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Correlation Path Analysis Studies in Sesamum

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A B S T R A C T

The present investigation was carried out to study the correlation between seed yield and yield contributing characters and to know the direct and indirect effects of different traits on seed yield. Forty-two genotypes of Sesamum were study the observations were recorded for the characters *viz;* days to 50 % flowering, days to maturity, plant height at maturity (cm), number of branches per plant, number of capsules per plant, number of seeds per capsule, 1000 seed weight (g), oil content (%) and seed yield per plant (g). Correlation study revealed that seed yield per plant had positive and significant correlations with number of capsules per plant, number of branches per plant, number of seeds per capsule, plant height at maturity, oil content and non-significant positive correlations with days to maturity. While, it was showed negative and significant correlations with days to 50% flowering. Further analysis by path coefficient method indicated that at genotypic, phenotypic and environmental level, 1000 seed weight, number of capsules per plant, number of branches per plant, oil content and number of seeds per capsule exerted high positive direct effect on seed yield per plant indicating that they are the most important yield related traits in sesame. Path analysis revealed that number of seeds per capsule had the highest positive direct effect (0.7276). It exhibited positive and significant correlation with seed yield per plant indicating its true and perfect association with seed yield. In addition to the number of capsules per plant, 1000 seed weight, oil content had positive direct effect on seed yield per plant. Days to maturity, number of branches per plant, plant height at maturity and days to 50% flowering had negative direct effect on the seed yield per plant. Positive and direct effects were exerted by, number of seeds per capsule, number of capsules per plant, 1000 seed weight and oil content on seed yield per plant. While, negative direct effect were exerted by days to maturity, number of branches per plant, plant height at maturity and days to 50% flowering on seed yield per plant. Characters, number of seeds per capsule and number of capsules per plant had positive direct effects and strong correlation with seed yield per plant indicating that they are more important yield related traits at both genotypic and phenotypic level.

Introduction

The knowledge of the interrelationships between yield and yield components is necessary; determination of correlation among plant characteristics is a matter of considerable importance in selection of correlated response. Correlation studies between yield and other traits of the crop will be of interest to breeder in planning the

hybridization programme in evaluating the individual plant in segregating populations. But it does not give an exact position of the relative importance of direct and indirect effects of various traits on yield and any other attributes. Path coefficient analysis is useful for evaluating the relative contribution of each component traits both direct and indirect to the yield. Path coefficient analysis helps to specify the cause and effect and to measure their relative significance. Following correlation analysis, the path coefficient analysis would provide a true picture of genetic association among different traits (Bhatt, 1973). So, correlation in combination with the path coefficient analysis quantify the direct and indirect contribution of one characteristics upon another (Dewey and Lu, 1959).

Materials and Methods

The present investigation was carried out to assess the genetic correlation and path analysis in sesame. The study was conducted during *kharif* 2019 at Agriculture Botany Section Farm, College of Agriculture, Dhule. Five competitive plants per genotypes in each replication were randomly selected for purpose of recording observations on different characters (except days to 50% flowering and days to maturity) and their averages were used in the statistical analysis. Days to 50 % flowering and days to maturity was measured on plot basis.

Analysis of covariance was carried out by taking two characters at a time. The genotypic and phenotypic covariances were calculated by Singh and Chaudhari (1977). Correlation co-efficient does not provide an exact picture of the relative importance of direct and indirect influence of each of the component character. Hence, to establish a cause and effect relationship, path co-efficient analysis was carried out and the simple correlation co-efficients (genotypic) were partitioned into direct and indirect effect by path analysis as suggested by Dewey and Lu (1959).

Results and Discussion

In the improvement of any crop, yield is the most important character that has to be taken into consideration. The knowledge of inter-relationship among the characters especially with yield is therefore useful to the plant breeder for improving the efficiency of selection programme. The phenotypic correlation indicates the extent of the observed relationship between two characters. This does not give a true genetic picture of relationship because it indicates the effects of both heredity as well as environment influences. The genotypic correlations provide estimate of an inherent association between genes controlling by two characters. Hence, it is of greater significance and can effectively be utilized in formulating an effective selection scheme. The estimates of correlation co-efficient may also help to identify the characters that prove to be of little or no importance in the selection programme.

In the present studies, the genotypic correlation co-efficient were higher than the phenotypic correlation co-efficient between all characters studied. This indicates that there was a strong inherent association between the various characters studied and the same was less influenced by environmental variations.

The seed yield per plant (Table 1) showed strong significantly positive genotypic correlation with number of capsules per plant (0.8797) followed by number of branches per plant (0.7800), number of seeds per capsule (0.7369), plant height at maturity (0.3528), oil content (0.3256) and 1000 seed weight (0.3100). Also the non-significant positive genotypic correlation with days to maturity (0.0802). While, it showed significant negative genotypic correlation with days to 50% flowering (-0.1227).

Table.1 Genotypic correlation co-efficient for nine characters in sesamum

Sr. No.	Characters	Days to 50% flowering	Days to maturity	Plant height at maturity (cm)	No. of branches/ plant	No. of capsules/ plant	No. of seeds/ capsule	1000 seed weight (g)	Oil content (%)	Seed yield/ plant (g)
1.	**Days to 50% flowering**	**1.0000**	0.1871*	-0.0623	-0.2560**	-0.1447*	-0.0366	0.1997*	-0.1609*	-0.1227*
2.	**Days to maturity**		**1.0000**	0.0358	-0.0829	0.1370*	0.2837**	0.2031*	0.3425**	0.0802
3.	**Plant height at maturity**			**1.0000**	0.4660**	0.3550**	0.3808**	0.1784*	-0.0868	0.3528**
4.	**No. of branches/ plant**				**1.0000**	0.7867**	0.4702**	0.2797**	0.2541**	0.7800**
5.	**No. of capsules/ plant**					**1.0000**	0.4927**	0.2000*	0.4307**	0.8797**
6.	**No. of seeds/ capsule**						**1.0000**	-0.1097	0.0108	0.7369**
7.	**1000 seed weight**							**1.0000**	0.0169	0.3100**
8.	**Oil content**								**1.0000**	0.3256**
9.	**Seed yield/ plant**									**1.0000**

*, ** Indicates significance at 5% and 1% level, respectively

Table.2 Phenotypic correlation co-efficient for nine characters in sesamum

Sr.No.	Characters	Days to 50% flowering	Days to maturity	Plant height at maturity (cm)	No. of branches/ plant	No. of capsules / plant	No. of seeds/ capsules	1000 seed weight (g)	Oil content (%)	Seed yield/ plant (g)
1	**Days to 50% flowering**	**1.0000**	0.1439	-0.0729	-0.1079	-0.1282	0.0338	0.1397*	-0.1278*	-0.1137*
2	**Days to maturity**		**1.0000**	0.0299	-0.0221	0.0959	0.0497	0.0166	0.1591*	0.0406
3	**Plant height at maturity**			**1.0000**	0.3815***	0.3109***	0.2023*	0.1474*	-0.0290	0.2954**
4	**No. of branches/ plant**				**1.0000**	0.5825***	0.2542**	0.2044*	0.1118*	0.4928**
5	**No. of capsules/ plant**					**1.0000**	0.1817*	0.1375*	0.1975*	0.6835**
6	**No. of seeds/ capsule**						**1.0000**	-0.0884	0.0275	0.3806**
7	**1000 seed weight**							**1.0000**	-0.0305	0.1492*
8	**Oil content**								**1.0000**	0.1621*
9	**Seed yield/ plant**									**1.0000**

*, ** indicates significance at 5% and 1% level, respectively

Table.3 Environmental correlation co-efficient for nine characters in sesamum

Sr. No.	Characters	Days to 50% flowering	Days to maturity	Plant height at maturity (cm)	No. of branches/ plant	No. of capsules / plant	No. of seeds/ capsules	1000 seed weight (g)	Oil content (%)	Seed yield/ plant (g)
1	**Days to 50% flowering**	**1.0000**	0.0904	-0.1862 *	0.1834 **	-0.0821	0.1148*	0.0554	-0.1263*	-0.0918
2	**Days to maturity**		**1.0000**	0.0364	0.0547	0.0321	-0.1148*	0.1651*	0.0649	-0.0197
3	**Plant height at maturity**			**1.0000**	0.1387**	-0.0484	-0.1038*	0.1539**	0.0714	-0.0107
4	**No. of branches/ plant**				**1.0000**	0.0438	0.0653	0.1071*	0.0198	-0.1425*
5	**No. of capsules/ plant**					**1.0000**	-0.2503 **	0.0270	0.0048	-0.0249
6	**No. of seeds/ capsule**						**1.0000**	-0.0745	0.0349	0.0114
7	**1000 seed weight**							**1.0000**	-0.0600	-0.1147*
8	**Oil content**								**1.0000**	0.0498
9	**Seed yield/ plant**									**1.0000**

*, ** Indicates significance at 5% and 1% level, respectively.

Table.4 Genotypic path co-efficient for nine characters in sesamum

Characters	Days to 50% flowering	Days to maturity	Plant height at maturity (cm)	No. of branches/ plant	No. of capsules/ plant	No. of seeds/ capsule	1000 seed weight (g)	Oil content (%)	Correlation with seed yield/ plant (g)
Days to 50% flowering	**-0.0448**	-0.0084	0.0028	0.0115	0.0065	0.0016	-0.0089	0.0072	-0.1227*
Days to maturity	-0.0691	**-0.3692**	-0.0132	0.0306	-0.0506	-0.1048*	-0.0750	0.1265*	0.0802
Plant height at maturity	0.0052	-0.0030	**-0.0829**	-0.0386	-0.0294	-0.0316	-0.0148	0.0072	0.3528**
No. of branches / plant	0.0441	0.0143	-0.0803	**-0.1723***	-0.1356*	-0.0810	-0.0482	-0.0438	0.7800**
No. of capsules/ plant	-0.0790	0.0748	0.1938*	0.4294**	**0.5458****	0.2690**	0.1092	0.2351**	0.8797**
No. of seeds/ capsule	-0.0266	0.2065*	0.2771**	0.3422**	0.3585**	**0.7276****	-0.0798	0.0079	0.7369**
1000 seed weight	0.0846	0.0861	0.0756	0.1185*	0.0847	-0.0465	**0.4237****	0.0072	0.3100**
Oil content	-0.0372	0.0792	-0.0201	0.0588	0.0996	0.0025	0.0039	**0.2313****	0.3256**

Residual effect = (0.54) Bold values indicated direct effect

Table.5 Phenotypic path co-efficient for nine characters in sesamum

Characters	Days to 50% flowering	Days to maturity	Plant height at maturity (cm)	No. of branches/ plant	No. of capsules/ plant	No. of seeds/ capsule	1000 seed weight (g)	Oil content (%)	Correlation with seed yield/ plant (g)
Days to 50% flowering	**-0.0447**	-0.0064	0.0033	0.0048	0.0057	-0.0015	-0.0062	0.0057	-0.1137*
Days to maturity	-0.0041	**-0.0283**	-0.0008	0.0006	-0.0027	-0.0014	-0.0005	-0.0045	0.0406
Plant height at maturity	-0.0021	0.0009	**0.0291**	0.0111	0.0090	0.0059	0.0043	-0.0008	0.2954**
No of branches / plant	-0.0057	-0.0012	0.0202	**0.0528**	0.0308	0.0134	0.0108	0.0059	0.4928**
No. of capsules/ plant	-0.0734	0.0549	0.1781*	0.3336**	**0.5727****	0.1041	0.0787	0.1131*	0.6835**
No. of seeds/ capsule	0.0090	0.0133	0.0540	0.0678	0.0485	**0.2668****	-0.0236	0.0074	0.3806**
1000 seed weight	0.0121	0.0014	0.0128	0.0178	0.0119	-0.0077	**0.0869**	-0.0026	0.1492*
Oil content	-0.0049	0.0060	-0.0011	0.0042	0.0075	0.0010	-0.0012	**0.0380**	0.1621*

Residual effect = (0.57) Bold value, indicated direct effect

Table.6 Environmental path co-efficient for nine characters in sesamum

Characters	Days to 50% flowering	Days to maturity	Plant height at maturity (cm)	No. of branches/ plant	No. of capsules/ plant	No. of seeds/ capsule	1000 seed weight (g)	Oil content (%)	Correlation with seed yield/ plant (g)
Days to 50% flowering	**-0.0576**	-0.0052	0.0107	-0.0106	0.0047	-0.0066	-0.0032	0.0073	-0.0918
Days to maturity	-0.0023	**-0.0255**	-0.0009	-0.0014	-0.0008	0.0029	0.0042	-0.0017	-0.0197
Plant height at maturity	-0.0017	0.0003	**0.0093**	0.0013	-0.0005	-0.0010	0.0014	0.0007	-0.0107
No of branches / plant	-0.0223	-0.0067	-0.0169	**-0.1217***	-0.0053	-0.0080	-0.0130	-0.0024	-0.1425*
No. of capsules/ plant	0.0015	-0.0006	0.0009	-0.0008	**-0.0178**	0.0045	-0.0005	-0.0001	-0.0249
No. of seeds/ capsule	0.0012	-0.0012	-0.0011	0.0007	-0.0027	**0.0107**	-0.0008	0.0004	0.0114
1000 seed weight	-0.0056	0.0166	-0.0155	-0.0108	-0.0027	0.0075	**-0.1004**	0.0060	-0.1147*
Oil content	-0.0050	0.0026	0.0028	0.0008	0.0002	0.0014	-0.0024	**0.0396**	0.0498

Residual effect = (0.58) Bold value, indicated direct effect

The seed yield per plant (Table 2) showed strong significantly positive phenotypic correlation with number of capsules per plant (0.6835) followed by number of branches per plant (0.4928), number of seeds per capsule (0.3806), plant height at maturity (0.2954), oil content (0.1621) and 1000 seed weight (0.1492). Also the non-significant positive phenotypic correlation with days to maturity (0.0406). Whereas, it also showed significant negative phenotypic correlation with days to 50% flowering (-0.1137).

The seed yield per plant (Table 3) showed negatively significant environmental correlation with number of branches per plant (-0.1425) followed by 1000 seed weight (-0.1147). Also the non-significant positive environmental correlation with oil content (0.0498) followed by number of seeds per capsule (0.0114). Also showed non-significant negative correlation with days to 50% maturity (-0.0918), number of capsules per plant (-0.0249), days to maturity (-0.0197) and plant height at maturity (-0.0107).

Similar results were confirmed by Li (1988) in capsules per plant, 1000 seed weight and seeds per capsule; Rong and Wu (1989) also reported same results for number of capsules per plant; Rao *et al.,* (1991) for number of capsules per plant, number of seeds per capsule, number of branches per plant and 1000 seed weight; Arulmozhi *et al.,* (2001) were also significant positive correlation between for number of capsules per plant and number of branches per plant with seed yield; Sumathi and Muralidharan (2010) for plant height, number of branches per plant, number of capsules per plant and 1000 seed weight; Gadisa *et al.,* (2014) for number of branches per plant, number of capsules per plant and 1000 seed weight; Bharathi *et al.,* (2015) for number of capsules per plant, number of seeds per capsule and 1000 seed weight; Mahmoud *et al.,* (2015) for number of branches per plant and number of capsules per plant. Based on the above results, it could be suggested that number of branches per plant with more number of capsules per plant, having higher number of seeds per capsule and 1000 seed weight can be used to select the productive types in sesamum for seed yield. It is also observed that non-significant positive genotypic and phenotypic correlations between seed yield per plant and days to maturity. Whereas, days to 50 % flowering shows significant negative correlation with seed yield per plant at genotypic as well as phenotypic level. Similar results were obtained by Raghuwanshi *et al.,* (2003) and Bharathi *et al.,* (2015) showed a significant negative correlation with days to 50 % flowering

The genotypic correlation between days to 50 % flowering and seed yield per plant was negative and significant (-0.1227). Whereas, its direct effect on seed yield per plant was negative and moderate (-0.0448).Phenotypic correlation between days to 50 % flowering and seed yield per plant was negative and significant (-0.1137) whereas, its direct effect on seed yield per plant was negative and low (-0.0447). Environmental correlation between days to 50% lowering and seed yield per plant was negative and non-significant (-0.0918) whereas, its direct effect on seed yield per plant was negative and low (-0.0576).

The genotypic correlation between days to maturity and seed yield per plant was positive and non-significant (0.0802). Its direct effect on seed yield per plant was negative and moderate (-0.3692). In respect of phenotypic correlation between days to maturity and seed yield per plant was positive and non-significant (0.0406). The direct effect of days to maturity on seed yield per plant was negative and low (-0.0283). In respect of environmental correlation between days to maturity and seed yield per plant was negative

and non-significant (-0.0197). The direct effect of days to maturity on seed yield per plant was negative and low (-0.0255) (Table 4).

Correlation between plant height at maturity and seed yield per plant was positive and highly significant (0.3528) at genotypic level. While the direct effect of plant height at maturity on seed yield per plant was negative and low (-0.0829). Phenotypic correlation between plant height at maturity and seed yield per plant had positive and significant (0.2954). Direct effect of plant height at maturity on seed yield per plant was positive and moderate (0.0291). As regards environmental correlation between plant height at maturity and seed yield per plant had negative and non-significant (-0.0107). Direct effect of plant height at maturity on seed yield per plant was positive and low (0.0093) (Table 5).

Genotypic correlation between number of branches per plant and seed yield per plant was positive and highly significant (0.7800). Direct effect of this trait on seed yield per plant was negative and moderate(-0.1723). The phenotypic correlation between number of branches per plant and seed yield per plant was positive and highly significant (0.4928). The direct effect of number of branches per plant on seed yield per plant was positive and moderate (0.0528). The environmental correlation between number of branches per plant and seed yield per plant was negative and significant (-0.1425). The direct effect of number of branches per plant on seed yield per plant was negative and moderate (-0.1217).

The genotypic correlation between number of capsules per plant and seed yield per plant was positive and highly significant (0.8797). The direct effects of this trait on seed yield per plant was positive with higher values (0.5458). In respect of phenotypic correlation between number of capsules per plant and seed yield per plant was positive and highly significant (0.6835). The direct effect of number of capsules per plant on seed yield per plant was positive and highest (0.5727). In respect of environmental correlation between number of capsules per plant and seed yield per plant was negative and non- significant (-0.0249). The direct effect of number of capsules per plant on seed yield per plant was negative and moderate (-0.0178).

Correlation between number of seeds per capsule and seed yield per plant was positive and highly significant (0.7369) at genotypic level. The direct effect of this trait on seed yield per plant was positive and highest (0.7276). Correlation between number of seeds per capsule and seed yield per plant was positive and highly significant (0.3806) at phenotypic level. Direct effect of number of seeds per capsule on seed yield per plant was positive and high (0.2668). Correlation between number of seeds per capsule and seed yield per plant was positive and non-significant (0.0114) at environmental level. The direct effect of this trait on seed yield per plant was positive and moderate (0.0107).

In respect of genotypic correlation of this trait with seed yield per plant was positive and highly significant (0.3100). The direct effect of 1000 seed weight on seed yield per plant was positive and higher value (0.4237). Phenotypic correlation between 1000 seed weight and seed yield per plant was positive and significant (0.1492). Its direct effect on seed yield per plant was positive and moderate (0.0869). Environmental correlation between 1000 seed weight and seed yield per plant was negative and significant (-0.1147). Its direct effect on seed yield per plant was negative and low (-0.1004).

The genotypic correlation between oil content and seed yield per plant was positive and highly significant (0.3256). This trait had

positive and high direct effect (0.2313) on seed yield per plant. In case of phenotypic correlation between oil content and seed yield per plant was positive and significant (0.1621). Oil content exhibited appreciable positive and moderate direct effect (0.0380) on seed yield per plant. In case of environmental correlation between oil content and seed yield per plant was positive and non-significant (0.0498). Oil content exhibited appreciable positive and moderate direct effect (0.0396) on seed yield per plant (Table 6).

Positive and direct effects were exerted by, number of seeds per capsule, number of capsules per plant, 1000 seed weight and oil content on seed yield per plant. While, negative direct effect were exerted by days to maturity, number of branches per plant, plant height at maturity and days to 50% flowering on seed yield per plant.

Characters, number of seeds per capsule and number of capsules per plant had positive direct effects and strong correlation with seed yield per plant indicating that they are more important yield related traits at both genotypic and phenotypic level.

Beside this, 1000 seed weight and oil content also contributed directly to seed yield per plant in positive direction. It indicated that the direct selection for these characters will be rewarding to obtain the high yielding genotypes as revealed by their close association with seed yield per plant. These results are in concurrence with earlier finding of Bharathi and Vivekanandan (2009) for oil content and Gadisa *et al.,* (2014) for days to maturity. Negative direct effect on seed yield per plant were observed for days to 50 % flowering and days to maturity finding of Agrawal *et al.,* These results are in confirming with the finding of Gupta and Chopra (1984) for plant height at maturity.

References

Agrawal, M. M., Sangram, S., Wawge, M. N. Shenha, M., Sasidharn, N. 2017. Correlation and path analysis for seed yield and yield attributing traits in Sesame germplasm (*Sesamum indicum* L.). *International Journal of Chemical Studies*, 5(4):1099-1102.

Arulmozhi N., Santha S., and Mohammed S. E. N. (2001) Correlation and path coefficient analysis in sesame *(Sesamum indicum* L.*).Journal of Eco biology*, 13(3): 229-232.

Bharaki, F,; Tschaye, Y. and Abay, F. 2015b. Seed yield based cluster analysis and correlation of agronomic traits of sesame (*Sesamum indicum* L.*)* genotypes in Ethiopia. *Journal of Nature and Science Research,* 5(9): 11-17.

Bharathi, K. and Vivekanandan, P., 2009. Correlation and path analysis for seed yield in sesame (*Sesamum indicum* L.) *Electronic Journal of Plant Breeding*, 1: 70-73.

Bhatt, G. M. 1973. Significance of path co-efficient analysis in determining the nature of character association. *Euphytica*, 22: 338-343.

Dewey, O.R. and Lu, K.H. 1959. A correlation and path coefficient analysis of components of crested wheat grass seed production. *Journal of Agronomy*, 5:515-518.

Gadisa, H. Negash, G. and Zerihun, J. 2014. Correlation and Divergence Analysis for Phenotypic Traits in Sesame (*Sesamum indicum* L.) *Journal Genotypes Science Technology Research,* 3(4): 01-09.

Gupta, B. S. and Chopra, D. P., 1984, Genetic variability, Correlation and path coefficient analysis in sesame. *Indian journal of Agricultural Science*, 54: 1030-1033.

Gangadharao, R. 2004. Genetic divergence in sesame, (*Sesamum indicum* L.). *Journal of Oilseeds Research,* 21(2): 336-337.

Li, M. Y., 1988, a genetic analysis of the man characters in sesame. *Oil Crops of China*, 4:33-36.

Mohammed, A. and Firew, M. 2015. Study on genetic divergence in low-altitude sesame (*Sesamum indicum* L.) germplasm of Ethiopia based on agro morphological traits. *Journal of Advanced Studies in Agriculture, Biological and Environmental Science*, 2:2394-2606.

Raghuwanshi, K.M.S., Duhoon, S.S., Singh, B.R. and Singh, R.B. 2003. Genetic variability, Correlation and regression studies in sesame *(Sesamum indicum* L*). Journal intra academica.*,7(2):144-146.

Rong, X. X. and Wu, W., 1989. Correlation and path analysis of seed yield and some important agronomic characters in sesame (*Sesamum indicum* L.). *Oil Crops of China*, 4: 30-32.

Singh, R. K. and Choudhari, B. D. 1977. Biometrical techniques in genetics and breeding, Kalyani Publishers New Delhi 163-191.

Sumathi, P. and Muralidharan, V. 2010. Analysis of genetic variability, association and path analysis in the hybrids of sesame (*sesamum indicum* L.). *Tropical Agriculture Research & Extension* 13(3).

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