IJPS INTERNATIONAL JOURNAL OF PLANT SCIENCES
Volume 8 | Issue 2 | July, 2013 | 280-283

RESEARCH ARTICLE

Estimation of genetic variability parameters in sesame (*Sesamum indicum* L.)

■ R.S. JADHAV AND M.N. MOHRIR

SUMMARY

Thirty-one germplasm lines of sesame (*Sesamum indicum* L.) were evaluated at Department of Botany, Pratishtan Mahavidyalaya Paithan, for genetic variability, heritability and genetic advance as per cent of mean for seventeen quantitative traits. Analysis of variance revealed significant differences for all characters except days to flower initiation. Character seed yield per plant, capsules per plant, capsules on main stem and plant height for first capsule, were shown high GCV and PCV values indicating that improvement through selection may be possible for these characters. High heritability and high genetic advance as per cent of mean were observed for seed yield per plant, capsules on main stem and capsules per plant, indicating that characters were governed predominantly by additive gene action and selection could be effective. High values for GCV and heritability coupled with high genetic advance as per cent of mean were observed for characters *viz.*, seed yield per plant, capsules on main stem, capsules per plant, nodes on main stem and plant height for first capsule indicating that these characters were governed by additive gene action and selection could be effective for improvement of these characters.

Key Words : GCV, Genetic advance, Heritability, PCV, Sesame

How to cite this article : Jadhav, R.S. and Mohrir, M.N. (2013). Estimation of genetic variability parameters in sesame (*Sesamum indicum* L.). *Internat. J. Plant Sci.*, **8** (2) : 280-283.

Article chronicle : Received : 26.10.2012; **Revised :** 20.02.2013; **Accepted :** 22.04.2013

Sesame (*Sesamum indicum* L.) is an important oilseeds crop and its seed contain 38-54% oil and 18-25% protein. In India, its sixth most important oilseed crop and having 1.94 mha area with 0.755 mt production and productivity of 389 kg/ha (Anonymous, 2012). The average productivity is very low as compare with other sesame growing countries and almost stagnant during last few years. The genetic variability present in gene pool is the basis for genetic improvement in yield and yield contributing characters. The effectiveness of selection depends on genetic variability, heritability of character and nature of gene action.

MEMBERS OF THE RESEARCH FORUM

Author to be contacted :
R.S. JADHAV, Department of Botany, Pratishtan Mahavidyalaya, Paithan, AURANGABAD (M.S.) INDIA
Email: msrama_res@yahoo.com

Address of the Co-authors:
M.N. MOHRIR, Department of Botany, Pratishtan Mahavidyalaya, Paithan, AURANGABAD (M.S.) INDIA
Email: mnmohrir@gmail.com

MATERIAL AND METHODS

In the present study thirty-one sesame germplasm lines were evaluated at Department of Botany, Pratishtan Mahavidyala Paithan, during summer 2009 in Randomized Block Design with three replications. Each plot consisted of 3 m length and planted at spacing of 30 cm x 15 cm, between row to row and plant to plant. The observations were recorded on five randomly selected plants for seventeen quantitative characters. Analysis of variance was calculated for quantitative characters (Table 1). The genotypic and phenotypic co-efficient of variation was worked out as per Burton and Devane (1953), heritability in broad sense and genetic advance were calculated as per method suggested by Johanson *et al.* (1955).

RESULTS AND DISCUSSION

The analysis of variance revealed significance differences for all characters except days to flower initiation, indicating the presence of considerable amount variability among the material under study for the characters and

selection could be effective for improvement of these characters (Table 1). Similar results were reported by Valarmathi *et al.* (2004) and Solanki and Gupta (2001).

Though, phenotypic co-efficient variation (PCV) values were higher than genotypic co-efficient of variation (GCV) values for all the characters *viz.*, seed yield per plant, capsules per plant, capsules on main stem, nodes for first capsule, nodes on main stem, number of primary branches, capsule bearing plant height and plant height for first capsule were shown little difference between GCV and PCV indicating that these characters were less affected by environment and selection could be effective for improvement of these traits. Highest GCV was shown by seed yield per plant followed by capsules per plant, capsules on main stem and plant height for first capsule, indicates that improvement through selection is possible for these characters (Table 2). These results are in agreement with those of Valarmathi *et al.* (2004) and Solanki and Gupta (2001) for seed yield and capsules per plant. Alake *et al.* (2010) also reported high GCV for plant height for first capsule. Moderate GCV values were observed for number of primary branches, nodes on main stem, capsule bearing plant height, 1000 seed weight, plant height, internode distance, days to 50 per cent flowering, and nodes for first capsule, where as low values were shown by days to first flowering, days to maturity, capsule length, oil content and seeds per capsule. Similar results were reported by Solanki and Gupta (2001), Alake *et al.* (2010) and Parameshwarappa *et al.* (2009) for days to maturity, number of days to flowering and oil content, respectively.

Heritability estimates were recorded up to the extent of 99.53 per cent by oil content, followed by 93.22 per cent (seed yield per plant), 90.83 per cent (number of capsules on main stem), 88.12 per cent (plant height for first capsule), 87.77 per cent (capsules per plant) and 84.61 per cent (nodes on main stem) (Table 2). These results are in agreement with those of Valarmathi *et al.* (2004) and Alake *et al.* (2010). While lowest estimate were shown by days to first flowering (6.75%), followed by capsule length (23.10%) and days to maturity (27.40%). Alake *et al.* (2010) and Solanki and Gupta (2001) reported low heritability for days to first flowering and days to maturity, respectively.

Genetic advance (GA) was highest for plant height (16.95) followed by capsules per plant (16.90), capsule bearing plant height (12.10) and plant height for first capsule (10.24), while capsule length (0.14) followed by internode distance (0.52) and days to first flowering (0.56) were having low GA (Table 2). Genetic advance as percent of mean was observed up to extent of 97.17 per cent (Seed yield per plant) followed by 77.51 per cent (capsules on main stem) and 75.86 per cent (number of capsules per plant), while lowest as 1.34 per cent (days to first flowering) followed by 7.04 per cent (days to maturity) and 9.00 per cent (seeds per capsule). Alake *et al.*

Table 1 : Analysis of variance for quantitative traits in sesame

Source of variation		Replication	Genotypes	Error	Total
d.f.		2	30	60	92
Sr. No.	Characters		Mean sum of square		
1.	Days to first flowering	0.91	19.01	15.69	
2.	Days to 50 % flowering	2.58	142.06 **	28.8	
3.	Days to maturity	1.03	177.00**	83.02	
4.	Plant height (cm)	0.06	338.50**	42.23	
5.	Plant height for first capsule (cm)	0.13	89.91**	3.87	
6.	Capsule bearing plant height (cm)	0.09	140.05**	9.79	
7.	Number of primary branches	0.000741417	1.21**	0.11	
8.	Inter node distance (cm)	0.01	0.65**	0.19	
9.	Capsule length (cm)	0.001293308	0.13**	0.07	
10.	Nodes on main stem	0.19	35.55**	2.03	
11.	Nodes for first capsule	0.03	3.09**	0.32	
12.	Capsules on main stem	0.22	46.49**	1.51	
13.	Capsules per plant	0.42	245.97**	10.92	
14.	Seeds per capsule	3.43	131.88**	63.85	
15.	Yield per plant (g)	0.000187285	2.94**	0.07	
16.	1000 seed weight (g)	0.002055482	0.45**	0.02	
17.	Oil content (%)	0.002222589	33.10**	0.05	

** Indicate significance of value at P=0.01

(2010) found similar results for seed yield per plant, plant height for first capsule and seeds per capsule, whereas Valarmathi *et al*. (2004) found contrast results for oil content.

High values for both heritability and genetic advance as per cent of mean were shown by ten characters *viz.*, seed yield per plant, capsules on main stem, capsules per plant, plant height for first capsule, 1000 seed weight, nodes on main stem, capsule bearing plant height, number of primary branches, plant height and nodes for first capsule, revealing that these characters were predominantly governed by additive gene action and selection could be effective. Alake *et al.* (2010) and Valarmathi *et al.* (2004) reported similar findings for seed yield per plant, while Parameshwarappa *et al.*(2009), Reddy *et al*.(2001) and Krishnaiah *et al*. (2002) recorded high heritability and genetic advance as per cent of mean for seed yield per plant and capsules per plant. Alake *et al.* (2010) reported similar results for plant height for first capsule. Days to 50 per cent flowering and internode distance shown high heritability with moderate genetic advance as per cent of mean, suggest that these characters were govern by both additive and non additive gene action, whereas low values for both heritability and genetic advance as percent of mean were observed for days to first flowering, days to maturity, capsule length and seeds per capsule, indication of high influence of environment, involvement of non additive gene action and early selection may be effective for improvement of those traits. However, Krishnaiah *et al*. (2002) and Parameshwarappa *et al.* (2009) obtained contrast results for days to maturity and capsule length. Heritability should be considered along with genetic advance as per cent of mean, however, it is not necessary that character showing high heritability will also exhibit high genetic advance (Johnson *et al.*, 1955). High heritability and low genetic advance as per cent of mean were observed for oil content. High heritability estimates for oil content may be due to favourable influence of environmental condition; however, the low GA as per cent of mean indicate that character was governed by non-additive gene action and could be improved through exploitation of heterosis breeding. These findings are in agreement with those of Parameshwarappa *et al*. (2009), Reddy *et al*. (2001) and Shabana and Ravikumar (2003).

GCV and heritability should be considered along with genetic advance as per cent of mean while assessing the effect of phenotypic selection than single parameter alone. Characters *viz.*, seed yield per plant, capsules on main stem, capsules per plant, nodes on main stem and plant height for first capsule were shown high GCV, heritability and genetic advance as per cent of mean, indicates that character were governed by additive gene action and selection may be effective with possible genetic gain of 1.92 per cent, 7.52 per cent, 16.90 per cent, 6.27 per cent and 10.24 per cent on selection of top 5 per cent genotypes, respectively. Alake *et al.* (2010) and Valarmathi *et al.* (2004) reported high GCV, heritability and genetic advance as per cent

Table 2 : Estimates of variability parameters for quantitative traits in sesame

Sr. No.	Characters	Range	Mean	σ^2e	σ^2g	σ^2p	h^2 (bs.) %	G.C.V (%)	P.C.V. (%)	G.A.	G.A. as % mean
1.	Days to first flowering	40.0-48.3	42.10	15.69	1.14	16.83	6.75	2.53	9.74	0.56	1.34
2.	Days to 50 % flowering	47.0-85.7	50.30	28.80	37.75	66.55	56.73	12.21	16.21	9.43	18.74
3.	Days to maturity	46.5-89.3	84.80	83.02	31.33	114.35	27.40	6.60	12.61	5.97	7.04
4.	Plant height (cm)	30.5-70.3	47.60	42.23	98.76	140.99	70.05	20.86	24.93	16.95	35.58
5.	Plant height for first capsule (cm)	10.0-29.2	17.70	3.87	28.68	32.55	88.12	30.23	32.20	10.24	57.82
6.	Capsule bearing plant height (cm)	17.5-44.2	27.90	9.79	43.42	53.21	81.60	23.63	26.15	12.13	43.48
7.	Number of primary branches	1.0-4.0	2.20	0.11	0.37	0.48	76.57	27.22	31.11	1.08	48.53
8.	Inter node distance (cm)	2.3-4.5	3.10	0.19	0.15	0.34	43.90	12.60	19.01	0.52	17.01
9.	Capsule length (cm)	1.6-2.8	2.40	0.07	0.02	0.09	23.10	5.96	12.40	0.14	5.84
10.	Nodes on main stem	4.2-19.2	12.00	2.03	11.17	13.20	84.61	27.86	30.29	6.27	52.23
11.	Nodes for first capsule	2.8-7.0	5.10	0.32	0.92	1.25	73.96	18.66	21.70	1.68	32.71
12.	Capsules on main stem	0-18.8	9.70	1.51	14.99	16.51	90.83	39.91	41.87	7.52	77.51
13.	Capsules per plant	7.8-41.8	22.30	10.92	78.35	89.27	87.77	39.74	42.42	16.90	75.86
14.	Seeds per capsule	41.0-68.0	55.20	63.85	22.68	86.53	26.21	8.62	16.85	4.97	9.00
15.	Yield per plant (g)	0.6-4.4	1.98	0.07	0.96	1.02	93.22	49.40	51.16	1.92	97.17
16.	1000 seed weight (g)	0.8-2.33	1.60	0.02	0.14	0.16	86.97	23.47	25.17	0.72	44.61
17.	Oil content (%)	38.20-48.80	44.80	0.05	11.02	11.07	99.53	7.41	7.43	6.75	15.06

of mean for seed yield per plant along with plant height for first capsule and capsules per plant, respectively.

REFERENCES

Alake, C.O., Ayo-Vaughan, M.A. and Ajani, O.O. (2010). Estimate of variability for yield and its characters in Nigerian sesame (*Sesamum indicum* L.) genotypes. *J. Agric. Sci. Env.*, **10** (1) : 72-85.

Anonymous (2012). Sesame and niger, project co-coordinator's report, pp. 31-33.

Burton, G.W. and Devane, E.H. (1953). Estimating heritability in tall fescue (*Festuca circulinaceae*) from replicated clonal material. *Agron. J.*, **45** : 478-481.

Johnson, H.W., Robinson, H.F. and Comstock, R.F. (1955). Estimation of genetic and environmental variability of soybean. *Agron. J.*, **47** : 314-318.

Krishnaiah, G., Reddy, K.R. and Sekhar, M.R. (2002). Variability studies in sesame. *Crop Res., Hisar*, **24** : 501-504.

Parameshwarappa, S.G., Palakshappa, M.G., Salimath, P.M. and Parameshwarappa, K.G. (2009). Studies on genetic variability and character association in germplasm collection of sesame (*Sesamum indicum* L.). *Karnataka J. Agric. Sci.*, **22**(2) : 252-254.

Reddy, P. A.V., Sekhar, M.R., Rangnatha, A.R.G. and Dhanraj, A. (2001). Genetic variability and heritability for seed yield and its components in sesame. *J.Oilseeds Res.*, **18** : 173-175.

Shabana, M. and Ravishankar, R.L.(2003). Evaluation of interspecific lines of sunflower (*Helianthus annuus* L.). *J. Oilseeds Res.*, **20**(2) : 263-266.

Solanki, Z.S. and Gupta, D. (2001). Variability and genetic divergence studies in sesame (*Sesamum indicum* L.). *Sesame & Safflower Newsl.*, **16**: 44-47.

Valarmathi, G., Kumar, M. and Saravana, N.A. (2004). Genetic variability and correlation studies for seed related traits in sesame (*Sesamum indicum* L.). *Sesame & Safflower Newsl.*, **19**:12-14.