Internat. J. agric. Sci. Vol.2 No.2 July 2006 : (338-340)

Yield component analysis through multiple regression analysis in sesame

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ABSTRACT

The present investigation was carried out to understand interrelationship and degree of dependence of seed yield on its components and elucidate their relative importance. The experiment was conducted by using a full diallel set of six diverse genotypes of sesame and observations were recorded on seed yield and seven component characters. The analysis of variance revealed significant mean squares for all the characters studied. The correlation coefficients of 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 capsules/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 characters 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: Sesame, Yield, Correlation coefficient, Multiple regression analysis.

INTRODUCTION

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 complex 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. The identification of character (s) related closely with yield than others is usually done through studies on correlation coefficients 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. To the best of our knowledge, use of multiple regression analysis in this regard has yet not 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.

MATERIALS AND METHODS

A field experiment was conducted by 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 the research farm of 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 random plants in each entry on eight quantitative characters namely, number of branches/ plant (NBP), plant height (PH) in cm, number of capsules/ 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 (DTFF) were recorded on plot mean basis. The analysis of variance, simple correlation coefficients and multiple regression analyses were done (Cochran and Cox, 1950; Gomez and Gomez, 1983). The path analysis was accomplished for seed yield and its component characters (Dewey and Lu, 1959; Wright, 1921).

RESULTS AND DISCUSSION

The analysis of variance revealed significant mean squares for all the characters studied, thus, indicating sufficient amount of variability available for carrying out the study. The results pertaining to association, path and multiple regression analyses are discussed as under:

Estimates of Correlation coefficients:

The correlation coefficient is a measure of symmetrical association (interrelationship) between two variables (characters) having cause and effect relationship. These estimates were worked out between seed yield and seven component characters (Table 1). The correlation coefficients of 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 and significant. This indicated that improvement in seed yield/ plant could be achieved by improving the characters like plant height, number of branches/ plant and number of capsules/ plant. Similar report for plant height, number of branches/ plant, number of capsules/ plant and 1000-seed weight with seed yield are also available (Solanki and Gupta, 2000).

Path analysis:

The correlation coefficients fail to provide the exact information on the degree and magnitude of relationship between dependent and independent characters. The path analysis is a standardized partial regression coefficient, which splits the correlation coefficients into the measures of direct and indirect effects of a set of independent variables on the dependent variable (Singh, 2000). Hence, the path analysis technique was resorted for estimating the direct and indirect effects of seven yield components on seed yield/ plant (Table 2). The maximum direct effect on seed yield was exerted through number of capsules/plant (Tomar *et al*., 1999). 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 even negative direct effects. Moreover, it was evident that most of the associations of seed yield with its component characters were indirectly influenced through the number of capsules/ plant. It was, therefore, concluded that importance of the characters based on magnitude of the direct effects could be in order of number of capsules/ plant> number of branches/ plant> plant height> capsule length> number of seeds/ capsules> days to first flower> 1000-seed weight. The low positive residual effect of 0.0301 indicated that the most of the important seed yield contributing characters had been included in the study.

Multiple regression analysis:

The step-wise multiple regression analysis is a statistical tool to pin point the most important character (s) from a group of

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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**	-0.22*	-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= Thousand seed weight; and SYP= Seed yield/ plant

Table 2 : The path analysis for seed yield (dependent character) and yield attributes (independent characters) in sesame

Character	DTF	PH	NBP	NCP	CL	NSC	TSW	'r' with SYP
DTF	-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 = 0.03; * 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= Thousand seed weight; and SYP= Seed yield/ plant

Table 3 : Construction of regression equations between seed yield/plant and other yield components 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)+0.02(PH)	0.9736	0.9480
5	Y = 4.67-1.62(CL)-0.28(NBP)+0.13(NCP)-0.05(NSC)+0.23(PH)	0.9747	0.9501
6	Y= 3.94-1.63(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= Thousand seed weight; and Y= Seed yield/ plant

independent characters 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 powerful statistical tools for identifying the most important character (s) associated with the seed yield by way of enter, step-wise and backward procedures. Different regression equations developed by including all seven independent characters studied and later excluding the non-significant ones from the equations are presented in Table 3. From the table it is clear 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 for by these seven characters. The step-wise regression analysis revealed that the number of capsules/ plant was the most important character having r=0.9687 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 was also done. The six independent characters other than number of capsules/ plant could explain only 1.31% of the total variation. 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.

From the above study it could be concluded that improvement in seed yield of sesame could be brought by indirect selection for the number of capsules/ plant. Further, multiple regression analysis technique could be used for the precise selection for the independent characters having significant role in governing the dependent character.

REFERENCES

Cochran, W.G. and Cox, G.M. (1950). Experimental Designs. John Wiley & Sons, Inc. New York.

Dewey, D.R. and Lu, K.H. (1959). A correlation and path coefficient analysis of components of crested wheat grass seed production. *Agronomy Journal*. **51:**515-518

Gomez, K.A. and Gomez, A.A. (1983) Statistical procedures for Agricultural Research, John Wiley & Sons, Inc. New York.

Singh, B.D. (2000). Plant Breeding- Principles and Methods. Kalyani Publishers, New Delhi

Solanki, Z.S. and Gupta, D. (2000). Correlation and path analysis for oil yield in sesame (*Sesamum indicum* L.). *Journal of Oilseeds Research*. **17(1):** 51-53

Tomar, H.S., Shrivastava, G.K., Tiwari, O.P. and Tripathi, R.S. (1999). Correlation and path coefficient analysis of various components on seed yield of summer sesame. *Journal of Oilseeds Research*. **16(1):** 137-138

Wright, S. (1921). Correlation and Causation. *Journal of Agricultural Research*. **20:** 557.851

Received : August, 2005; Accepted : February, 2006