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Correlation and Path Coefficient Analysis in Sesame (*Sesamum Indicum* L.)

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ABSTRACT

Fourteen parents were crossed in half-diallel fashion to generate 91 F_1s and were evaluated in four environments *viz.,* Bapatla (*kharif*), Bapatla (*rabi*), Peddapuram (*kharif*) and Peddapuram (*rabi*). The studies of character association on pooled basis revealed highest contribution was made by number of capsules/plant towards seed yield per plant. Only days to 50% flowering was found to be negatively associated at genotypic level. A higher positive direct effect was recorded by number of capsules/plant towards seed yield per plant at both phenotypic and genotypic levels. The present correlation and path coefficient analysis studies on the whole adds to the established complementary relationship of plant height, number of primary branches, number of secondary branches, number of seeds/capsule and number of capsules/plant towards high seed yield in sesame.

Key words : Analysis in sesame, Correlation, Path coefficient

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%). Sesame oil has long shelf life due to presence of lignans (which have remarkable antioxidant function), sesamol and sesamolin together with tocopherols, while its protein is used for industrial purposes and it holds tremendous potential for export. 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.

MATERIAL AND METHODS

The study included fourteen diverse sesame genotypes crossed in half-diallel fashion to generate 91 F_1s. the parents along with the crosses were evaluated in four environments Bapatla (*kharif*), Bapatla (*rabi*), Peddapuram (*kharif*) and Peddapuram (*rabi*). Each parent and hybrid was raised in two rows of 2 meters length with an inter row spacing of 20 cm and 10 cm between plants adopting Randomized Block Design (RBD) with three replications. A fertilizer dose of 40 Kg N, 40 Kg P_2O_5 and 20 Kg K_2O ha^{-1} was applied. Irrigation, weeding and plant protection operations were taken up as and when needed during the crop growth uniformly in all the replications. Observations were recorded on ten randomly selected plants of each genotype of each replication for nine quantitative characters *viz.,* days to 50% flowering, plant height, number of primary branches, number of secondary branches, number of seeds/capsule, 1000 seed weight, oil content and seed yield per plant. Percentage of oil content in the genotypes was estimated by NMR (Nuclear Magnetic Resonance). Analysis of co-variance was computed for the characters as per the standard statistical procedures given by Snedecor and Cochran (1967) and the direct and indirect contribution of various characters to yield were calculated through Path coefficient analysis proposed by Dewey and Lu (1959).

RESULTS AND DISCUSSION

The phenotypic and genotypic correlations among the yield and yield component characters in sesame are presented in Table 1.The genotypic correlation were greater than phenotypic correlation in most of the traits except days to 50% flowering and 1000 seed weight. A significant positive

Table 1. Phenotypic (above diagonal) and genotypic (below diagonal) correlation coefficients for seed yield and yield component traits of sesame genotypes at pooled environments.

Character	Days to 50 % flowering	Plant height (cm)	No. of primary branches	No. of secondary branches	No. of capsules/ plant	No. of seeds/ capsule	1000 seed weight (gm)	Oil content (%)	Seed yield/ plant (gm)
Days to 50 % flowering	**1.0000**	-0.0074	0.0018	-0.0103	-0.0285	0.0367	0.0856**	-0.0369	**-0.0340****
Plant height (cm)	-0.0558	**1.0000**	0.1665**	0.1109**	0.3546**	0.1336**	-0.0463	0.0131	**0.2881****
No. primary branches	0.0504	0.3439**	**1.0000**	0.2662**	0.3495**	0.1864**	-0.0735**	-0.0256	**0.3238****
No. secondary branches	0.2560**	0.2200**	0.4748**	**1.0000**	0.2690**	0.1145**	0.0070	-0.0303	**0.2173****
No. capsules/ plant	0.0781**	0.5472**	0.5294**	0.4619**	**1.0000**	0.1783**	0.0809**	0.0258	**0.6973****
No. seeds/capsule	0.0521	0.2422**	0.3348**	0.3145**	0.3315**	**1.0000**	-0.0472	0.1036**	**0.2235****
1000 seed weight (gm)	0.1948**	-0.1794**	-0.0513	0.0183	0.1121**	-0.1317**	**1.0000**	0.0789**	**0.0927**
Oil content (%)	-0.2078**	-0.0473	0.0456	-0.1098	0.0551	0.2432**	0.0942**	**1.0000**	**0.0864**
Seed yield/plant (gm)	**0.0011**	**0.5421****	**0.5450****	**0.4337****	**0.8189****	**0.4336****	**0.0819**	**0.1595****	

*Significant at 5% level ** Significant at 1% level

Table 2. Pooled phenotypic path coefficient analysis of yield and yield components in sesame.

Character	Days to 50 % flowering	Plant height (cm)	No. of primary branches	No. of secondary branches	No. of capsules/ plant	No. of seeds/ capsule	1000 seed weight (gm)	Oil content (%)
Days to 50 % flowering	**-0.0211**	-0.0003	0.0001	-0.0001	-0.7234	0.0032	0.0044	-0.0022
Plant height (cm)	0.0002	**0.0397**	0.0138	0.0014	0.2231	0.0115	-0.0024	0.0008
No. of primary branches	0.0000	0.0066	**0.083**	0.0034	0.2199	0.0926	-0.0037	-0.0015
No. of secondary branches	0.0002	0.0044	0.0221	**0.0129**	0.1692	0.0099	0.0004	-0.0018
No. of capsules/ plant	0.0006	0.2337	0.1975	0.1985	**0.6292**	0.0154	0.0415	0.0015
No. of seeds/capsule	-0.0008	0.0053	0.0155	0.0015	0.1122	**0.0861**	-0.0024	0.0265
1000 seed weight (gm)	-0.0139	-0.0018	-0.0061	0.0001	0.0509	-0.0041	**0.0509**	0.0046
Oil content (%)	0.0008	0.0005	-0.0021	-0.0004	0.0162	0.0089	0.0040	**0.0585**
Seeds Yield/ Plant (gm)	**-0.0340**	**0.2881****	**0.3238****	**0.2173****	**0.6973****	**0.2235****	**0.0927****	**0.0864****

Residual Effect = 0.1723

Table 3. Pooled genotypic path coefficient analysis of yield and yield components in sesame.

Character	Days to 50 % flower-ing	Plant height (cm)	No. of primary branches	No. of second-ary branches	No. of capsules/ plant	No. of seeds/ capsule	1000 seed weight (gm)	Oil content (%)
Days to 50 % flowering	**-0.0601**	-0.0078	0.0054	0.0128	-0.4331	0.0072	0.0127	-0.0168
Plant height (cm)	0.0034	**0.1393**	0.0367	0.011	0.3338	0.0335	-0.0117	-0.0038
No. of primary branches	-0.003	0.0479	**0.1066**	0.3253	0.2028	0.1500	-0.0034	0.0037
No. of secondary branches	-0.0154	0.0306	0.0506	**0.0502**	0.1616	0.0435	0.0012	-0.0089
No. of capsules/ plant	-0.0047	0.33	0.3106	0.0232	**0.6101**	0.0458	0.0202	0.0045
No. of seeds/capsule	-0.0031	0.0337	0.0357	0.0158	0.2023	**0.1382**	-0.0086	0.0924
1000 seed weight (gm)	-0.0117	-0.025	-0.0055	0.0009	-0.0518	-0.0182	**0.0653**	0.0076
Oil content (%)	0.0957	-0.0066	0.0049	-0.0055	-0.2068	0.0336	0.0062	**0.0808**
Seeds Yield/ Plant (gm)	**0.0011**	**0.5421****	**0.5450****	**0.4337****	**0.8189****	**0.4336****	**0.0819****	**0.1595****

Residual Effect = 0.1516

correlation was recorded between seed yield with all the characters except days to 50% flowering. The magnitude of correlation with seed yield was highest in case of number of capsules per plant (0.6973, 0.8189) followed by number of primary branches (0.3238, 0.5450), plant height (0.2881, 0.5421), number of seeds/capsule (0.2235, 4336), number of secondary branches (0.2173, 0.4337) at phenotypic and genotypic levels. Highest contribution of number of capsules/plant towards seed yield was also reported by Renuka *et al*. (2011) and Vanishree *et al*. (2011). Thus suggesting selection of genotypes with more number of capsules/plant would render corresponding increase in seed yield. Number of capsules per plant had positive correlation with all other characters studied except for days to 50% flowering where the character was associated negatively at genotypic level. Hence the character can be subjected to direct selection for further improvement of seed yield of sesame. The character days to 50% flowering though non-significant at phenotypic level was associated negatively with seed yield. This implicates that selection for the two characters number of capsules/plant and days to 50% flowering would be effective in generating genotypes with high number of capsules/plant coupled with early flowering behaviour which is an ideotypic phenomenon for any kind of breeding programme by a plant breeder.

Partitioning of the total correlation coefficient into direct and indirect effects for seed yield per plant presented in Tables 2 and 3 and the path diagrams depicted in Fig.1 and 2 revealed that number of capsules per plant had maximum direct effect on seed yield per plant (0.6101) followed by number of plant height (0.1393), seeds per capsule (0.1382) and number of primary branches (0.1066) at genotypic level. While, low positive direct effect was exhibited by oil content (0.0808) and 1000 seed weight (0.0653). Days to 50% flowering had exerted low negative direct effect (-0.0211, -0.0601) at phenotypic and genotypic levels. Positive direct effect of plant height was also explained by Yoll *et al.* (2010) while, positive direct effect of number of primary branches and number of seeds/ capsule was reported by Vanishree *et al*. (2011). Renuka *et al*. (2011) also affirmed the positive direct effect of number of capsules/plant. On the other hand negative direct effect of days to 50 per cent flowering towards seed yield was in consonance with Yoll *et al.* (2010).

The indirect effect of plant height, number of branches per plant and number of seeds per capsule *via* other characters was not considerable except number of capsules/plant which was high and positive. But the indirect effect of number of capsules per plant *via* all the other characters was positive but low, while it exerted a negative indirect effect via days to 50% flowering. In the present

Fig 1. Pooled genotypic path diagram showing cause effect relationship of direct effects with seed yield per plant in sesame (*Sesamum indicum* L.)

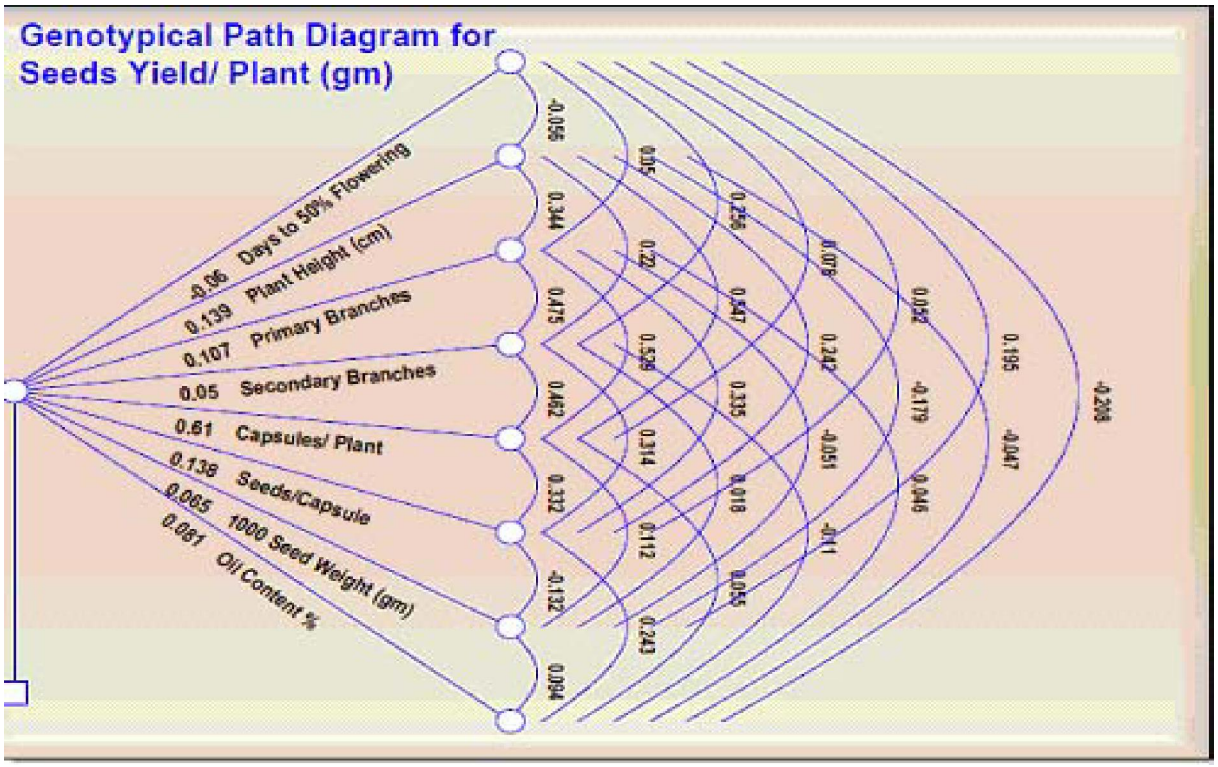
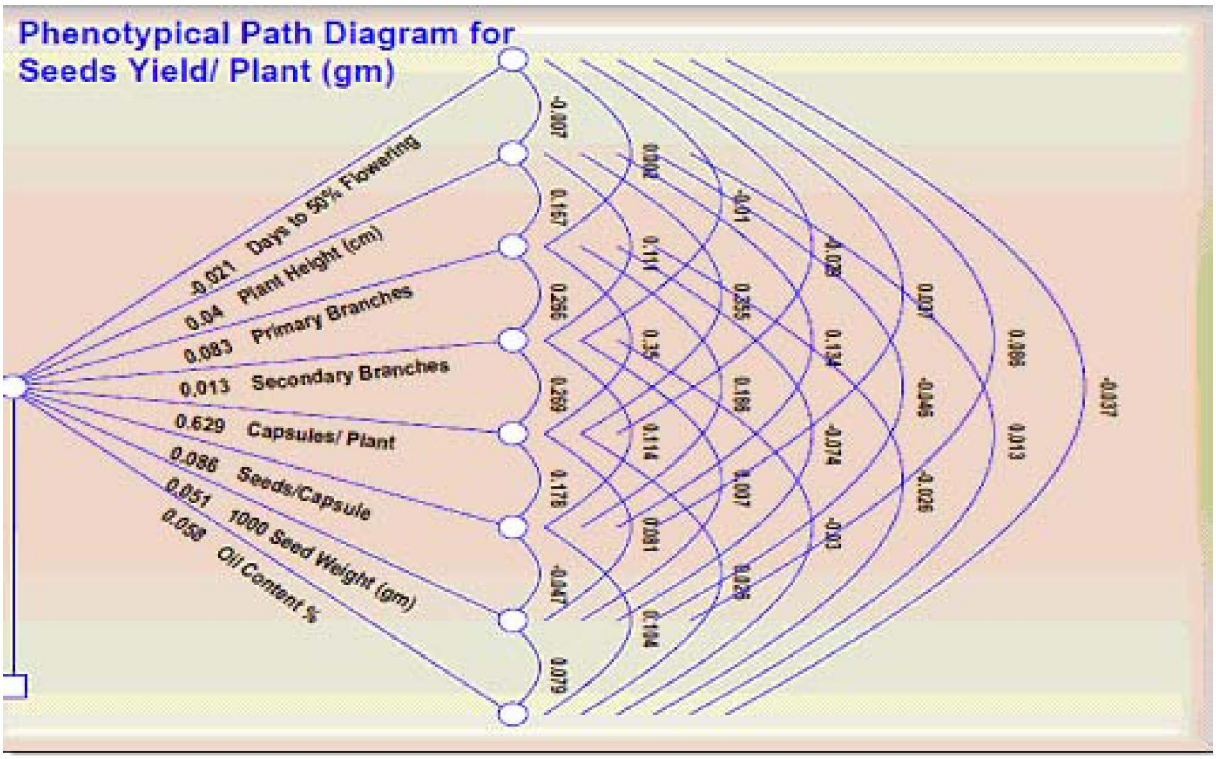


Fig 2. Pooled phenotypic path diagram showing cause effect relationship of direct effects with seed yield per plant in sesame (*Sesamum indicum* L.)



study, the residual effect (0.17, 0.15) was low in magnitude which showed that the characters chosen are chief determining indices for higher seed yield in sesame. The association among plant height, number of primary branches, number of capsules/ plant and number of seeds /capsule towards seed yield was not only positive and significant but had positive indirect effects among themselves. This discloses close association among the characters and direct selection for the above characters would reap genotypes with high seed yield in sesame.

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