Studies on Genetic Variability, Character Association and Path Coefficient Analysis in Sesame (*Sesamum indicum* L.)

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Eighty two genotypes of sesame (*Sesamum indicum* L.) were evaluated in randomized block design during rainy season of 2006 at Agricultural Research Station, Mandor, Jodhpur to assess the variability and character association. The mean sum of squares were significant for all the characters studied except oil content, indicating the presence of variability. Characters like seed yield, primary branches per plant, capsules per plant and capsule bearing height exhibited high heritability coupled with high genetic advance revealing that these characters were controlled by additive gene action. Seed yield showed significant positive correlation with capsules per plant, oil content, test weight, capsule bearing height and primary branches per plant. The maximum positive direct effects on seed yield was observed by capsules per plant followed by test weight and plant height, while days to maturity, days to 50% flowering and capsule bearing height had negative effect. Thus, capsules per plant, test weight and plant height were the major components contributing to the seed yield in sesame.

Key Words: Sesame, Variability, Heritability, Correlation, Path coefficient

Introduction

Rajasthan is the major sesame growing state (314.9 thousand ha area) in India with a production of 126.9 thousand tonnes but the productivity (403 kg/ha) is low (Anonymous, 2007-08). In order to increase the potential of sesame genotypes for seed yield, an understanding of the relationship among different characters with seed yield and presence of variability is essential. Besides this, knowledge about the direct contribution of different characters to seed yield would be highly useful for formulating a selection criterion, which will combine high seed yield and other desirable traits such as oil content. Therefore, the present study was undertaken to know variability and characters association among sesame genotypes for seed yield with yield contributing characters.

Materials and Methods

The materials for present investigation comprised of 78 newly developed white seeded genotypes selected from F_6 generation of different crosses (Parents RT 3, RT 46, RT 73, RT 125, RT 127, RT 142, RT 156, RMT 34, RMT 40, RMT 50, RMT 117, RMT 123, TKG 20, TKG 55, ES 135, ES 187, GRT 8333, GRT 8368, JLT 8, TNAU 63, AT 8, C 6, TC 383, IS 158-2, IS 225-3 and IS 238) and four standard check varieties (RT 46, RT 54, RT 127 and TKG 22) of sesame (*Sesamum indicum* L.). A set of 82 entries/varieties of sesame was grown in randomized block design with three replications during *kharif* 2006 at research farm of Agricultural Research Station, Mandor, Jodhpur. Each genotype was sown in five rows of 4 m length following crop geometry of 30 × 15 cm. The crop was raised under rainfed conditions and all agricultural operations were done as and when necessary. The data were recorded on five competitive plants taken from each replication for plant height (cm), capsule bearing height (cm), number of primary branches per plant and number of capsules per plant. Seed yield (kg/ha), test weight (g), oil content (%), days to 50% flowering and maturity were recorded considering whole plot. The data were subjected to analysis of variance following standard methods. Correlation coefficients were used to perform the path analysis of seed yield suggested by Dewey and Lu (1959) and the other genetic parameters such as variability, heritability and expected genetic advance as percent of mean were estimated using INDOSTAT software (Indostat Services, Hyderabad).

Results and Discussion

The analysis of variance revealed significant differences among the genotypes for all the characters except oil content, indicating the presence of variability. The range, mean, coefficient of variability, heritability in broad sense and genetic advance (as per cent of mean) for yield and its component characters are given in Table 1. Wide variability was observed for seed yield (250-891 kg/ha) and other characters also. The high magnitudes of phenotypic as well as genotypic coefficient of variation for seed yield, primary branches per plant and capsules per plant indicated the presence of ample amount of variation for these characters. The high heritability (75-95%) combined with high genetic advance as percent of

Table 1. Estimates of genetic parameters of seed yield and its component characters in sesame

Characters	Mean	Range		GCV	PCV	Heritability	GA as per cent
		Min.	Max.	(%)	(%)	(%)	of mean
Seed yield (kg/ha)	571	250	891	25.4	26.0	95	50.9
Days to 50% flowering	42	38	45	3.2	3.6	82	6.0
Days to maturity	80	71	87	2.5	2.7	88	4.9
Plant height (cm)	127	95	145	5.4	6.2	75	9.7
Capsule bearing height (cm)	59	47	93	8.9	10.3	76	16.0
Primary branches/plant	2.9	1.0	4.4	18.7	20.4	84	35.4
No. of capsules/plant	45	28	62	13.9	15.2	84	26.2
Test weight (g)	2.66	2.44	2.95	3.7	4.1	83	7.0
Oil content (%)	45.7	38.4	49.2	1.9	3.9	22	1.8

GCV-Genotypic coefficient of variation, PCV- Phenotypic coefficient of variation and GA- Genetic advance

mean for seed yield, primary branches per plant, capsules per plant and capsule bearing height revealed that these characters were controlled by additive gene action, suggesting that selection for these traits would be effective for crop improvement. These results are in agreement with those reported by earlier workers (Solanki and Gupta, 2004; Babu *et al.*, 2004).

The estimates of correlation coefficients between seed yield and other yield contributing characters in all possible combinations are presented in Table 2. Relative higher magnitude of correlation coefficients indicated a strong inherent association among various characters. Therefore, selection on the basis of the phenotype would be effective. Seed yield was found to be significantly and positively correlated with number of capsules per plant (0.56), oil content (0.48), test weight (0.31), number of primary branches per plant (0.26) and capsule bearing height (0.23), while days to maturity were significantly and negatively correlated with the seed yield (-0.42), which was a good sign for escaping drought in high yielding genotypes of sesame. Similar results were reported by Osman Khidir and Osman (1970) for plant height, branches number, capsules number and 1000-seed weight. Among other characters number of capsules per plant had positive significant correlation with number of primary branches per plant (0.52) and capsule bearing height (0.45). Plant height also exhibited significant positive association with days to maturity (0.47), days to 50% flowering (0.43) and capsule bearing height (0.31). These results indicated that improvement in seed yield can be achieved by improving the characters like capsules per plant, test weight and primary branches per plant.

Dewey and Lu (1959) suggested that when more variables are considered in correlation matrix, path coefficient analysis becomes more useful in specifying the cause and also measures the relative importance of each character. The direct and indirect effects of various characters on seed yield are given in Table 3. Number of capsules per plant had the maximum direct effects (0.471) on seed yield followed by test weight (0.229) and plant height (0.051), while days to maturity (-0.330) showed maximum negative direct effect *i.e.* early maturing genotypes were also higher yielders.

Thus, it may be concluded from this study that number of capsules per plant, test weight, number of primary branches per plant and plant height are the most

Table 2. Correlation coefficients between seed yield and its component characters in sesame

Characters	Days to maturity	Plant height	Capsule bearing height	Primary branches/ plant	No. of capsules/ plant	Test weight	Oil content	Seed yield
Days to 50% flowering	0.328**	0.429**	-0.103	0.162	0.036	-0.265*	-0.045	-0.132
Days to maturity		0.479**	0.146	-0.301**	-0.273*	0.094	-0.112	-0.415**
Plant height			0.316**	-0.038	0.056	0.179	0.155	0.017
Capsule bearing height				-0.121	0.450**	0.253*	0.083	0.227*
Primary branches/plant					0.516**	-0.224*	0.234*	0.263*
No. of capsules/plant						0.098	0.167	0.561**
1000-seed weight							0.150	0.314**
Oil content								0.484**

*and ** significant at 5% and 1% level, respectively.

Table 3. Path coefficient analysis showing direct (diagonal) and indirect effects in sesame

Characters	Days to 50%	Days to maturity flowering	Plant height	Capsule bearing/ height	Primary branches/ plant	No. of capsules plant	1000-Seed weight	Oil content	Seed yield
Days to 50% flowering	**-0.029**	0.009	0.012	-0.003	0.005	0.001	-0.008	-0.001	-0.132
Days to maturity	-0.108	**-0.330**	-0.158	-0.048	0.099	0.090	-0.031	0.037	-0.415**
Plant height	0.022	0.025	**0.051**	0.016	-0.002	0.003	0.009	0.008	0.017
Capsule bearing height	0.005	-0.008	-0.017	**-0.053**	0.006	-0.024	-0.013	-0.004	0.227*
Primary branches/plant	-0.200	0.037	0.005	0.015	**-0.121**	-0.063	0.027	-0.028	0.263*
Capsules/plant	0.017	-0.129	0.026	0.212	0.243	**0.471**	0.046	0.078	0.561**
1000-seed weight	-0.061	0.022	0.041	0.058	-0.051	0.023	**0.229**	0.034	0.314**
Oil content	-0.016	-0.040	0.056	0.030	0.084	0.060	0.054	**0.360**	0.484**

Residual effect = 0.6321

important components for determining seed yield, as they recorded significant positive correlation coefficients and higher positive direct and indirect effects on seed yield.

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