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RESEARCH ARTICLE :

Genetic parameters for yield improvement in sesame

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SUMMARY : This study was carried out using seventeen advanced varietal lines during *Kharif* 2016 at Regional Agricultural Research Station, Polasa, Jagtial, Telangana state. The evaluation of phenotypic and genotypic co-efficient of variation, heritability and genetic advance as per cent of mean were calculated for various agronomic characters. High values for phenotypic co-efficient of variation (PCV) and genotypic co-efficient of variation (GCV) was recorded for seed yield per hectare, number of capsules per plant and number of branches per plant and hence improvement through selection could be possible. High heritability combined with high genetic advance was recorded for yield per hectare followed by number of capsules per plant, days to 50% flowering. While moderate heritability coupled with high genetic advance as per cent of mean for number of branches per plant indicating the influence of additive gene action, as such simple selection would likely to be effective for improvement of these traits. Indicating that selection of these characters would be effective for further breeding purpose.

KEY WORDS :
Genetic variability, Heritability, PCV, GCV, Sesame

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BACKGROUND AND OBJECTIVES

Sesame is one of the important and world's oldest edible oilseed crops. It is the 6th most important oilseed crop grown in India. 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%) (Saxena *et al*., 2017). Globally sesame is cultivated in an area of 20 lakh hectares with an annual production of 8.28 lakh tonnes and productivity of 4055 kg ha^{-1} in India (INDIASTAT, 2014-2015). While in Telangana, it is grown in an area of 0.18 lakh hectares with an annual production 0.05 lakh million tonnes and productivity of 278 kg ha^{-1}, respectively (Telangana Agriculture Action Plan, 2014-2015) (Hemalatha, 2016). Though variations in climatic and edaphic conditions, effect 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 (Saxena *et al*., 2017).

Success of plant breeding depends on the extent of genetic variability present in the crop. Critical analysis of genetic variability present in the germplasm of a crop and its estimation is a pre-requisite for initiating any crop improvement programme as well as adopting appropriate selection techniques and helps breeding of high yielding and good quality cultivars that will increase production. Heritability indicates the extent of transmissibility of a character into future generations. It is very difficult to judge whether observed variability is heritable or non-heritable. Hence, the knowledge of heritability is also essential for selection of component traits for yield improvement. Genetic advance measures the difference between the mean genotypic values of selected population and the original population from which these were selected. Heritability estimates along with genetic advance is normally more helpful in predicting the genetic gain under selection than heritability estimates alone. Estimation of such genetic parameters facilitates the evaluation of genetic and environmental effects important in selection. Moreover, estimates of heritability can also be used to predict genetic advance under selection, so that the plant breeder can anticipate improvement from different types and intensities of selection Khadir *et al.* (1996). Laurentin and Montilla (2002) and Valarmathi *et al.* (2004) reported high degree of variability for various characters which can be utilized to improve seed yield in sesame. The present study was carried out to generate knowledge on heritability and genetic advance in this crop. Keeping the above points in view, this study was carried out for genetic variability in 17 advanced varietal lines and three checks *viz.*, Swtha, Hima and Rajeshwari of sesame to asess the variability, heritability and genetic advance of some quantitative characters.

RESOURCES AND METHODS

Experimental material for the present study consisted of fourteen advanced varietal lines of sesame genotypes grown during *Kharif* 2016 at the Regional Agricultural Research Station, Polasa, Jagtial, Telangana state in a Randomized Complete Block Design with three replications. Each plot consisted of tenrows of 3m length spaced at 30 cm between rows and 10 cm between plants. Normal recommended cultural practices and plant protection measures were followed. Ten competitive plants were randomly selected for recording biometrical observations on, days to 50% flowering, days to maturity, plant height, number of branches per planr, number of capsules per plant, 1000 seed weight and yield per plant. The data were subjected to statistical analysis. The phenotypic and genotypic co-efficient of variability was computed as per Burton, 1952. Heritability in broad sense was computed by the formula suggested by Lush (1940). Genetic advance was worked out as per the formula given by Johnson *et al.* (1955).

OBSERVATIONS AND ANALYSIS

In the present study, the genotypic co-efficient of variation for all the characters studied were lesser than the phenotypic co-efficient of variation indicating the effect of the environment. The high magnitude of both co-efficients were recorded for traits *viz.*, seed yield per hectare, number of branches per plant and number of capsules per plant showed high PCV and GCV estimates. Similar findings were reported by Hika *et al.* (2015); Mahmoud *et al.* (2015) and Saxena *et al.* (2017) for seed yield per plant and Bharathi *et al.* (2014); Mahmoud *et al.* (2015) and Saxena *et al.* (2017) for number of branches per plant. Moderate GCV and PCV exhibited by days to 50% flowering. This indicates that these characters are highly influenced by environmental effect. Similar findings for Moderate value of genotypic and phenotypic co-efficient of variation for plant height were reported by Bharathi*et al.* (2014); Mahmoud *et al.* (2015) and Saxena *et al.* (2017). The traits, days to maturity, plant height and 1000-seed weight exhibited low values for genotypic and phenotypic co-efficients of variation. The similar findings was reported by Hika *et al.* (2015) for days to maturity and 1000-seed weight. Abate and Mekbib (2015) for plant height it indicates that low scope of selection for 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 (51.40% to 99.6%). Heritability in broad sense estimates were high for days to maturity followed by days to 50% flowering, 1000-seed weight, yield/ha, number of capsules per plant and number of branches per plant.Similar results have been obtained by Alake *et al.* (2010) for number of capsules/plant and 1000-seed weight. For

Table 1 : Mean, range, variability, heritability (broad sense), genetic advance and genetic advance as per cent mean for ten characters in 17 sesame genotypes

	Mean	GCV	PCV	h^2 (Broad sense)	Genetic advance as 5% of mean	Genetic advance as 1% of mean
Days to 50% flowering	43.00	12.71	12.78	98.9	26.04	33.37
Days to maturity	97.00	8.99	9.01	99.6	17.87	23.70
Plant height (cm)	129.66	7.21	10.05	51.4	10.65	13.65
No. of branches per plant	3.00	25.43	33.81	56.6	39.4	50.49
No. of capsules per plant	42.00	28.6	33	75.1	51.1	65.45
1000 seed weight (g)	2.70	8.2	8.46	93.7	16.34	20.94
Seed	575.66	30.96	32.49	90.8	60.76	77.86
Yield/ha (kg/ha)						

number capsules/plant by Thirumalarao *et al.* (2013); Vanishree *et al*. (2013); Bharathi *et al*. (2014); Chandramohan (2014) and days to 50% flowering by Shekhawat *et al*. (2013) and Mahmoud *et al*. (2015). 1000 seed weight by Thirumalarao *et al*. (2013); Ismaila and Usman (2014) and Tripathi *et al.* (2013) 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. High heritability accompanied with high genetic advance recorded for seed yield/ha, number of capsules per plant and days to 50% flowering 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 *et al*. (2012) and Thirumalarao *et al*. (2013) exhibiting high genetic advance for number of branches per plant and number of capsules per plant. Moderate heritability with moderate genetic advance as per cent of mean was recorded for plant height indicated lesser influence of environment in expression of this character. Similar results were reported by Thripathi *et al.* (2013) and Bharathi *et al.* (2014). Whereas, number of branches per plant recorded moderate heritability along with high genetic advance expresses as per cent of mean, which indicated additive type of gene action controlling these characters, so selection might be useful. These results are similar with the findings of Pathak and Dixit (1992) and Menzir (2012).

High estimates of heritability along with moderate genetic advance were observed for days to maturity and 1000-seed weight. These results are similar with the findings of Gangadhara *et al.* (2012) and Vanishree and Goudappagoudar Banakar (2013) for days to maturity and Thirumalarao *et al.* (2013) and Ismaila and Usman (2014) for 1000-seed weight. Hence, there is a good scope of improvement for this trait through simple selection. While, plant height recorded moderate heritability along with moderate genetic advance expresses as per cent of mean,These results are similar with the findings of Tripathi *et al.* (2013) and Bharathi *et al.* (2014).

Conclusion :

In the present study, high heritability, genetic advance as % mean were recorded for number of number of capsules per plant, yield per hectare and days to 50% flowering. While, high PCV and GCV recorded for seed yield per plant, number of capsules per plant and number of branches 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 varieties of sesame.

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