters, but significant positive correlation was observed for the characters *viz.*, number of capsules per plant, number of seeds per capsule, number of branches per plant, plant height and 1000 seed weight (Table 1). The magnitude of correlation with seed yield was highest in case of number of capsules per plant (r= 0.7302). Similar results were reported by Shadakshari (1984), Sharma and Chauhan (1984), Reddy et al. (1984), Ranganatha (1985), Godawat and Gupta (1986), Bhuvan and Sharma (2004), Mothilal (2005), Siddiqui *et al*. (2005) and Vidhyavathi *et al*. (2005), This clearly indicates that increased capsule number per plant will increase seed yield and hence while making selection for yield more emphasis should be given to this character. Bhuvan and Sharma (2004), Mothilal (2005), Siddiqui *et al*. (2005), Vidhyavathi *et al*. (2005), Tomar *et al*. (1999) and Arriel *et al*. (1999) reported similar results for number of seeds per capsules, while the characters *viz.*, days to 50% flowering, days to maturity, distance from ground to first capsule, capsule length, exhibited positive non significant correlation. Number of capsules per plant had positive correlation with all other characters studied except 1000 seed weight. Similar results have been reported by Sumathi *et al.* (2007).

Path coefficient analysis (Table 2) revealed that number of capsules per plant had maximum direct effect on seed yield per plant (0.7214) followed by 1000 seed weight(0.4880) and number of seeds per capsule(0.2472). Rong and Wu (1989), Bhele *et al*. (1987), Tomar *et al*. (1999) and Mothilal (2005) also found similar observations. Other character days to 50 per cent flowering had positive direct effect. Similar results have been reported by Bhele *et al*. (1987), Tomar *et al*. (1999) and Pathak and Dixit (1986). But, the trait like plant height showed positive but low direct effect on seed yield. Negative direct effects were recorded for distance from ground to first capsule, number of days to maturity, capsule length, indicating that a genotype that produce capsule close to ground shall be high yielding. These results are in conformity with the findings of Godawat and Gupta (1986), Li (1988), Li and Zhang (1991) and Janardhanan *et al*. (1981). The indirect effect of days to 50% flowering, days to maturity, plant height, distance from ground to first capsule, number of branches per plant**,** capsule length, number of seeds per capsule via other characters was not considerable but the indirect effect of number of capsules per plant via days to 50% flowering, plant height, number of branches per plant on seed yield was high and positive, while it exerted a negative indirect effect via 1000 seed weight was also high followed by 1000 seed weight also exerted positive indirect effect via number of seeds per capsule was high.

In the present study, the residual effect (0.37) was high in magnitude which showed that some other important yield contributing characters which contributed to yield had to be included. This was in accordance with Sumathi *et al.* (2007). From the above results, it could be inferred that the characters, number of capsules per plant, number of seeds per capsule and 1000-seed weight should be given prime importance as they revealed a significant positive correlation coefficient and a high positive direct effect compared to other traits.

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Table 1. Correlation coefficient between different yield components in sesame

Attributes	50% days to flowering	Days to maturity	Plant height (cm)	Distance from ground to first capsule (cm)	No. of branches /plant	No. of capsules/ plant	Capsule length(cm)	No. of seeds/ capsule	1000seed weight (g)	Seed yield per plant(g)
50% days to flowering	1.0000	0.8082**	0.4183**	0.0062	0.1163	0.2652**	-0.1220	-0.2651**	-0.0470	0.1226
Days to maturity		1.0000	0.1956*	0.0590	-0.0861	0.0408	-0.1316	-0.1140	0.0992	0.0110
Plant height (cm)			1.0000	0.4005**	0.3025**	0.5568**	-0.1278	-0.0536	-0.0540	0.3831**
Distance from ground to first capsule(cm)				1.0000	-0.0203	0.1300	-0.1369	-0.0131	0.2124*	0.1030
No. of branches /plant					1.0000	0.4830**	0.0275	-0.0260	-0.0719	0.4064**
No. of capsules /plant						1.0000	0.0382	0.1057	-0.1410	0.7302**
Capsule length(cm)							1.0000	0.1332	0.0360	0.0797
No. of seeds/ capsule								1.0000	0.2160*	0.4150**
1000seed weight (g)									1.0000	0.3992**
Seed yield per plant(g)										1.0000

****= S**ignificant at 1% ***** = Significant at 5%

Table 2. Direct (diagonal) and indirect effects of 9 characters on seed yield per plant at phenotypic level in sesame

	X1	X2	X3	X4	X5	X6	X 7	X8	X9	Correlation with seed yield
X1	**0.0806**	0.0652	0.0337	0.0005	0.0094	0.0214	-0.0098	-0.0214	-0.0038	0.1226
X2	-0.0789	**-0.0977**	-0.0191	-0.0058	0.0084	-0.0040	0.01280	0.0111	-0.0097	0.0110
X3	0.0083	0.0039	**0.0199**	0.0080	0.0060	0.0111	-0.0025	-0.0011	-0.0011	0.3831**
X4	-0.0006	-0.0056	-0.0377	**-0.0942**	0.0019	-0.0123	0.0129	0.0012	-0.0200	0.1030
X5	0.0086	-0.0064	0.0224	-0.0015	**0.0741**	0.0358	0.0020	-0.0019	-0.0053	0.4064**
X6	0.1913	0.0295	0.4017	0.0938	0.3484	**0.7214**	0.0276	0.0762	-0.1017	0.7302**
X7	0.0017	0.0018	0.0018	0.0019	-0.0004	-0.0005	**-0.0138**	-0.0018	-0.0005	0.0797
X8	-0.0655	-0.0282	-0.0132	-0.0032	-0.0064	0.0261	0.0329	**0.2472**	0.0534	0.4150**
X9	-0.0229	0.0484	-0.0264	0.1036	-0.0351	-0.0688	0.0176	0.1054	**0.4880**	0.3992**

Residual effect = 0.37

Where,

X1= Days to 50% flowering
X2= Days to maturity
X3= Plant height (cm)
X4= Distance from ground to first capsule(cm)
X5= Number of branches per plant
X6= Number of capsules per plant
X7= capsule length (cm)
X8= Number of seeds per capsule
X9=1000 seed weight (g)