

# PHENOTYPIC AND GENOTYPIC PATH COEFFICIENT ANALYSIS IN BLACK SESAME (*SESAMUM INDICUM* L.)

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**Abstract :** The phenotypic path coefficient analysis revealed that length of capsule and number of capsules per plant exhibited high and positive direct effect on seed yield per plant and was found to be the most important yield components. The characters, plant height had moderate and positive direct effect on seed yield per plant. While days to maturity and width of capsule had low and positive direct effect on seed yield per plant. Genotypic path coefficient analysis revealed that length of capsule, oil content, number of capsules per leaf axil and number of internodes per plant exhibited high and positive direct effect on seed yield per plant and most important yield component.

Index Terms - Path, Phenotypic, Genotypic

## 1. INTRODUCTION

High yield is the prime objective in all breeding programme's but generally yield has low heritability and highly affected by various abiotic and biotic factors. Hence, direct and indirect selections are important to get better yield. Some biometrical techniques such as path analysis provide information about the relative contribution of various component traits towards economic yield. Path analysis splits the correlation coefficient into the measures of direct and indirect effects and determines the direct and indirect contribution of various characters towards yields. Seed yield, a polygenic trait, is influenced by its various components directly as well as indirectly *via* other traits, which create a complex situation for a breeder for making selection. When two or more variables are included in the correlation studies, it becomes difficult to determine which characters enhance the yield. The technique of path coefficient analysis overcomes this situation which partitions the forces of association and examines the relative contribution of direct and indirect effects of the independent variables on the dependent variables.

## 2. Material and Methods:

The experimental material consisted of 40 diverse genotypes of sesame [*Sesamum indicum* L.]. The pure seeds of these genotypes were obtained from the Agriculture Research Station, Junagadh Agricultural University, Amreli. Fourty genotypes of sesame were sown on 29<sup>th</sup> July, 2020 in a Randomized Block Design with three replications at Sagdividi Farm, Department of Seed Science and Technology, College of Agriculture, Junagadh Agricultural University, Junagadh. Each genotype was sown in a single row plot of 3.0 m length with a spacing of 45 cm × 15 cm. The genotypes were randomly allotted to the plots in each replication. Path coefficient is a standardized partial regression coefficient and measures the direct and indirect influence of one variable upon another thereby permitting the separation of the correlation coefficient into the component of direct and indirect effects. The path coefficient analysis was carried-out as per the method suggested by Dewey and Lu (1959). Genotypic and phenotypic correlation coefficients of 13 variables with seed yield were used to estimate the path coefficient for the direct effects of various

independent characters on yield.

### 3, Result and Discussion:

The phenotypic path coefficient analysis revealed that the number of capsules per plant and length of capsule exhibited high and positive direct effects on seed yield per plant as shown in table 1.1. Similar result has been reported for number of capsules per plant by Singh *et al.* (2018), Patidar *et al.* (2020), Saravanan *et al.* (2020) and Thepfukolie *et al.* (2020). For length of capsule similar result reported by Navaneetha *et al.* (2019), Disowja *et al.* (2020) and Thepfukolie *et al.* (2020).

The genotypic path coefficient analysis revealed that the length of capsule, oil content, number of capsules per leaf axil and number of internodes per plant exhibited high and positive direct effect as shown in table 1.2 on seed yield per plant. Similar result has been reported for oil content by Sasipriya *et al.* (2018), Navaneetha *et al.* (2019), Disowja *et al.* (2020) and Thepfukolie *et al.* (2020).

Phenotypic path coefficient analysis showed height to first capsule, number of internodes per plant, 1000-seed weight, number of capsules per leaf axil and oil content expressed negative direct effect of negligible magnitude on seed yield. However, among these two traits number of internodes per plant and number of capsules per leaf axil had positive association with seed yield because of cumulative minor positive indirect effect *via* rest of other character.

Genotypic path coefficient analysis showed days to 50% flowering, days to maturity and height to first capsule expressed negative direct effect of negligible magnitude on seed yield. However, among these two traits number of Days to 50% flowering and days to maturity had positive association with seed yield because of cumulative minor positive indirect effect *via* rest of other character.

Phenotypic path coefficient analysis revealed that the residual effect (0.3895) was low in magnitude indicated that the majority of the yield attributes have been included in the study of path analysis and also genotypic path coefficient analysis have moderate residual effect (0.5216).

### 4. Conclusions

The phenotypic path coefficient analysis revealed that length of capsule, number of capsule per plant and plant height exhibited high and positive direct effect on seed yield per plant and that was found to be the most important yield components. The characters days to maturity and width of capsule had low and positive direct effect on seed yield per plant. Genotypic path coefficient exhibited high and positive direct effect for length of capsule, oil content, number of capsules per leaf axil and number of internodes per plant on seed yield plant that was most important yield contributing character. The character plant height and width of capsule had negative and high direct effect on seed yield.

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Table 1.1 Phenotypic path coefficient analysis showing direct (diagonal and bold) and indirect effect of different characters on seed yield per plant in sesame

Characters	Days to 50% flowering	Days to maturity	Plant height (cm)	Number of branches per plant	Number of capsules per plant	Height to first capsule (cm)	Length of capsule (cm)	Width of capsule (cm)	Number of internodes per plant	1000-seed weight (g)	Number of capsules per leaf axil	Number of seeds per capsule	Oil content (%)	Phenotypic correlation with seed yield per plant
Days to 50% flowering	<b>0.0139</b>	0.0516	0.0442	0.0106	-0.0191	-0.0276	0.0171	-0.0200	-0.0149	-0.0018	0.0017	-0.0007	-0.0022	0.0527
Days to maturity	0.0059	<b>0.1205</b>	0.0322	0.0250	0.0436	-0.0021	0.1205	-0.0051	-0.0187	-0.0027	0.0067	-0.0011	0.0008	0.3255*
Plant height (cm)	0.0025	0.0156	<b>0.2481</b>	0.0032	0.0775	-0.0499	0.0541	0.0061	-0.0553	-0.0045	-0.0139	0.0005	-0.0021	0.2818
Number of branches per plant	0.0019	0.0393	0.0102	<b>0.0767</b>	0.1516	0.0281	0.3323	0.0095	-0.0022	-0.0014	-0.0022	-0.0007	0.0091	0.6522**
Number of capsules per plant	-0.0009	0.0174	0.0639	0.0387	<b>0.3009</b>	0.0113	0.3105	-0.0007	0.0007	0.0004	-0.0101	0.0001	0.0055	0.7377**
Height to first capsule (cm)	0.0029	0.0019	0.0948	-0.0165	-0.0261	<b>-0.1307</b>	-0.0563	0.0035	0.0019	-0.0012	-0.0021	-0.0003	-0.0094	-0.1373
Length of capsule (cm)	0.0005	0.0298	0.0276	0.0523	0.1918	0.0151	<b>0.4871</b>	0.0328	-0.0014	0.0097	-0.0073	0.0007	0.0145	0.8533**
Width of capsule (cm)	-0.0023	-0.0051	0.0127	0.0060	-0.0017	-0.0038	0.1330	<b>0.1203</b>	-0.0077	0.0020	-0.0028	0.0017	-0.0005	0.2517
Number of internodes per plant	0.0024	0.0258	0.1572	0.0019	-0.0023	0.0029	0.0077	0.0106	<b>-0.0873</b>	-0.0091	-0.0045	0.0004	-0.0008	0.1049
1000-seed weight (g)	0.0006	0.0070	0.0245	0.0024	-0.0026	-0.0033	-0.1026	-0.0051	-0.0172	<b>-0.0460</b>	-0.0087	0.0001	-0.002	-0.1530
Number of capsules per leaf axil	-0.0005	-0.0191	0.0812	0.0039	0.0711	-0.0063	0.0833	0.0079	-0.0092	-0.0093	<b>-0.0426</b>	0.0007	0.0149	0.1759
Number of seeds per capsule	-0.0016	-0.0237	0.021	-0.0094	0.0021	0.0071	0.0606	0.0348	-0.0057	-0.0006	-0.005	<b>0.0058</b>	0.0019	0.0872
Oil content (%)	0.0007	-0.0022	0.0115	-0.0157	-0.0371	-0.0275	-0.1576	0.0015	-0.0016	-0.0021	0.0142	-0.0002	<b>-0.0447</b>	-0.2610

\*, \*\* Significant at 5% and 1% levels, respectively. (Residual effect = 0.3895)

Table 1.2. Genotypic path coefficient analysis showing direct (diagonal and bold) and indirect effect of different characters on seed yield per plant in sesame

Characters	Days to 50% flowering	Days to maturity	Plant height (cm)	Number of branches per plant	Number of capsules per plant	Height to first capsule (cm)	Length of capsule (cm)	Width of capsule (cm)	Number of internodes per plant	1000-seed weight (g)	Number of capsules per leaf axil	Number of seeds per capsule	Oil content (%)	Genotypic correlation with seed yield per plant
Days to 50% flowering	<b>-0.0407</b>	-0.0113	-0.1547	0.0119	0.0153	-0.0037	0.0849	0.1170	0.0939	-0.0059	-0.0549	-0.0165	0.0231	0.0584
Days to maturity	-0.0246	<b>-0.0187</b>	-0.1656	0.0448	-0.0515	-0.0001	0.6760	0.0728	0.1529	-0.0109	-0.2303	-0.0260	0.0910	0.5097**
Plant height (cm)	-0.0084	-0.0041	<b>-0.7534</b>	0.0036	-0.0670	-0.0065	0.2226	-0.0289	0.3664	-0.0159	0.4348	0.0182	0.1646	0.3261*
Number of branches per plant	-0.0056	-0.0096	-0.0314	<b>0.0874</b>	-0.1202	0.0039	1.2937	-0.0509	0.0155	-0.0041	0.0691	-0.0202	-0.5585	0.6690**
Number of capsules per plant	0.0027	-0.0042	-0.2215	0.0461	<b>-0.2279</b>	0.0013	1.1569	0.0084	-0.0035	0.0013	0.2646	-0.0005	-0.2603	0.7633**
Height to first capsule (cm)	-0.0094	-0.0002	-0.3111	-0.0214	0.0188	<b>-0.0158</b>	-0.2266	-0.0279	-0.0140	-0.0031	0.0462	-0.0083	0.4285	-0.1441
Length of capsule (cm)	-0.0019	-0.0071	-0.0943	0.0636	-0.1482	0.0020	<b>1.7787</b>	-0.1891	0.0072	0.0271	0.1904	0.0176	-0.7594	0.8864**
Width of capsule (cm)	0.0080	0.0023	-0.0363	0.0074	0.0032	-0.0007	0.5615	<b>-0.5991</b>	0.0504	0.0091	0.0861	0.0445	0.1416	0.2780
Number of internodes per plant	-0.0074	-0.0055	-0.5319	0.0026	0.0015	0.0004	0.0247	-0.0582	<b>0.5190</b>	-0.0263	0.1217	0.0100	0.0526	0.1034
1000-seed weight (g)	-0.0019	-0.0016	-0.0932	0.0028	0.0023	-0.0004	-0.3761	0.0427	0.1063	<b>-0.1282</b>	0.2264	0.0018	0.0631	-0.1560
Number of capsules per leaf axil	0.0021	0.0041	-0.3100	0.0057	-0.0571	-0.0007	0.3205	-0.0488	0.0598	-0.0275	<b>1.0566</b>	0.0153	-0.8192	0.2008
Number of seeds per capsule	0.0049	0.0035	-0.0997	-0.0128	0.0008	0.0010	0.2270	-0.1935	0.0376	-0.0017	0.1172	<b>0.1379</b>	-0.1286	0.0935
Oil content (%)	-0.0007	-0.0013	-0.0921	-0.0363	0.0441	-0.0050	-1.0033	-0.0630	0.0203	-0.0060	-0.6429	-0.0132	<b>1.3463</b>	-0.4532**

\*, \*\* Significant at 5% and 1% levels, respectively. (Residual effect = 0.5216)