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# Morphological and biochemical characters studies in sesame (*Sesamum indicum* L.) varieties

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**Abstract**
Genetic variability, heritability and other related parameters of nine quantitative and qualitative characters were taken into account for study by growing thirteen diverse varieties of sesame (*Sesamum indicum* L.) including two (NC) and one zonal check varieties. The study was carried out agriculture research farm, Rajaula, MGCGV, Chitrakoot, Satna (M.P.) during the *kharif* season of session 2021-22. The experiment was laid out in randomized block design and the obtained data was subjected to statistical analysis by the means of analysis of variance (ANOVA). Analysis of variance or design of the experiment indicated highly significant differences among the genotypes for all the eight characters except 1000-seed weight. The phenotypic coefficient of variation was higher than the genotypic coefficients of variation. Maximum genotypic and phenotypic coefficient of variations were obtained for plant height, number of branches per plant, seed yield kg/ha, and number of seeds/capsule, conclusively indicating possibilities for making further improvement in these characters due to presence of high magnitude of genetic variability in the material for these characters. The minimum genotypic and phenotypic coefficients of variation were observed for 1000 seed- weight. The high heritability was expressed by plant height, seed yield (kg/ha), days to 50% flowering, oil content percentage, number of capsules/plant, 1000 seed weight, number of branches/plant, days to maturity and number of seed/capsule in the range of 75.30-99.50%. High to moderate estimates of expected genetic advance were found for all characters other than 1000 seed weight which showed low genetic advance. The direction for genotypic and phenotypic correlations was similar for almost all characters and in general, genotypic correlations were higher than phenotypic ones in magnitude for many characters.

**Keywords:** Sesame, genetic variability, heritability, genetic advance, biochemical study

## Introduction
Sesame (*Sesamum indicum* L.) belongs to the family Pedaliaceae with diploid chromosome number of 2n=26 and is known as "Queen of oil seed crop". Sesame contains more than 30 species and is usually self-pollinated. Among the oilseeds, sesame (*Sesamum indicum* L.) is an important and ancient oil-yielding crop. It is also known as til, gingerly benni seeds, sim-sim and rasi. Sesame is a rich source of edible oil containing 46%-52% and highest recorded as 60% in Russia. Fats are highly stable and does not develop rancidity in its oil as compared to other oils. Besides, its oil contains two Sulphur containing amino acid, cysteine, and methionine, maximum is cysteine content and appreciable quantity of methionine (Singh, 2013) [3]. The seed yield and oil yield are considered to be the complex characters and are known to be influenced collectively by several factors such as environmental conditions like rainfall etc. variable agronomic managements condition and several yield components traits. Proper understanding of the effects of these complex components on yield is an important research aspect or agricultural scientists. The breeders have to collect information on the phenotypic and genotypic inter-relationships of seed yield, oil yield with their component characters and among the components inter-se coupled with path coefficient analysis would be of immense help in identifying the effective components. An assessment of variability in germplasm is required to judge its potential as base material for the genetic improvement. The information on heritability (broad sense), genetic advance as percentage of mean for different parameters is of prime importance to the breeder to identify the characters to be relied upon and to decide the breeding strategies for improvement in yield (Singh R. M., 1992) [4]. Sesame genotypes have been extensively studied for their morphological and biochemical traits, providing valuable insights into their genetic diversity and potential application.

## Materials and Methods

An investigation entitled "Morphological and biochemical traits studies in Sesame (*Sesamum indicum* L.) Genotypes" was carried out at nanaji agriculture research farm, Rajaula, MGCGV, Chitrakoot, Satna (M.P.) to evaluate the thirteen genotype/varieties under normal soil and rain fed condition and the biochemical analysis was conducted in Biochemistry and biotechnology lab in the department of crop sciences. A genotype collection of 13 diverse varieties of sesame (*Sesamum indicum* L.) Including two (NC) and one zonal check constituted the experimental study. The material was obtained from the ICAR, project coordinating unit (sesame and niger), JNKVV, Jabalpur (M.P.). The name of the varieties is mentioned in table-1. The experiment was laid out in randomized block design (RBD) with four replications during *kharif* season of 2021-22. Each treatment was grown in 3m x 4m plot spaced 30 cm apart. The plant to plant distance was maintained 10 cm by means of thinning. The observations that were recorded were days to 50% flowering from the date of sowing to the date on which 50% plants of each plot lowered, number of branches per plant, number of capsules per plant, number of seeds per capsule, plant height (PH), days to maturity (DM), 1000-seed weight (gm), oil content %, seed yield kg/ha. The oil content percentage was analyzed through Soxhlet extraction procedure. The steps that were involved in the statistical analysis are tabulation of the data, calculation of the mean sum of squares, analysis of variance (ANOVA) and test of significance. There was also subjected to estimation of variability, estimation of coefficient of variation and heritability in broad sense (Burton and De Vane 1953) [7], expected genetic advance (Johnson *et al*., 1955) [8]. Correlation coefficient (Al-Jibouri *et al.*, 1958) [1] and path coefficient analysis (Dewey and Lu 1959) [9].

**Table 1:** Name of Varieties/Genotypes used during experimentation

| S.No | Varieties / Genotypes |
|---|---|
| 1. | TLT-06 |
| 2. | RT-390 |
| 3. | TLT-10 |
| 4. | TKG-22 (NC) |
| 5. | RT-389 |
| 6. | DS-19-56 |
| 7. | SVT-451 |
| 8. | GT-10 (NC) |
| 9. | DS-19-49 |
| 10. | MT-2017-11 |
| 11. | JCS-3593 |
| 12. | DS-18-10 |
| 13. | JTS-8 (ZC) |

## Results and Discussion

### Genetic variability along with biochemical studies

Analysis of variance for design of the experiment indicated highly significant differences among the genotypes for all the eight characters except 1000- seed weight. The 1000 seed weight under study indicated the presence of considerable amount of variability in the materials. Success in selection depends primarily on the nature and magnitude of genetic variability. Wide range of variation was found for plant height, branches/plant, days to 50% flowering, seed yield kg/ha, oil content, number of seed/capsule. Similar result was obtained by (Bharathi, 2014) [2]. Number of capsules per plant, plant height, capsule length and seed yield per plant showed high range of variation indicated good scope for improvement. In general, phenotypic coefficient of variation was higher than genotypic coefficient of variation. Maximum genotypic and phenotypic coefficient of variation were observed for plant height that is 19.08 and 19.13 respectively followed by number of branches/ per that is 11.88 and 13.63 respectively. This result suggests that possibilities for making further improvement in the characters. The result was in conformity with (Thakur, 2018) [5]. The minimum GCV and PCV were observed for 1000 seed weight and days to maturity. Low values of GCV indicated the need to create variability either by hybridization or mutation followed by selection.

### Heritability and genetic advance along with biochemical character studies

Heritability estimates provides information on transmission of characters from parent to the progeny. Such estimates facilitate evaluation of hereditary and environmental effect in phenotypic variation and thus aid in selection. In this study, the heritability values were ranged from 75.30 per cent for no. of seeds / capsule to 99.50 per cent for plant height. The high heritability were expressed by plant height, seed yield (kg/ha), days to 50% flowering, oil content %, no. of capsules / plant, 1000-seed weight, no. Of branches / plant, days to maturity and no. Of seeds / capsule showed high heritability, respectively. The expected genetic advance in per cent of mean ranged from 3.84% for 1000 seed weight to 39.20% for plant height. 4.3).High to Moderate estimates of expected genetic advance were found for plant height, no. Of branches / plant, days to 50% flowering, seed yield kg/ha, oil content, no. of capsules / plant, no. Of seeds / capsule and low estimates of expected genetic advance were found for days to maturity and 1000 seed Weight characters showed low genetic advance.

### Correlation Coefficient along with Biochemical studies

The study of correlations was taken up together information on the inter- relationship among the characters. In the present study, the direction of phenotypic and genotypic correlations was similar for almost all the characters. In general, genotypic correlations were higher than phenotypic ones in magnitude for many characters. The character which showed negative association at genotypic level also showed negative association at phenotypic level. These results in conformity with the findings were reported by Ved Narain *et al.* (2004) [6].

**The supporting data are given in the Table 2 and Table 3 below**

**Table 2:** Analysis of Variance for Nine quantitative and biochemical characters in Sesame.

| S. No. | Characters | Mean Sum of Square | | |
|---|---|---|---|---|
| | | Replication | Treatments | Error |
| | d.f. | 3 | 12 | 36 |
| 1 | Days to 50% flower | 98.56 | 82.27** | 4.83 |
| 2 | No. of Branches/ plant | 0.3 | 1.21** | 0.29 |
| 3 | No. of Capsule/Plan | 25.56 | 12.77** | 1.63 |
| 4 | No. of Seeds/Capsule | 4.22 | 16.97** | 4.2 |
| 5 | Plant height | 6.38 | 1997.38** | 10.25 |
| 6 | Days to Maturity | 11.87 | 35.56** | 8.68 |
| 7 | 1000 Seeds Weight(g) | 0 | 0.02 | 0.01 |
| 8 | Oil Content (%) | 0.36 | 26.52** | 2.47 |
| 9 | Seed Yield (kg/ha) | 657.12 | 13182.37** | 261.84 |

*Significant at 5% provability level; ** Significant at 1% provability level

**Table 3:** Mean, range, genotypic, phenotypic and error variance, coefficient of variation, heritability %, genetic advance at 5%, and genetic advance as % means for Nine quantitative and biochemical characters in Sesame

| S. No. | Characters | Grand mean (`X) + SE (m) | Range | | Coefficient of Variation | | C.V. (%) | Heritability% (broad sense) | Genetic advance at 5% | Genetic advance as % means |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min. | Max. | GCV | PCV | | | | |
| 1 | Days to 50% flower | 46.15±1.10 | 41.00 | 52.00 | 9.53 | 9.83 | 4.76 | 94.10 | 8.79 | 19.05 |
| 2 | No. of Branches | 4.04±0.27 | 3.00 | 5.40 | 11.88 | 13.63 | 13.36 | 76.00 | 0.86 | 21.33 |
| 3 | No. of Capsule/Plant | 41.58±0.64 | 38.00 | 44.00 | 4.01 | 4.30 | 3.07 | 87.20 | 3.21 | 7.72 |
| 4 | No. of Seeds/Capsule | 41.67±1.02 | 39.00 | 45.00 | 4.29 | 4.94 | 4.92 | 75.30 | 3.19 | 7.67 |
| 5 | Plant height | 116.83±1.60 | 81.68 | 139.93 | 19.08 | 19.13 | 2.74 | 99.50 | 45.80 | 39.20 |
| 6 | Day's to Maturity | 91.02±1.47 | 88.00 | 95.50 | 2.85 | 3.28 | 3.24 | 75.60 | 4.64 | 5.10 |
| 7 | 1000 Seeds Weight | 3.13±0.04 | 2.98 | 3.22 | 2.12 | 2.41 | 2.28 | 77.50 | 0.12 | 3.84 |
| 8 | Oil Content% | 45.64±0..79 | 41.50 | 50.50 | 5.37 | 5.64 | 3.44 | 90.70 | 4.81 | 10.54 |
| 9 | Seed Yield (kg/ha) | 625.17±8.09 | 528.50 | 702.95 | 9.09 | 9.18 | 2.59 | 98.00 | 115.91 | 18.58 |

* Significant at 5% probability level, **Significant at 1% probability level

## Conclusion

Based on per se performancesTKG-22(NC), GT-10(NC), TLT-10 and JTS-8(ZC) are found high yielding promising varieties and possess good percent of oil content among all varieties of sesame in the vicinity of rainfed area of Chitrakoot.

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