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Genetic Variability, Heritability and Genetic Advance for the Phenotypic Traits in Sesame (*Sesamum indicum* L.)

Kanak Saxena* and Rajani Bisen

*Ph.D. Research Scholar, Senior Scientist

Department of Genetics and Plant breeding, Jawaharlal Nehru KrishiVishwaVidyalaya, JNKVV, Jabalpur 482004 (M.P)

*Corresponding Author E-mail: kanak.saxena27@gmail.com

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ABSTRACT

The evaluation of phenotypic variability, heritability and genetic advance fourteen advanced varietal lines of sesame genotypes were grown during kharif 2015-16 at the Project Coordinating Unit Sesame and Niger, JNKVV, Jabalpur. High values for phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV) was recorded seed yield per plant (g) followed by number of primary branches per plant, oil content and seeds per capsuleand hence improvement through selection could be possible. High heritability was recorded for seeds per capsule followed by oil content, yield per plant, harvest index, days to 50% flowering, number of primary branches per plant, number of secondary branches per plant, plant height, days to maturity, capsule length, 1000-seed weight and number of capsules per plant. High heritability combined with high genetic advance was recorded for seeds per capsule followed by oil content, yield per plant, harvest index, days to 50% flowering, number of primary branches per plant, number of secondary branches per plant, plant height, days to maturity, capsule length, 1000-seed weight and number of capsules per plant indicating that selection of these characters would be effective for further breeding purpose

Key words: *Genetic variability, Heritability, PCV, GCV, Sesame*

INTRODUCTION

Sesame (*Sesamum indicum* L.) is one of the world's oldest oilseed crops and is under cultivation in Asia for over 5000 years. The crop is highly tolerant to drought, grows well in most of the well drained soils and various agro climatic regions, and is well adapted to different rotations. It can set seed and yield well under fairly high temperature and can grow in stored soil moisture without rainfall and irrigation. However, continuous flooding or severe drought adversely affects the crop resulting in low yield[1]. Sesame oil has highest antioxidant content and contains several fatty acids such as oleic acid (43 %), linoleic acid (35%), palmitic acid (11%) and stearic acid (7%).

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Though variations in climatic and edaphic conditions, affect sesame yields and performance, the major constraints identified in growing sesame in most countries are instability in yield, lack of wider adaptability, drought, non-synchronous maturity, poor stand establishment, lack of response to fertilizer application, profuse branching, lack of seed retention, low harvest index and susceptibility to insect pests and pathogens[2]. Genetic diversity in crop plants is essential to sustain level of high productivity[2]. Genetic variation survives for agronomically important characters in sesame but its production is still very low in India. Traditional sesame landraces as well as related wild species are an important source of genetic diversity for breeders and form the backbone of agricultural production. The characterization and conservation of sesame germplasm are essential for both safe guarding and the future use of existing genetic resources of sesame. However, the development of improved plant cultivars is restricted mainly due to narrow genetic pool which results into limited possibility to restructure the sesame crop. The knowledge of genetic variability in germplasm will help in the selection and breeding of high yielding, good quality cultivars that will increase production. Keeping the above points in view, this study was carried out for genetic variability in 14 advanced varietal lines of sesame to asses the variability, heritability and genetic advance of some quantitative characters.

MATERIALS AND METHODS

Experimental material for the present study consisted of fourteen advanced varietal lines of sesame genotypes grown during kharif 2015-16 at the Project Coordinating Unit Sesame and Niger, JNKVV, Jabalpur, in a randomized complete block design with three replications. Each plot consisted of three rows of 4m length spaced at 45 cm between rows and 30 cm between plants. Normal recommended cultural practices and plant protection measures were followed. Three competitive plants were randomly selected for recording biometrical observations on days to flower initiation, days to 50% flowering, days to maturity, plant height, number of primary branches, number of secondary branches, number of capsules per plant, capsule length, number of seeds per plant, 1000 seed weight, oil content, harvest index and seed yield per plant. The mean values were used for analysis of variance. The coefficient of variation was calculated as per Burton[3]. Heritability in broad sense and genetic advance were calculated as per Johnson *et al*[4].

RESULTS AND DISCUSSION

High magnitude of genotypic coefficient of variation than phenotypic coefficient of variation indicates the presence of substantial amount of genetic variability in the population and there is little influence of the environment on the expression of the character.In the present study, the phenotypic coefficient of variation was greater than genotypic coefficient of variation for all the traits. The high magnitude of both coefficients were recorded for traits viz., seed yield per plant, number of primary branches per plant, oil content and seeds per capsule showed high PCV and GCV estimates. Similar findings were reported by Narayanan[5], Parameshwarappa[6], Sudhakar[7] and Gangadhara[8] for seed yield per plant and Tripathi[9], Vanishree[10], Bharathi[11], Ismaila[12], Hika[13] and Mahmoud[14] for number of branches per plant.

Moderate GCV and PCV exhibited by plant height, number of secondary branches per plant, number of capsules per plant, days to maturity and 1000-seed weight showed moderate PCV but low GCV. This indicates that these characters are highly influenced by environmental effect. Similar findings for Moderate value of genotypic and phenotypic coefficient of variation for plant height were reported by Bharathi[11], Mahmoud[14], Chandramohan[15] and Abate[16]. For number of

capsules per plant was in agreement with Sumathi[17] and Sivaprasad[18]. For number of secondary branches per plant reported by Solanki[19]. For days to maturity, similar findings were reported by Bharathi[11], Hika[13] Mahmoud[14] Chandramohan[15] and Shekhawat[20].

The estimates of phenotypic and genotypic coefficient of variation were low for days to 50 per cent flowering, capsule length and harvest index. Similar results for low GCV and PCV are in conformity with Bharathi[11], Hika[13], Chandramohan[15], Abate[16] and Thirumalarao[21] for days to 50 per cent flowering. For capsule length similar results were reported by Bharathi[11], Shekhawat[20], Thirumalarao[21] and Tripathi[22]. For harvest index similar results were reported by Hika[13] and Gidey[23].

Heritability plays a vital role in deciding the suitability and strategy for selection of a particular character. The traits under study exhibited high broad sense heritability (11.50% to 98.10%). Heritability in broad sense estimates were high for seeds per capsule followed by oil content, yield per plant, harvest index, days to 50% flowering, number of primary branches per plant, number of secondary branches per plant, plant height, days to maturity, capsule length, 1000-seed weight and number of capsules per plant. Similar results have been obtained by Alake[24] for plant height, number of capsules/plant and 1000-seed weight. For number of capsules/plant and 1000-seed weight[7]. For number capsules/plant, plant height and days to 50% flowering[6]. For number of capsules/plant[25]. For capsules/plant, plant height, capsule length and 1000 seed weight[8] and Tripathi[22] for days to 50% flowering.

Genetic advance as per cent of mean (GA) is more reliable index for understanding the effectiveness of selection in improving the traits because it defines the estimates that are derived by involvement of heritability, phenotypic standard deviation and intensity of selection. Thus, genetic advance along with heritability provides clear picture regarding the effectiveness of selection for improving the plant characters. Noor[26] had cautioned that high heritability per se is no index of high genetic gain hence it should be accompanied by high genetic advance.

High heritability accompanied with high genetic advance recorded for seeds per capsule followed by oil content, yield per plant, harvest index, days to 50% flowering, number of primary branches per plant, number of secondary branches per plant, plant height, days to maturity, capsule length, 1000-seed weight and number of capsules per plant indicated lesser influence of environment in expression of these characters and these characters are controlled by additive gene effect, hence, amenable for simple selection. Similar results have been reported by Gangadhara[8] and Thirumalarao[21] exhibiting high genetic advance for number of primaries/plant and number of capsules/plant, for oil content[22] and for number of primary branches[23].

Moderate heritability with moderategenetic advance as per cent of mean was recorded fornumber of primary branches per plant, number of secondary branches per plant, indicated lesser influence of environment in expression of these characters. Similar results were reported by Bharathi[11], Ismaila[12], Hika[13] and Mahmoud[14] Revathi[27] and Kumhar[28] for number of primary and secondary branches per plant.

Moderate heritability with low genetic advance as per cent of mean were recorded for plant height, similar results were reported by Gangadhara[8], Vanishree[10], Thirumalarao[21] and Ukaan[29].

Low heritability and low genetic advance as percent of mean was observed for this trait. This indicates the presence of non additive gene action and hence selection would be ineffective. These results are in conformity with the finding of Suvarna[30] and Sivaprasad[31].

Table 1: Estimates of genetic parameters for twelve quantitative traits in *sesame* genotypes

Characters	Mean	Range	h^2(bs.) %	G.C.V(%)	P.C.V.(%)	G.A.	G.A. as % mean
Days to 50 % flowering	42.48	39.67-46.33	73.40	4.44	5.19	3.33	15.84
Plant height (cm)	90.84	69.00-113.67	50.30	6.46	8.77	6.92	9.09
Number of primary branches	4.01	3.21-5.05	52.30	11.87	12.27	0.51	13.22
Number of secondary branches	3.63	2.81-4.63	51.10	6.34	6.94	0.51	12.20
Number of capsules per plant	83.42	77.54-88.37	11.50	6.17	6.40	1.26	4.51
Capsule length (cm)	2.86	2.78-2.98	15.10	3.77	4.55	0.04	8.42
Number of Seeds per capsule	97.43	81.67-114.33	98.10	10.94	11.45	22.55	23.14
Days to maturity	51.69	46.40-58.42	27.90	8.78	9.05	2.69	5.20
1000 seed weight (g)	3.32	2.96-3.57	13.60	6.29	7.57	0.07	6.12
Yield per plant (g)	8.48	7.14-10.00	83.70	12.89	17.83	3.57	19.95
Harvest index (%)	29.86	26.19-33.17	75.60	4.11	4.73	3.51	17.37
Oil content (%)	48.08	46.20-50.74	87.10	11.34	11.72	1.78	21.03

CONCLUSION

In the present study, high heritability, high genetic advance and genetic advance as % mean were recorded for number of number of seeds per capsule while, high PCV, GCV recorded for seed yield per plant this character could be relied upon for selection. Selection of such genotypes based on various quantitative yield attributes leads to genetic improvement in sesame especially for seed yield. In future, such traits may be considered for the development of high yielding with good quality sesame varieties.

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