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Identification of Characters for Yield Improvement Through Multiple Regression Analysis in Sesame (*Sesamum indicum* L.)

K Parimala, R K Mathur, P Thangavel and J Ganesan
Department of Agricultural Botany, Faculty of Agriculture, Annamalai University, Annamalai Nagar 608 002, Tamil Nadu

ABSTRACT

The present investigation was carried out to understand the interrelationship and degree of dependence of seed yield on its componenets and elucidate their relative importance. The experiment was conducted by using a full diallel set of diverse genotypes of sesame and observations were recorded for seed yield and seven component characters. The analysis of variance revealed significant mean squares for all the characters studied. The correlation coefficient for seed yield with plant height, number of branches/plant and number of capsules/plant were highly significant and positive while, with number of seeds/capsule and 1000 seed weight, these were negative. In path analysis, maximum direct effect on seed yield was exerted through number of capusles/plant. It was evident that most of the associations of seed yield with its component characters were indirectly influenced through the number of capsules/plant. The multiple correlation coefficient between seed yield and all seven charaacters in equation was very high (R=0.9754). The step-wise regression analysis revealed that the number of capsules/plant was the most important character having r=0.9687 and could explain 93.84% of the total variation of seed yield. The relative importance of the characters for seed yield/plant could be in the order of number of capsules/plant>capsule length>number of branches/plant>plant height>number of seeds/capsule>1000 seed weight>days to first flower.

Key words : Analysis, Correlation, Multiple, Regression, Sesame

Sesame (*Sesamum indicum* L.) is an important edible oilseed crop grown for its high quality oil, rich in unsaturated fatty acids (80%). Development of high yielding sesame genotypes is an important objective in sesame breeding. Since yield is a polygenic character and is the result of manifestation of many mutually interrelated component characters, the direct selection of superior genotypes based on *per se* performance alone will not be an effective strategy. Identification of character(s) closely related with yield is usually done through studies on correlation coefficient and path analysis. In these methods, estimation of the characters associated with seed yield and their direct and indirect effects on yield helps in the selection of desirable plant types. Multiple regression analysis is as important tool for this type of study and has not yet been exploited in sesame. Therefore, the present investigation was carried out to understand symmetrical association, degree of dependence and relative importance of major yield characters of seed yield in sesame.

MATERIAL AND METHODS

A field experiment was conducted using a full diallel set of six diverse genotypes of sesame. The experimental material was grown in randomized complete block design with three replications at Faculty of Agriculture, Annamalai Nagar. The experimental plot consisted of 5 rows each of 4 m length. The inter- and intra-row spacings were 30 cm and 20 cm, respectively. Observations were recorded on fifteen randomly selected plants in each entry on eight quantitative characters namely, number of branches/plant (NBP), plant height (PH) in cm, number of capusles/plant (NCP), capsule length (CL) in cm, number of seeds/capsule, 1000 seed weight (TSW) in grams and seed yield/plant (SYP) in grams. Days to first flower was recorded on plot mean basis. The analysis of variance, simple correlation coefficients and multiple regression analysis were computed (Cohran and Cox, 1950 and Gomez and Gomez, 1983). The path analysis was accomplished for seed yield and its component characters as per Dewey and Lu, 1959 and Wright, 1971.

Table 1. Correlation coefficients among seed yield and its component traits in sesame.

Character	PH	NBP	NCP	CL	NSC	TSW	SYP
DTFF	0.41*	0.35*	0.28	0.17*	-0.27	0.05	0.24
PH		0.75**	0.70**	0.31	-0.44*	-0.07	0.66**
NBP			0.73**	-0.02*	-0.61**	-0.38*	0.68**
NCP				-0.07*	-0.69**	-0.40*	0.98**
CL					0.27	0.24	-0.14
NSC						0.35*	-0.70**
TSW							-0.37*

* = Significant at 5% level, ** = Significant at 1% level.

DTFF - Days to first flower, PH - Plant height, NBP - Number of branches / plant, NCP - Number of capsules/plant, CL - Capsule length, NSC - Number of seeds/capsule, TSW - Thousnad seed weight and SYP - Seed yield/plant.

Table 2. Path analysis for seed yield (dependent character) and yield attributes (independent characters) in sesame.

Character	DTFF	PH	NBP	NCP	CL	NSC	TSW	'r' with SYP
DTFF	-0.013	0.088	-0.089	0.272	-0.031	0.015	0.000	0.24
PH	-0.005	0.215	-0.190	0.675	-0.057	0.024	0.000	0.66**
NBP	-0.004	0.161	-0.254	0.706	0.041	0.033	0.000	0.68**
NCP	-0.004	0.151	-0.186	0.964	0.012	0.037	0.000	0.98**
CL	-0.002	0.066	0.056	-0.062	-0.186	-0.014	0.000	-0.14
NSC	0.003	-0.093	0.156	-0.663	-0.050	-0.054	0.000	-0.70**
TSW	-0.001	-0.015	0.097	-0.384	-0.044	-0.019	-0.001	-0.37*

Residual = 0.030

* = Significant at 5% level, ** = Significant at 1% level.

DTFF - Days to first flower, PH - Plant height, NBP - Number of branches / plant, NCP - Number of capsules/plant, CL - Capsule length, NSC - Number of seeds/capsule, TSW - Thousnad seed weight and SYP - Seed yield/plant.

Table 3. Composition of regression equations between seed yield/plant and other seven component characters using multiple regression analysis in sesame.

S.No.	Regression equation	R	R^2
1	Y = -0.777+0.125 (NCP)	0.9687	0.9384
2	Y = 1.98 -1.10 (CL) = 0.12 (NCP)	0.9714	0.9436
3	Y = 2.56 - 1.24 (CL) = -0.16 (NBP)+ 0.13 (NCP)	0.9728	0.9464
4	Y = 2.23 - 1.64 (CL) - 0.24 (NBP)+ 0.13 (NCP) - 0.05(NSC) + 0.23 (PH)	0.9736	0.9480
5	Y = 3.94 - 1.63 (CL) - 0.26 (NBP)+ 0.13 (NCP) - 0.05(NSC) + 0.23 (PH) + 0.34(TSW)	0.9747	0.9501
6	Y = 4.21 - 1.58 (CL) - 0.26 (NBP)+ 0.13 (NCP) - 0.05(NSC) + 0.23 (PH) + 0.34(TSW)	0.9751	0.9509
7	Y = 4.21 - 1.58 (CL) - 0.01 (DTFF) - 0.24 (NBP)+ 0.13 (NCP) - 0.05(NSC) + 0.02 (PH) + 0.37(TSW)	0.9754	0.9515

DTFF - Days to first flower, PH - Plant height, NBP - Number of branches / plant, NCP - Number of capsules/plant, CL - Capsule length, NSC - Number of seeds/capsule, TSW - Thousnad seed weight and SYP - Seed yield/plant.

RESULTS AND DISCUSSION

The analysis of variance revealed signficant mean squares for all the characters studied, indicating that sufficient amount of variability was available for carrying out the sutdy.

The correlation coefficients were worked out between seed yield and seven compoenent characters (Table 1). The correlation coefficient of seed yield with plant height, number of branches/ plant and number of capusles/plant were highly significant and positive (Sudhakar *et al.,* 2007) while with number of seeds/capsule and 1000-seed weight, these were negative and significant. This indicated that improvement in seed yield/plant could be achieved by improving plant height, number of branches/plant and number of capsules/plant as also reported by Solanki and Gupta, 2000.

The maximum direct effect on seed yield was exerted through (Table 2) number of capsules/plant (Tomar *et al.,* 1999 and Sudhakar, 2007). It was interesting to note that direct effect of plant height was of low magnitude when compared with the magnitude of its correlation coefficient with seed yield. The number of branches though showed positive and significant association with seed yield/ plant, had negative direct effects. Most of the associations on seed yield with its component characters were indirectly influenced through the number of capsules /plant. Therefore, it was concluded that importance of the characters based on magnitude of the direct effects could be in the order of number of capsules/plant>number of branches/plant>plant height>capsule length> number of seeds/capsule>days to first flower>1000 seed weight. The low positive residual effect of 0.0301 indicated that most of the important seed yield contributing characters had been included in the study.

The step-wise multiple regression analysis is a statistical tool to pin point the most important character(s) from a group of independent character (s) which influence the dependent character most and hence, could precisely be included in construction of selection indices. The path analysis though helps in selecting the most important character (s), has limited application in selection of the character (s) when compared with multiple regression analysis. The multiple regression analysis technique is a powerful statistical tool for identifying the most important character (s) associated with the seed yield by way of enter, step-wise and backward procedures. Different regression equations by including all seven independent characters studied and later excluding the non-significant ones from the equations are presented in Table 3. It is evident that the multiple correlation coefficient between seed yield and all seven characters in equation was very high in magnitude and statistically significant at 1% level (R=0.9754). This indicated that about 95.15% of total variation (coefficient of determination, R^2=0.9515) for seed yield could be accounted by these seven characters. The step-wise regression analysis revealed that the number of capsules/plant was the most important character having r=0.39687 and thus, alone could explain 93.84% of the total variation of seed yield. The backward removal of least important characters from the regression equation were also done. The six independent characters other than number of the characters for seed yield/plant could be in order of number of capsules/plant>capsule length>number of branches/plant height>number of seeds/ capsule>1000-seed weight>days to first flower.

It could be concluded that improvement in seed yield of sesame could be brought about by indirect selection for number of capsules/plant. Further, multiple regression analysis technique could be used for the precise selection of the independent characters having significant role in governing the dependent character which could help in construction of selection indices for the improvement of the dependent character.

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