Karnataka J. Agric. Sci., 22(2): (252-254) 2009

Studies on genetic variability and character association in germplasm collection of sesame (*Sesamum indicum* L.)

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(Received : July, 2008)

Abstract: One hundred fifty one Sesame genotypes were evaluated during Kharif -2006 for genetic diversity in respect of nine quantitative characters. Analysis of variance revealed significant difference among genotypes for all the nine character studied. High GCV and PCV were observed for seed yield/plant, number of capsules/plant, number of primary branches/plant, number seeds/capsule and plant height. High heritability and genetic advance as per cent mean was observed for seed yield, number of primary branches/plant, number capsules/plant, number of seeds/capsule, plant height and days to 50% flowering. Seed/plant showed significant and positive association with number of primary branches/plant, number of seeds/capsule and capsule length. Path co-efficient analysis revealed maximum positive direct effect of number of capsules on seed yield followed by capsule length and plant height

Key words : Sesame, character association, genetic variability

Introduction

Sesame, *Sesamum indicum L*. is an important oilseed crop of tropical and sub tropical region. India ranks first in the world in sesame cultivation (27.7% area) but its productivity is quite low (368kg/ha) as compared to worlds average (489 kg/ha) (FAO, 2004). The success of any crop improvement programme essentially depend on the nature and magnitude of genetic variability present in the crop. The knowledge of nature and magnitude of genetic variability is of immense value for planning efficient breeding programme to improve the yield potential of the genotypes. Information on the association of plant characters with seed yield is great importance to breeder in selecting desirable genotypes. Hence, the present investigation was carried out to gather information on variability, character association and path co-efficient analysis in 151 germplasm collections of sesame for nine characters.

Material and methods

The material for the study comprised 151 germplasm collections of Sesame received from Project Co-ordinating unit, AICRP on Sesame & Niger, Jabalapur (M.P) representing diverse eco-geographic origin. The experiment was conducted at Main Agricultural Reseach Station, Dharwad during Kharif, 2006 in a Randomized Block Design with two replications. Each genotype was sown in a single row of 4 m length at a distance of 30 cm between the rows and 10 cm between the plants within the rows. Five plants in each row were selected at random and the data on nine characters were analysed based on the formula given by Lush (1940)for heritability. Heritability in the broad sense was derived based on the formula given by Hansan *et al*., (1956). Genetic advance was obtained by the formula prescribed by Johnson *et al*., (1955). The method adopted by Burton and Devane (1953) was used to calculate phenotypic and genotypic co-efficient of variation. The genotypic and phenotypic correlation coefficients were worked out by following Al-jibouri *et al*., (1958) and path co-efficient analysis as suggested by Dewey and Lu (1959).

Results and discussion

The analysis of variance revealed significant difference among the genotypes for seed yield and component characters indicating considerable amount of genetic variation in the material. The phenotypic and genotypic co-efficient of variation (Table-1) were highest for seed yield/plant, number of primary branches/plant, number of capsules/plant and number of seeds/ capsule and higher genotypic co-efficient of variation suggest that these characters are under the influence of genetic control. Therefore, these characters can be relied upon and simple selection can be practiced for further improvement. These results are in agreement with those of Patil and Sherif (1966) and Reddy *et al*., (2001). Moderate phenotypic co-efficient of variation (PCV) and genotypic co-efficient of variation (GCV) values were recorded for plant height, days to 50% flowering, days to maturity and capsule length. The results are in conformity with the findings of Chandrasekhar and Reddy (1993) and Reddy *et al*.., (2001). Oil content recorded a low phenotypic and genotypic co-efficient of variation. Similar results were reported by Pathak and Dixit (1992), Chandrasekhara and Reddy (1993) and Shadaksari *et al*., (1995).

High heritability coupled with high genetic advance over mean was observed for seed yield/plant, number of primary branches/plant, number of capsules/plant, number of seeds/ capsule, plant height and days to 50% flowering. This indicates the lesser influence of environment in expression of these characters and prevalence of additive gene action in their inheritance,. Hence, are amenable for simple selection.. Similar findings were reported by Reddy *et al*., (2001) and Krishnaiah *et al*., (2002). High heritability with moderate genetic advance was recorded for days to maturity and capsule length indicating that the characters were governed by both additive and non-additive

Table 1. Genetic parameters for nine quantitative traits in sesame

Characters	Range		Mean	Variance		Coefficients of variability		Broad sense heritability (%) (h^2)	Expected genetic advance at 5% (GA)	Genetic advance percent mean (GAM)
	Min	Max		Phenotypic	Genotypic	Phenotypic (PCV)	Genotypic (GCV)			
Days to 50% flowering	29.0	56.3	42.7	49.7	44.9	15.7	15.2	98.2	14.2	33.6
Days to maturity	73.0	115.7	94.4	82.4	81.6	10.6	10.4	99.1	18.7	21.9
Plant height (cm)	45.6	129.0	87.3	268.6	245.6	20.9	19.3	92.6	31.6	38.2
Number of primary branches/plant	0.3	60.0	3.2	0.8	0.8	32.0	31.1	88.2	1.6	57.0
Number of capsules/plant	21.6	115.2	68.4	359.6	341.7	43.1	42.2	96.2	37.9	86.1
Capsule length (cm)	1.4	3.9	2.7	0.2	0.2	11.9	10.3	78.0	0.5	19.6
Number of seeds/capsule	39.2	121.6	80.4	228.6	19.2	23.9	21.8	85.1	26.0	41.3
Oil content (%)	46.7	56.2	51.5	0.9	0.8	1.7	1.5	82.0	1.8	3.2
Seed yield/plant (g)	2.9	19.6	11.3	7.6	7.9	60.2	58.7	98.6	5.4	121.2

gene action. These results are in accordance with Krishnaiah *et al*., (2002). High heritability coupled with low genetic advance was recorded for oil content indicating non-additive gene action. These results are in conformity with the findings of Reddy *et al*., (2001).

Phenotypic and genotypic correlation in general was higher than the correlation (Table 2 and 3) indicating a less influence of environmental factors. Plant height exhibited significant and very high positive association with seed yield/ plant. Similar association exhibited was observed by Pawar *et al*., (2002). Significant and very high positive association between number of capsules/plant and seed yield/plant indicating that this character was a reliable yield component charecters. Tomar *et al*., (1999) also found similar observations. Number of primary branches/plant, Number of seed/capsule and capsule length exhibited significant but moderate positive correlation with seed yield/Plant.

The results of the path co-efficient analysis revealed (Table 4) that the number of capsules/ plant had maximum positive direct effect on seed yield/plant followed by capsule length and plant height. Therefore, these traits may be considered as the principal traits while selecting for seed yield. In other words, selection indices may be formed by considering all these characters for improvement of seed yield.

Acknowledgements: The authors are greatfully thank Project Co-ordinator (Sesame and Niger), AICRP on Sesame and Niger, JNKVV, Jabalapur (MP) for having supplied 150 Sesame germplasm collections for the study.

Table 2. Phenotypic correlation coefficients between seed yield and its components in sesame

Character	Days to 50% flow.	Days to maturity	Plant height	Number of primary branches	Number of capsules /plant	Capsule length	Number of seeds/ capsule	Oil content	Seed yield/ plant
Days to 50% flowering	1.000	0.687**	0.098	0.019	0.117	0.189	0.193	0.004	0.210
Days to maturity		1.000	0.224	-0.002	0.212	0.312	0.310	0.086	0.239
Plant height			1.000	0.410*	0.997**	0.367*	0.389*	0.295	0.886*
Number of primary branches/plant				1.000	0.428*-	-0.112	-0.087	-0.009	0.434*
Number of capsules/plant					1.000	0.394*	0.434*	0.264	0.894**
Capsule length						1.000	0.991**	0.047	0.401*
Number of seeds/capsule							1.000	0.087	0.415*
Oil content								1.000	0.260
Seed yield/plant									1.000

Table 3. Genotypic correlation co-efficient between seed yield and its components in sesame

Characters	Days to 50% flow.	Days to maturity	Plant height	Number of primary branches	Number of capsules/ plant	Capsule length	Number of seeds/ capsule	Oil content	Seed yield/ plant
Days to 50% flowering	1.000	0.678**	0.082	0.011	0.097	0.195	0.158	0.012	0.113
Days to maturity		1.000	0.123	-0.001	0.117	0.241	0.231	0.043	0.131
Plant height			1.000	0.335**	0.987**	0.327**	0.326**	0.187	0.885**
Number of primary branches/plant				1.000	0.345**	-0.149	-0.123	-0.003	0.418**
Number of capsules/plant					1.000	0.338**	0.352**	0.206	0.872**
Capsules length						1.000	1.117**	0.042	0.442**
Number of seeds/capsule							1.000	0.045	0.429**
Oil content								1.000	0.212
Seed yield/plant									1.000

* significant at 5 % ** significant at 1%

Table 4. Direct (diagonal) and indirect effects of eight characters on seed yield / plant at phenotypic level in Sesame

Character	Days to 50% flowering	Days to maturity	Plant height	Number of primary branches	Number of capsules/plant	Capsule length	Number of seed/capsule	Oil content	Seed yield/ plant
Days to 50% flowering	0.042	0.002	0.031	0.002	0.081	0.071	-0.037	0.000	0.210
Days to maturity	0.021	0.004	0.029	0.000	0.079	0.072	-0.063	0.006	0.228
Plant height	0.008	0.000	0.262	0.030	0.650	0.095	-0.074	0.009	0.879
Number of primary branches/plant	0.001	0.000	0.060	0.098	0.287	-0.045	0.029	0.000	0.421
Number of capsules/plant	0.006	0.000	0.263	0.034	0.668	0.086	-0.312	0.012	0.894
Capsule length	0.008	0.000	0.056	-0.020	0.262	0.394	-0.264	0.004	0.415
Number of seed/capsule	0.009	0.000	0.061	-0.010	0.265	0.396	-0.281	0.008	0.420
Oil content	0.000	0.000	0.036	-0.002	0.121	0.023	-0.025	0.078	0.216

Residual 0.486

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