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Research Note

Genetic variability studies for quantitative traits in sesame (*Sesamum indicum* L.)

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Abstract
Thirty one germplasm lines of sesame (*Sesamum indicum* L.) were evaluated 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. Characters *viz.*, seed yield per plant, number of capsules per plant, number of capsules on main stem and plant height for first capsule, had high GCV and PCV values and hence improvement through selection could be possible. High GCV, heritability and genetic advance as per cent of mean were recorded for seed yield per plant, number of capsules on main stem, number of capsules per plant, number of nodes on main stem and plant height for first capsule indicating that selection could be effective for improvement of these characters.

Key words
Sesame, variability parameters, heritability

Sesame (*Sesamum indicum* L.) is an important oil seed crop and its seed contains 38-54% oil and 18-25% protein. Its sixth most important oil seed crop in India and having 1.94 mha area with 0.755 mt production and productivity of 389 kg/ha (Anon, 2012). The average productivity is very low as compare to other sesame growing countries and almost stagnant during last few years. The effectiveness of selection for genetic improvement in yield and yield contributing characters depends on genetic variability present in gene pool and extent of its heritability. Hence the present study was under taken to understand the genetic variability exist among the sesame germplasm.

The study was undertaken at Department of Botany, Pratishthan Mahavidyalaya Paithan, during summer 2009 in Randomized Block Design with 3 replication, with spacing of 30 cm x 15 cm and 3 m length of each plot size. All need based practices were followed during the crop growth period in maintaining the good crop stand. Thirty one sesame germplasm lines collected from AICRP on Sesame & Niger, Jabalpur and NBPGR Regional Station, Akola were used for the present study. Observations on five randomly selected plants were recorded for all seventeen quantitative characters. Analysis of variance (ANOVA) was calculated for quantitative characters (Table 1), genotypic and phenotypic coefficient of variation was worked out as per Burton and Devane (1953), and heritability in broad sense and genetic advance was calculated as per method suggested by Johanson *et al.* (1955).

The results revealed analysis of variance shows significant differences for all characters except days to flower initiation, indicating the presence of substantial amount variability and selection could be effective for improvement of those characters. Similar line of result was also reported by Solanki and Gupta (2001) and Valarmathi *et al.,* (2004).

Even though, phenotypic coefficient variation (PCV) was found to be higher than genotypic coefficient of variation (GCV) for all the characters, but a very little difference between PCV and GCV were noticed for characters *viz.*, seed yield per plant, number of capsules per plant, number of capsules on main stem, number of nodes for first capsule, number of nodes on main stem, number of primary branches, capsule bearing plant height and plant height for first capsule, indicating that these characters were less affected by environment and selection could be effective for further improvement of these traits (Table 1). High GCV was shown by character *viz.,* seed yield per plant, number of capsules per plant, number of capsules on main stem and plant height for first capsule, clearly indicates that through selection it's possible to improve these characters. These results are in agreement with those of Solanki and Gupta (2001) and Valarmathi *et al.,* (2004) for seed yield and number of capsules per plant. Alake *et al.*, (2010) also reported high GCV for plant height for first capsule.

Moderate GCV values were recorded by eight characters *viz.,* number of primary branches, number of nodes on main stem, capsule bearing plant height, 1000 seed weight, plant height, internode distance, days to 50 per cent flowering, and number of nodes for first capsule, whereas characters like days to first flowering, days to maturity, capsule length, oil content and seeds per capsule were shown low GCV values. Similar findings were also reported by Solanki and Gupta

(2001), Parameshwarappa *et al.,* (2009) and Alake *et al.,* (2010).

High heritability estimates were recorded for characters *viz.*, number of nodes on main stem (84.61%), plant height for first capsule (88.12%), number of capsules on main stem (90.83%), number of capsules per plant (87.77%), seed yield per plant (93.22%) and oil content (99.53%) (Table 2). These findings are in agreement with those of Valarmathi *et al.,* (2004) and Alake *et al.,* (2010). However, lower estimate of heritability were noticed in characters days to first flowering (6.75%), days to maturity (27.40%) and capsule length (23.10%). Solanki and Gupta (2001) and Alake *et al.,* (2010) reported low heritability for days to first flowering and days to maturity respectively.

The high genetic advance (GA) was recorded in characters *viz.*, plant height (16.95), number of 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 recorded low GA (Table 2). Genetic advance as per cent of mean (GAM) was observed 97.17, 77.86 and 75.51 per cent for seed yield per plant, number of capsules on main stem and number of capsules per plant, respectively. However, low GAM was observed for days to first flowering (1.34%), days to maturity (7.04 %) and seeds per capsule (9.00 %). These findings are similar with Alake *et al.,* (2010) for seed yield per plant, plant height for first capsule and seeds per capsule, whereas contrast with Valarmathi *et al.*, (2004) for oil content.

High heritability along with high genetic advance as per cent of mean (GAM) were shown by seed yield per plant, number of capsules on main stem, number of capsules per plant, plant height for first capsule, 1000 seed weight, number of nodes on main stem, capsule bearing plant height, number of primary branches, plant height and number of nodes for first capsule, revealed that selection could be effective for these characters. Valarmathi *et al.,* (2004) and Alake *et al.,* (2010) reported similar findings for seed yield per plant, while Reddy *et al*., (2001), Krishnaiah *et al*., (2002) and Parameshwarappa *et al.,*(2009) recorded high heritability and genetic advance as per cent of mean for seed yield per plant and number of capsules per plant. Alake *et al.,* (2010) reported similar results for plant height for first capsule. However, Krishnaiah *et al*., (2002) and Parameshwarappa *et al.,* (2009) were 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). Oil content shown high heritability accompanied by low genetic advance as per cent of mean (GAM) and the high heritability may be due to favourable influence of environmental condition. These findings are in agreement with those of Reddy *et al*., (2001), Shabana and Ravikumar (2003) and Parameshwarappa *et al.,* (2009).

GCV, heritability in broad sense and Genetic advance as per cent of mean (GAM) should be considered together while assessing the effect of selection than single parameter alone. Valarmathi *et al.,* (2004) and Alake *et al.,* (2010) reported high GCV, heritability and genetic advance as per cent of mean for number of capsules per plant and seed yield per plant along with plant height for first capsule respectively.

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Table 1 Estimates of variability parameters for quantitative traits in thirty one germplasm lines of Sesame

Characters	Range	Mean	σ^2e	σ^2g	σ^2p	h^2 (bs.)%	G.C.V (%)	P.C.V. (%)	G.A.	G.A. as % mean
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
Days to 50 per cent flowering	47.0-85.7	50.30	28.80	37.75	66.55	56.73	12.21	16.21	9.43	18.74
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
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
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
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
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
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
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
Number of 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
Number of 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
Number of 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
Number of 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
Number of 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
Seed 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
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
Oil content (%)	38.20-48.80	44.80	0.05	11.02	11.07	99.53	7.41	7.43	6.75	15.06