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

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ABSTRACT

The evaluation of phenotypic variability, heritability and genetic advance fourteen advanced varietal lines of sesame were grown during kharif 2015 at the Project Coordinating Unit Sesame and Niger, JNKVV, Jabalpur. High values for phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV) were recorded for seed yield per plant followed by number of primary branches per plant, oil content and seeds per capsule and 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.

Keywords: Genetic variability, heritability, yield components, sesame

INTRODUCTION

Sesame (*Sesamum indicum* L.) is one of the oldest oilseed crops and is under cultivation in Asia for over 5000 years. In India, the antiquity of sesame is known from the use of its seed in religious ceremonies. 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 (Mensah *et al.*, 2009). 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%). Though variations in climatic and edaphic conditions, according to Muhamman and Gungula (2008), 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. Genetic diversity in crop plants is essential to sustain level of high productivity. Genetic variation survives for agronomically vital 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

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2015-16 at the Project Coordinating Unit Sesame and Niger, Department of Genetics and Plant Breeding, 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 oil content analysis were determined by using NMR (Nuclear Magnetic Resonance) Spectrometer method. The mean values were used for analysis of variance. The coefficient of variation was calculated as per Burton (1952). Heritability in broad sense and genetic advance were calculated as per Johnson *et al.* (1955).

RESULTS AND DISCUSSION

Coefficient of variation truly provides a relative measure of variance among the different traits. The variation of different traits under this study revealed that the Phenotypic coefficient of variation (PCV) were higher than Genotypic coefficient of variation (GCV) for all the characters studied indicating the role of environmental variance in the total variance (Table 1). The traits seed yield per plant followed by number of primary branches per plant, oil content and seeds per capsule showed high PCV and GCV estimates. High coefficient of variation for number of branches per plant Gidey *et al.* (2013), Siva *et al.* (2013), Saha *et al.* (2012), Sudhakar *et al.* (2007), Solanki and Gupta (2003) and seed yield per plant (Sumathi and Murlidharan (2010), Parameshwarappa *et al.* 2009 and Sudhakar *et al.* 2007) and Gangadhara *et al.* (2012) for capsules per plant, Siva *et al.* (2013) for number of branches/plant and Tripathi *et al.* (2013) for number of secondary branches per plant and number of primary branches per plant has also been reported. Hence, these characters can be relied upon and simple selection can be practiced for further improvement. 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 *et al.* (2010a) for plant height, number of capsules/plant and 1000-seed weight; Sudhakar *et al.* (2007) for number of capsules/plant and 1000-seed weight, Parameshwarappa *et al.* (2009) for number capsules/plant, plant height and days to 50% flowering; Boranayaka *et al.* (2011) for number of capsules/plant; Gangadhara *et al.* (2012) for capsules/plant, plant height, capsule length and 1000 seed weight; and Tripathi *et al.* (2013) for days to 50% flowering.

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
Primary branches per plant	4.01	3.21-5.05	52.30	11.87	12.27	0.51	13.22
Secondary branches / plant	3.63	2.81-4.63	51.10	6.34	6.94	0.51	12.20
Capsules / 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
Seeds / 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
Seed yield / 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

Genetic advance as per cent of mean (GA) is more reliable index for understanding the effectiveness of selection in improving the traits because the estimates 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 *et al.* (2004) 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 Thirumala Rao *et al.* (2013) and Gangadhara *et al.* (2012) exhibiting high genetic advance for number of primaries/plant and number of capsules/plant, Tripathi *et al.*, (2013) for oil content and Gidey *et al.* (2013) for number of primary branches.

In the present study, the high heritability, high genetic advance and high genetic advance as % mean recorded for seeds per capsule and high PCV, GCV recorded for seed yield per plant, this character which could be relied upon for selection. Selection of these genotypes on the basis of these yield attributes could certainly lead to genetic improvement in sesame especially for seed yield.

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