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Genetic Variability for Seed Yield and Yield Components in Sesame (*Sesamum indicum* L.)

J V Ramana, V Satyanarayana Rao, Lal Ahamed M, Y Asoka Rani and P Anil Kumar
Department of Genetics and Plant Breeding, Agricultural College, Bapatla 522 101, A P

ABSTRACT

The study was undertaken with an objective to study the genetic variability for seed yield and yield traits in sesame during *rabi*, 2010 at Agricultural Research Station, Yellamanchili, Andhra Pradesh. Analysis of variance showed highly significant differences among the thirty six genotypes for all the characters studied indicating that the data generated from the above diverse material will yield reliable genetic information. The genetic variability studies revealed that the material used in present investigation possessed variability which provides scope for selection by breeder. Moderate to low coefficients of variability was observed for most of the traits indicating moderate variability. The estimates of high heritability and moderate genetic advance as per cent of mean were observed for the traits primary branches/plant, 1000 seed weight and seed yield per plant.

Key words : Genetic advance, Heritability, Sesame and Variability.

Sesame (*Sesamum indicum* L.), is a member of the order *Tubiflorae* and family *pedaliaceae* and commonly known as gingelly, til, benniseed and simsim. It is considered to be the oldest of the oil seed crops which are under cultivation in Asia from ancient times. Sesame is one of the most important oil seed crops in India, grown next to groundnut, rapeseed and mustard and is grown in the tropics as well as temperate zones. Sesame is highly nutritive and has medicinal value. Its oil contains an antioxidant called sesamol which imparts a high degree of resistance against oxidative rancidity along with vitamin E and essential amino acid, methionine.

Sesame is cultivated in an area of about 1.94 million hectares in India with a production of about 0.58 million tones (Ministry of Agriculture, 2014). In Andhra Pradesh it occupies an area of 0.09 million hectares with a production of about 0.2 million tonnes. The average productivity of sesame in Andhra Pradesh (222.2 kg/ha) is far less as compared to the Indian average of 303 kg/ha (Ministry of Agriculture, 2010) which indicates that there is much need to enhance the productivity potential of this crop by evolving high yielding varieties for different agro climatic situations. In India, the sesame oil and yield productivity are static over years and not impressive as compared to the other sesame growing countries of the world. The slow improvement in sesame is due to the arbitrary choice of parents and inadequate information about the nature of gene action in governing the traits. A thorough knowledge on genetic parameters like mean, variability, heritability, genetic advance and genetic advance on per cent of mean will provide basis for selecting systematic breeding strategy to improve yield potential of the genotypes. Keeping this in view, the present experiment was conducted to know the genetic variability for yield and yield components in sesame.

MATERIAL AND METHODS

The present investigation was planned with 36 genotypes of sesame and evaluated for yield and yield components *viz.,* days to 50% flowering, days to maturity, plant height, primary branches/ plant, capsules per plant, number of seeds per capsule, 1000 seed weight, oil content and seed yield per plant during *rabi* 2010 in randomized block design with three replications at Agricultural Research Station, Yelamanchili, Vizianagaram District, Andhra Pradesh. The intra and inter row spacing was 10 cm x 20 cm, with 4 rows per genotypes per replication. Recommended package of practices were followed to raise a good crop. The mean values were used for the statistical analysis. The data was analysed statistically for genotype and phenotypic coefficients of variation

and heritability (Burton, 1952) and genetic advance (Johnson *et al*., 1955).

RESULTS AND DISCUSSION

The analysis of variance revealed significant differences among the genotypes for all the characters indicating a high degree of variability in the material (Tables 1 & 2). The PCV values were higher than the GCV values and the difference between them was low indicating the little role of environment in the expression of these traits.

Days to 50% Flowering

The variation for number of days to 50% flowering ranged from 35.00 (YLM 105) to 39.00 (YLM 82, 86, 88 and VZM5) days with a mean of 37.04 days. The PCV (3.87) and GCV (2.58) estimates were low indicating less variation for days to 50% flowering among the genotypes studied. Similar estimates of PCV and GCV were earlier reported by Sudhakar *et al.* (2007), Sumathi and Muralidharan (2010) and Nayak *et al.* (2011).

Moderate heritability (45.00%) coupled with low genetic advance as per cent of mean (3.55) was noted for this trait which may be due to the predominance of non additive gene action in the inheritance of this trait. Similar finding is also observed by Chandramohan (2011).

Days to Maturity

The no. of days to maturity ranged from 75.33 (YLM 102) to 80.00 (VZM 5) with a mean of 77.47 days. The estimates of PCV (2.22) and GCV (0.92) were low indicating less variation among the genotypes. Sudhakar *et al.* (2007), Sumathi and Muralidharan (2010) and Nayak *et al.* (2011) also recorded similar findings in their studies.

Heritability (17.00) and genetic advance as per cent of mean (0.78) were low indicating this trait is governed by non additive gene action. This result was in agreement with the findings of Suvarna *et al.* (2008).

Plant Height

This character ranged from 89.26 (YLM 80) to 110.76 (YLM 88) cm with a mean of 97.41 cm. The estimates of PCV (5.35) and GCV (4.45) were low indicating less variation among the genotypes for plant height. These findings are in conformity with those of Thangavel *et al*. (2000).

High heritability (69.00) coupled with low genetic advance was observed for this trait indicating the predominance of both additive and non additive gene actions and the desired results may not be obtained by simple selection. These results were in agreement with Parameshwarappa *et al.* (2009a), Sumathi and Muralidharan (2010) and Singh *et al.* (2000).

No. of Primary Branches/plant

The character, no. of primary branches per plant, possessed considerable variability ranging from 3.7 (YLM 103) to 5.1 (YLM 96) with a mean of 4.35. The estimates of PCV (9.32) and GCV (9.05) were low indicating presence of less variation in the studied material. Similar results were reported by Singh *et al.* (2008).

High heritability (94.00) and moderate genetic advance as per cent of mean (18.08) were observed indicating the predominant role of additive and non additive gene actions in the inheritance of this trait and the desired results may not be obtained by simple selection. These findings are in accordance with that of Nayak *et al.* (2011).

No. of Capsules per plant

Significant variability was indicated by analysis of variance for this character and it ranged from 50.40 (YLM 101) to 63.03 (YLM 95) with a mean of 56.68. Low (PCV 6.11) and GCV (5.20) were observed indicating less variation among the genotypes. Heritability was high (72.00) while genetic advance as per cent of mean was low (9.10) indicating the operation of both additive and non additive gene effects in the expression of the trait and the desired results may not be obtained by simple selection. This result was in agreement with the findings of Nayak *et al.* (2011) and Suvarna *et al.* (2008).

No. of Seeds per Capsule

The variation for number of seeds per capsule were significant among the genotypes and was ranged from 75.13 (YLM 11) to 87.36 (YLM 99) with a mean of 81.77. PCV (4.36) and GCV (3.45) were low indicating the existence of low variability among the genotypes. Similar results were

Table 1. Analysis of variance for yield and yield components in sesame (*Sesamum indicum* L.).

Source of Variation	d.f.	Days to 50% Flowering	Days to Maturity	Plant Height cm	Primary Branches/ Plant	Capsules/ Plant	Seeds/ Capsule	1000 Seed Weight	Oil Content	Seed Yield/ Plant
		Mean sum of squares								
Replications	2	1.37	3.86	1.26	0.02	9.31	6.60	0.01	0.61	1.09
Treatments	35	3.88*	3.95*	64.72**	0.48**	29.35**	28.59**	0.10**	6.51**	3.82**
Error	70	1.14	2.44	8.32	0.01	3.32	4.74	0.01	0.17	0.31

d.f. = Degrees of freedom
* = Significant at 5% level;
** = Significance at 1% level.

Table 2. Mean, coefficient of variation, heritability (broad sense), genetic advance and genetic advance as per cent of mean for different characters in sesame.

Character	Mean	Range		Coefficient of variation		h^2 (b) (%)	Genetic advance	Genetic advance as % of mean (%)
		Minimum	Maximum	Phenotypic (%)	Genotypic (%)			
Days to 50% flowering	37.05	35.00	39.00	3.87	2.58	45.00	1.31	3.55
Days to maturity	77.47	75.33	80.00	2.22	0.92	17.00	0.60	0.78
Plant height (cm)	97.42	89.27	110.76	5.35	4.45	69.00	7.44	7.63
Primary branches/ plant	4.35	3.70	5.10	9.32	9.05	94.00	0.79	18.08
Capsules/ plant	56.69	50.40	63.03	6.11	5.20	72.00	5.16	9.10
Seeds/ capsule	81.77	75.13	87.37	4.36	3.45	63.00	4.60	5.62
1000 seed weight (g)	2,50	2.23	3.06	7.77	7.46	92.00	0.37	14.78
Oil content (%)	48.25	45.91	51.63	2.68	2.38	79.00	2.11	4.37
Seed yield/ plant (g)	11.30	9.03	13.57	10.79	9.58	79.00	1.98	17.53

also reported by Sumathi and Muralidharan (2010) and Nayak *et al.* (2011). High heritability (6.30) and low genetic advance as per cent of mean (5.62) were observed revealing the predominance of additive and non additive nature in the inheritance of this trait. Similar results were also reported by Thangavel *et al.* (2000).

1000 Seed Weight

The range of variation for this trait was 2.23 (VZM 5) to 3.06 (YLM 107) with a mean of 2.49 gm. PCV and GCV values (7.7 and 7.46) were low indicating less variability among the genotypes. These findings were in line with the results of Sumathi and Muralidharan (2010).

High heritability (92.00) coupled with moderate genetic advance as per cent of mean was observed for this trait revealing the predominance of additive and non additive gene actions in the expression of this trait. These results indicated that simple selection is not rewarding for improvement of the trait. These findings are in agreement with the results of Sumathi and Muralidharan (2010).

Oil Content

The range of variation for oil content varied from 45.91 (VZM 5) to 51.62 (YLM 103) with a mean of 48.59%. PCV (2.68) and GCV (2.38) were low indicating less variation in the studied material. Similar results were earlier reported by Sudhakar *et al.* (2007), Parameshwarappa *et al.* (2009b) and Sumathi and Muralidharan (2010).

High heritability (79.00) and low genetic advance as per cent of mean (4.37) were observed

indicating the presence of both additive and non additive gene actions in the inheritance of the trait and simple selection is not rewarding for improvement in this trait. Similar results were also reported by Sudhakar *et al*. (2007), Parameshwarappa *et al*. (2009a) and Sumathi and Muralidharan (2010).

Seed Yield per Plant

This character possessed significant variation which was ranged from 9.03 (YLM 101) to 13.56 (YLM 100) with a mean of 11.29 gm. The PCV (10.79) was moderate while GCV (9.58) was low indicating less variability among the genotypes studied. Similar estimates of GCV and PCV were earlier reported by Thangavel *et al.* (2000).

High heritability (79.00) coupled with moderate genetic advance as per cent of mean (17.53) was recorded indicating the operation of both additive and non additive gene actions in the expression of the trait. These findings are in accordance with the reports of Thangavel *et al*. (2000), Saravanan *et al*. (2001) and Suvarna *et al.* (2008).

Thus, analysis of variance revealed significant differences among the genotypes for all the characters under study. The estimates of high heritability and moderate genetic advance as per cent of mean were observed for the traits primary branches/plant, 1000 seed weight and seed yield per plant indicating their usefulness in the breeding programmes as they are easily selected through simple selection.

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