

Trait Association and Path Coefficient Analysis for Yield and Yield Attributing Traits in Sesame (*Sesamum indicum*. L)

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Abstract Character association and path analysis between yield and its contributing traits were studied in 62 sesame genotypes for ten characters. Analysis of variance revealed the existence of significant differences among genotypes for all the characters studied. Seed yield per plant was significant positive association with number of seeds per capsule and number of capsules per plant. Path coefficient analysis revealed maximum positive direct effect of number of seeds per capsule on seed yield followed by number of capsules per plant. Selection for the traits with positive association and direct effects will be useful for the improvement in yield of sesame through breeding program.

Keywords Correlation, Path analysis, Sesame.

Introduction

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%). Gingelly seed is consumed as a source of calcium, potassium, tryptophan and methionine. It is also used in pharmaceutical as well as cosmetic industries [1]. It is widely preferred for its qualities of high drought tolerance during the vegetative stage mainly attributed to its extensive root system.

Yield is the end product of multiplicative interaction between various yield components and this necessitates a thorough understanding of character association and direct and indirect effects contributed by each character on grain yield before launching any breeding program. Correlation is the measure of the mutual relationship between two variables. The study of correlation may help the plant breeder to know how the improvement of one character will bring simultaneous improvement in other characters. Knowledge of correlation between grain yield and other characters is helpful in the selection of suitable plant type (Ne Wall and Eberhart (1961).

As correlation does not provide the true contribution of the characters towards yield, the genotypic and phenotypic correlation coefficients should be partitioned into direct and indirect effects through path coefficient analysis. Path coefficient analysis is a standardized regression coefficient and measures the direct influence of one variable upon the other. It allows separating the direct effect and their indirect

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Table 1. Phenotypic (P) and genotypic (G) correlation coefficients among yield attributes in 62 sesame genotypes. *and** =significant at 5% and 1% level respectively, DF 50% = Days to 50% flowering, DM = Days to maturity, PH = Plant height, NBP = Number of branches per plant, NCP = Number of capsules per plant, CL = Capsule length, NSC = Number of seeds per capsule, 1000 SW = 1000 seed weight, HI=Harvest index, SYP = Seed yield/plant.

Characters		DF50%	DM	PH (cm)	NBP	NCP
DF 50%	P	I	0.7120**	0.103	0.1928**	0.0253
	G	I	0.7667**	0.126	0.2207**	0.0094
DM	P		I	0.2410**	0.2240**	0.0911
	G		I	0.3365**	0.2946**	0.0676
PH (cm)	P			I	0.1062	-0.2144**
	G			I	0.1197	-0.2311**
NBP	P				I	0.4038**
	G				I	0.4328**
NCP	P					I
	G					I
CL (cm)	P					
	G					
NSC	P					
	G					
1000 sw (g)	P					
	G					
HI (%)	P					
	G					
SYP (g)	P					
	G					

Table 1. Continued.

Characters		CL (cm)	NSC	1000 SW (g)	HI (%)	SYP (g)
DF 50%	P	0.0721	0.0009	0.1695*	0.0075	-0.2676**
	G	0.0643	-0.0006	0.1779*	0.0148	-0.4107**
DM	P	0.2312	0.0767	0.2865**	0.0294	-0.2096**
	G	0.3105	0.1215	0.4006**	0.061	-0.4021**
PH (cm)	P	0.0812	-0.1882*	0.0615	0.2182**	-0.1814*
	G	0.0916	-0.2022**	0.0802	0.2327**	-0.2210**
NBP	P	0.0049	0.3706**	0.1224	0.0341	0.0508
	G	0.0145	0.4050**	0.1382	0.0412	0.0826
NCP	P	-0.612	0.8662**	0.2276**	-0.0367	0.5956**
	G	-0.0713	0.9297**	0.2541**	-0.0428	0.7016**
CL (cm)	P	I	-0.0044	0.1006	0.137	-0.0825
	G	I	-0.0045	0.1204	0.142	-0.0645
NSC	P		I	0.2058**	-0.0233	0.6237**
	G		I	0.2291**	-0.0177	0.7666**
1000 sw (g)	P			I	0.1434	0.0001
	G			I	0.1510*	-0.009
HI (%)	P				I	0.0122
	G				I	0.0144
SYP (g)	P					I
	G					I

effects through other attributes by apportioning the correlations for better interpretation of cause and effect relationship Wright (1921).

Materials and Methods

The experimental material used in the present investi-

gation comprised of sixty genotypes of sesame which were obtained from All India Coordinated Research Project on Sesame and Niger (ICAR), JNKVV Campus, Jabalpur, Madhya Pradesh. They were selected on the basis of duration, suitable for *kharif* season and yield. The following are raised along with two check varieties Swetha Thil and Rajeshwari obtained from RARS, Jagtial. The experiment was laid out in randomized block design (RBD) with three replications during *kharif*, 2015. Each genotype was sown in four rows of 4 meter length with inter row spacing of 30 cm and intra row spacing of 10 cm. Sowing was done by dibbling and all the recommended package of practices were followed to raise a healthy crop and necessary prophylactic measures were adopted against pests and diseases. Observations were recorded for yield, yield attributing characters on five randomly selected competitive plants for each entry in each replication. The mean data obtained at each location was considered for final statistical analysis. Days to 50% flowering was recorded on plot basis. Observations were recorded and the data was subjected to statistical analysis.

Results and Discussion

In general the genotypic correlation coefficients were slightly higher than the phenotypic correlation coefficients, indicating the masking effect of the environment in the total expression of the genotypes (Table 1). Such results are in concurrence with the findings of Sumathi et al. [2]. The association between seed yield and its contributing characters indicated that the seed yield per plant had positive and highly significant association with number of seeds per capsule and number of capsules per plant. Similar results were reported for number of seeds per capsule [3–5] and also for number of capsules per plant [2, 5, 6]. This clearly indicates that increased capsules per plant and seeds per capsule will increase seed yield and hence while making selection for yield more emphasis should be given to these characters.

Among inter correlations days to 50% flowering has significant positive association with days to maturity, number of branches per plant and 1000 seed weight and positive non-significant association with

plant height, number of capsules per plant, capsule length and number of seeds per capsule and harvest index. Days to maturity has significant positive association with plant height, number of branches per plant and 1000 seed weight. Plant height has significant positive association with harvest index and significant negative association with number of capsules per plant and number of seeds per plant. Number of branches per plant has significant positive association with number of capsules per plant and number of seeds per capsule. Number of capsules per plant has significant positive association with number of seeds per capsule and 1000 seed weight. Capsule length has positive non significant association with 1000 seed weight and harvest index. Number of seeds per capsules has positive significant association with 1000 seed weight. 1000 seed weight has positive significant association with harvest index at genotypic level. This indicates that, if other characters are held constant, improvement in these characters shall reflect in an increased seed yield. This is in accordance with the earlier findings [4, 5, 7–10].

From the result of study it is concluded that effective selection for superior genotypes is possible by considering the characters viz. number of seeds per capsule and number of capsules per plant.

The results of path coefficient analysis based on the genotypic and phenotypic correlation coefficient are presented in Table 2. The trait number of seeds per capsule showed high positive direct effects on seed yield per plant followed by number of capsules per plant at phenotypic level. This is in confirmation with findings earlier [4–5]. The traits plant height and harvest index showed positive but low direct effects on seed yield per plant.

In the present study, the residual effect (0.33) was high in magnitude which showed that some other important yield contributing characters which contributed to yield had to be included. From the above results, it could be inferred that the characters, number of seeds per capsule and number of capsules per plant were to be given prime importance as they revealed a significant positive correlation coefficient and a high positive direct effect compared to other traits.

Table 2. Phenotypic (P) and genotypic (G) path coefficients among yield attributes in 62 sesame genotypes. *and** = significant at 5% and 1% level respectively, DF 50% = Days to 50% flowering, DM = Days to maturity, PH = Plant height, NBP = Number of branches per plant, NCP = Number of capsules per plant, CL = Capsule length, NSC = Number of seeds per capsule, 1000 SW = 1000 seed weight, HI = Harvest index, SYP = Seed yield/plant.

Characters		DF 50%	DM	PH (cm)	NBP	NCP	CL (cm)	NSC	1000 sw (g)	HI (%)	Correlation with SYP (g)
DF 50%	P	-0.1595	-0.0657	0.0027	-0.0361	0.0084	-0.0019	0.0004	-0.0163	0.0004	-0.2676**
	G	0.0828	-0.4915	0.0214	-0.0313	-0.0013	0.0069	-0.0007	0.0028	0.0002	-0.4107**
DM	P	-0.1136	0.0923	0.0064	-0.0419	0.0301	-0.0062	0.0338	-0.0276	0.0017	-0.2096**
	G	0.0635	-0.6410	0.0571	-0.0417	-0.0094	0.0332	0.129	0.0064	0.0008	-0.4021**
PH (cm)	P	-0.0164	-0.0222	0.0266	-0.0199	-0.0709	-0.0022	-0.0828	-0.0059	0.0123	-0.1814*
	G	0.0104	-0.2157	0.1697	-0.017	0.032	0.0098	-0.2147	0.0013	0.0032	-0.2210**
NBP	P	-0.0308	-0.0207	0.0028	-0.1871	0.1335	-0.0001	0.163	-0.0118	0.0019	0.0508
	G	0.0183	-0.1888	0.0203	-0.1416	-0.0599	0.0015	0.4301	0.0022	0.0006	0.0826
NCP	P	-0.004	-0.0084	-0.0057	-0.0755	0.3306	0.0016	0.381	-0.0219	-0.0021	0.5956**
	G	0.0008	-0.0434	-0.0392	-0.0613	-0.1385	-0.0076	0.9874	0.004	-0.0006	0.7016**
CL (cm)	P	-0.0115	-0.0213	0.0022	-0.0009	-0.0202	-0.0267	-0.0019	-0.0097	0.0077	-0.0825
	G	0.0053	-0.1991	0.0155	-0.0021	0.0099	0.1068	-0.0048	0.0019	0.002	-0.0645
NSC	P	-0.0001	-0.0071	-0.005	-0.0693	0.2864	0.0001	0.4398	-0.0198	-0.0013	0.6237**
	G	-0.0001	-0.0779	-0.343	-0.0574	-0.1288	-0.0005	1.0621	0.0036	-0.0002	0.7666**
1000 sw (g)	P	-0.027	-0.0264	0.0016	-0.0229	0.0753	-0.0027	0.0905	-0.0963	0.0081	0.0001
	G	0.0147	-0.2568	0.0136	-0.0196	-0.0352	0.0129	0.2433	0.0159	0.0021	-0.009
HI (%)	P	-0.0012	-0.0027	0.0058	-0.0064	-0.0121	-0.0037	-0.0102	-0.0138	0.0565	0.0122
	G	0.0012	-0.0391	0.0395	-0.0058	0.0059	0.0152	-0.0188	0.0024	0.0139	0.0144

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