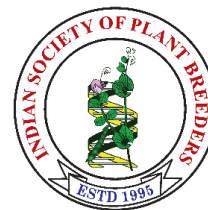


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## Research Article

### Evaluation of sesame (*Sesamum indicum* L.) based on correlation and path analysis

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#### Abstract

In this study, four lines and six testers of sesame were subjected to crossing in a line × tester mating design, during summer, 2019 and 24 hybrids were developed. All 24 F<sub>1</sub> hybrids along with ten parents were raised in a RBD and evaluated. Biometrical data was taken for ten traits viz., days to attain fifty percent flowering, height to formation of the first capsule, height of the plant, the number of primary branches, capsules per plant, the number of capsules on the main stem, length of the capsule, days to attain maturity, thousand seed weight and yield per plant. ANOVA revealed that there existed a quite good significant difference for all the biometrical characters, among the lines, testers and hybrids indicating sufficient variability, which can be further utilized for genetic enhancement of the genotypes. Correlation analysis was used to understand the association between yield attributing characters and with yield. Correlation studies revealed that yield/plant expressed positive and significant correlation with height to formation of first capsule, height of the plant, capsules/plant and weight of thousand seed weight. Capsules/plant registered highly positive and significant genotypic and phenotypic correlation with yield/plant. Days to attain maturity exhibited a negative association with yield/plant. Path analysis was determined to understand the true relationship of yield attributing components among themselves and with the yield. Maximum direct effect on yield was contributed by capsules/plant followed by weight of 1000 seeds and length of capsule. Hence, the selection of genotypes based on capsules/plant, length of the capsule, weight of 1000 seeds will be quite effective in aiding yield improvement in further generations.

#### Keywords

Sesame, Correlation analysis, Path coefficient analysis

#### INTRODUCTION

*Sesamum indicum* L. is one of the most important edible oilseeds cultivated in various parts of the world, most particularly in tropical regions like India and Africa, which is also believed to be its centre of the origin. Sesame is recognized and popular with various names all over the India, like nuvvulu, sim sim, til, ellu. Sesame seed is used for extraction of vegetable oil which are rich in antioxidants like sesamin and sesamol which impart oxidative stability to the oil under varied climatic conditions providing resistance against rancidity. Hence, sesame is often referred to as “Queen of oilseeds”. Besides sesame is high in nutritive value and used in confectioneries. Sesame is also a drought tolerant crop except during early stages of crop growth. Although sesame is substantially used for several purposes, the

productivity has been decreasing compared to other oilseed crops. Sesame growing area is also de-escalating due to various reasons. Hence, there is a need for high yielding varieties of sesame. Correlation coefficient analysis helps in understanding the nature and degree of association between the yield contributing characters and with yield which helps in fixing the desirable trait that plays an important role in increasing yield. Path coefficient analysis helps in partitioning the direct and indirect effects on yield and gives the true relationship of the component traits on yield and aids in effective selection.

#### MATERIALS AND METHODS

In this experiment, twenty four hybrids generated by crossing four lines viz., VRI 3, SVPR 1, TMV 6 and TMV 7 with six testers viz., Thilathara, Thilak, TKG 55, RT 125,

RT 127 and Thilothama were raised in a RBD along with their parents during July-October, 2019, in the farm at the Department of Plant Breeding and Genetics, Agricultural College and Research Institute, TNAU, Madurai. The hybrids along with parents were sown in 4m rows with a spacing of 30 × 30 cm in two replications. Need and time based recommended package of practices were implemented along with plant protection measures. Data on five randomly selected plants for the traits viz., height to the first capsule, height of the plant, the number of primary branches, capsules per plant, the number of capsules on the main stem, length of the capsule, days to attain maturity, thousand seed weight and yield per plant. Days to 50% flowering was recorded on plot basis. The association between yield and yield contributing attributes was estimated by correlation coefficient utilizing the procedure suggested by Miller *et al.* (1958). Direct and indirect effects by path coefficient analysis are estimated using the method suggested by Dewey and Lu (1959).

Statistical analysis for association and path analysis was calculated by using GENRES statistical package.

## RESULTS AND DISCUSSION

In this study, ANOVA revealed significant difference between the sesame genotypes (Table 1) for all the biometrical characters recorded. This implies that there is a sufficient amount of variation present among the genotypes, which can be further exploited in desirable direction for genetic enhancement of the crop.

Yield is quite a complex quantitative trait, which is dependent on interaction of several other related or unrelated characters. Correlation coefficient analysis is used to measure the degree and direction of associations between yield and contributing components of yield. The estimates of genotypic and phenotypic correlation coefficients of yield/plant with other characters are presented in table 2.

**Table 1. ANOVA for biometrical traits in sesame**

Source	df	MSS									
		DF	HC	HP	PB	CP	CM	LC	DM	TSW	YL
Replication	1	60.237	18.404	51.143	0.741	117.757	28.115	0.364	64.062	0.966	23.676
Genotypes	33	5.773**	367.69**	452.903**	4.614**	3311.250**	275.645**	0.024**	9.456**	0.186**	60.574**
Error	33	1.053	0.30	0.740	0.012	35.905	0.194	0.008	0.907	0.051	0.654
C.V %		2.088	1.119	1.750	0.231	12.191	0.897	0.189	1.938	0.463	1.647

\*\* = 1 % significance

DF - days to attain fifty percent flowering, HC - height to formation of first capsule, HP - height of the plant, PB - primary branches, CP - capsules per plant, CM - capsules on main stem, LC - length of the capsule, DM - days to attain maturity, TSW – thousand seed weight and YL – yield per plant

**Table 2. Genotypic and phenotypic correlation coefficients of component characters with yield per plant**

Characters		DF	HC	HP	PB	CP	CM	LC	DM	TSW	YL
DFF	G	1	0.450**	0.258	0.295	0.330	0.301	-0.123	-0.048	-0.336*	0.162
	P	1	0.380*	0.219	0.249	0.313	0.255	-0.122	-0.051	-0.236	0.120
HFC	G		1	0.255	0.280	0.556**	0.366*	0.055	-0.130	-0.064	0.495**
	P		1	0.255	0.279	0.551**	0.366*	0.036	-0.115	-0.051	0.488**
PH	G			1	0.161	0.539**	0.344*	-0.244	-0.200	-0.183	0.462**
	P			1	0.160	0.532**	0.344*	-0.166	-0.181	-0.135	0.455**
NPB	G				1	0.346*	0.177	-0.194	-0.161	-0.058	0.333
	P				1	0.346*	0.176	-0.136	-0.155	-0.042	0.328
NCP	G					1	0.351*	-0.165	-0.254	-0.080	0.885**
	P					1	0.348*	-0.113	-0.236	-0.069	0.863**
NCM	G						1	0.069	0.130	-0.256	0.275
	P						1	0.045	0.117	-0.185	0.272
CL	G							1	0.128	0.657**	0.261
	P							1	0.081	0.344*	0.184
DM	G								1	-0.178	-0.231
	P								1	-0.062	-0.224
1000 SW	G									1	0.411*
	P									1	0.340*
YLD	G										1
	P										1

\*and\*\* = 1 % and 5 % significance respectively.

DF - days to attain fifty percent flowering, HC - height to formation of first capsule, HP - height of the plant, PB - primary branches, CP - capsules per plant, CM - capsules on main stem, LC - length of the capsule, DM - days to attain maturity, TSW – thousand seed weight and YL – yield per plant

For almost all the characters, genotypic correlation was higher than phenotypic correlation. Yield/plant recorded positive and significant association with capsules per plant (0.885) followed by height to formation of first capsule (0.495), height of the plant (0.462) and thousand seed weight (0.411) at both genotypic and phenotypic level. This is in conformity with Mothilal (2005), Vidhyavathi *et al.* (2005) Sumathi and Muralidharan (2011), Ibrahim and Khidir (2012), Haibru *et al.* (2018), Vinoth *et al.* (2018), Navaneetha *et al.* (2019). Thousand seed weight expressed positively significant association with length of the capsule at both genotypic and phenotypic levels and negatively significant with days to attain fifty percent flowering at genotypic level and remaining traits it was found to be negatively non-significant. Days to attain maturity registered a negative and non-significant correlation with yield/plant. This was in accordance with Haibru *et al.* (2018). Length of the capsule showed a positive and highly significant genotypic correlation with thousand seed weight, which is also analogous to the results by Teklu *et al.* (2014). Length of the capsule manifested negatively non-significant relationship with days to attain fifty percent flowering, height of the plant, primary branches/plant, capsules/plant, thousand seed weight, for remaining it was positively non-significant.

For capsules on main stem, the association with height to formation of capsule, height of the plant, capsules per plant was positively significant. Capsules per plant was found to exhibit positive and significant association with all the characters except days to attain fifty percent flowering, whereas, negative and non-significant relationship with length of the capsule, days to attain maturity and thousand seed weight, whereas Hika *et al.* (2015) reported that capsules per plant is showing a positive and significant relationship with thousand seed weight. Days to attain fifty percent flowering indicated highly negative and significant correlation with thousand seed weight, and, positive and significant correlation with height to formation of first capsule. Height of the plant marked positive and significant relationship with the yield per plant. This was in uniformity with Khan *et al.* (2001). Height of the plant evinced positive and significant positive association with capsules per plant, capsules on main stem and yield per plant. and positive and non-significant association with yield per plant. Height to formation of first capsule expressed a positive and highly significant genotypic correlation with yield and capsules per plant. Height of first capsule along with height of the plant determine the length of fruiting zone and thereby contribute to yield.

**Table 3. Direct effects and indirect effects of component characters on yield**

Characters	DF	HC	HP	PB	CP	CM	LC	DM	TSW	YL
DF	<b>-0.01950</b>	-0.00968	0.0276	0.0261	0.29612	-0.00016	-0.02249	-0.00363	-0.13193	0.162
HC	-0.00878	<b>-0.02150</b>	0.02735	0.02476	0.4984	-0.0002	0.01017	-0.00984	-0.02522	0.495
HP	-0.00502	-0.00549	<b>0.10718</b>	0.01425	0.48353	-0.00018	-0.0447	-0.01512	-0.07197	0.462
PB	-0.00575	-0.00602	0.01727	<b>0.08845</b>	0.30991	-0.00009	-0.03555	-0.01221	-0.02296	0.333
CP	-0.00644	-0.01195	0.0578	0.03057	<b>0.89659</b>	-0.00019	-0.03029	-0.01926	-0.03135	0.885
CM	-0.00587	-0.00788	0.03689	0.01567	0.31452	<b>-0.00054</b>	0.01264	0.00986	-0.10032	0.275
LC	0.00239	-0.00119	-0.02611	-0.01714	-0.14801	-0.00004	<b>0.18350</b>	0.00967	0.25792	0.261
DM	0.00093	0.0028	-0.02141	-0.01426	-0.22816	-0.00007	0.02344	<b>0.07570</b>	-0.07006	-0.231
TSW	0.00655	0.00138	-0.01965	-0.00517	-0.07158	0.00014	0.12055	-0.01351	<b>0.39261</b>	0.411

**Direct effects are indicated by bold numbers**

**Residual effect = 0.22**

DF - days to attain fifty percent flowering, HC - height to formation of first capsule, HP - height of the plant, PB - primary branches, CP - capsules per plant, CM - capsules on main stem, LC - length of the capsule, DM - days to attain maturity, TSW – thousand seed weight and YL – yield per plant

Path coefficient analysis is pertinent as it gives the true relationship between the yield contributing characters and with the yield. As it gives more realistic understanding of direct and indirect effects of different components of yield on yield which helps the plant breeder in efficiently selecting the characters which finally helps in escalating the yield. In this present investigation, genotypic correlation coefficients are further classified into direct and indirect effects which are presented in table 3. Highest direct effect on yield was marked by capsules per plant (0.896), followed by thousand seed weight (0.392), length of the capsule (0.183), height of the plant (0.107), primary branches per plant (0.088) and days to attain maturity (0.075). This is comparable to the results of Mothilal (2005) and Goudappagoudra *et al.* (2011). As these

characters directly influence the yield per plant, selection based on these characters would be quite effective and pertinent. These traits can be used in developing sesame varieties with high yield, as these traits show positive direct effect on yield per plant. Results reported by Singh *et al.* (2018), Teklu *et al.* (2014), Vinoth *et al.* (2018) were complementary to the present results. Very high positively direct effect is exerted by capsules per plant, along with positively indirect effects on height of the plant and primary branches per plant. This is in identical with the results reported by Abate *et al.* (2015) and Vinoth *et al.* (2018). Height to formation of first capsule showed a negative and low direct effect, contrary to the present results, Teklu *et al.* (2014) reported as highly positive direct effect was found for height to formation of first capsule. Yield per

plant was positively and directly effected by height of the plant. Contrary to the present results, Ibrahim and Khidir (2012) reported a negatively direct effect on yield per plant. Height to formation of the first capsule and height of the plant found to express highest positive indirect effect through capsules per plant followed by capsules on main stem, primary branches per plant, length of the capsule through thousand seed weight. Residual effect for path analysis in this study is 0.22, which indicates that most of the traits which contribute to yield are covered in this experiment.

Based on the results of correlation and path analysis, genotypes with high capsules per plant, primary branches/ plant, length of the capsule and thousand seed weight should be given prime importance, while selecting the sesame genotypes for improvement of yield.

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