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**Research Note**

# Study on character association and contribution of yield related traits to seed yield in segregating generation ($F_4$ Families) of Sesame (*Sesamum indicum* L.)

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**Abstract:**
One hundred and twenty four $F_4$ families of a cross E8 x Tamil Nadu Local were evaluated to study the interrelationship between yield and yield attributing characters using correlation coefficients and contributions of yield related traits to seed yield through path coefficient analysis. Days to 50% flowering, days to maturity, plant height, number of branches per plant, number of capsules per plant, capsule length and number of seeds per capsule had positive and significant association with seed yield per plant. The magnitude of correlation was highest in case of number of capsules per plant (r=0.932) with seed yield per plant. Number of capsules per plant had highest positive direct effect (0.9525) followed by equal contribution by number of seeds per capsule (0.1826) and 1000 seed weight (0.1821). Selection for capsules per plant shall improve seed yield in sesame.

**Key words:** Correlation coefficient**,** $F_4$ families, Path coefficient analysis, Sesame.

Sesame, an ancient traditional oilseed crop, better known as "Queen of oil seed crops" by virtue of its edible quality oil (50%), believed to be a native to Africa. Sesame seed is a rich source of protein (20%), minerals; contains about 47% oleic acid and 39% linolenic acid (Shyu and Hwang, 2002). Although sesame is widely used for different purposes, the productivity has been miserably low compared to other oil seed crops. Sesame growing area is shrinking due to several reasons. Ironically, the demand for sesame seed is increasing year after year. Selection for high yielding types with wider adaptability shall be not only very useful but shall help in increasing the production both locally and globally. Genetic improvement of seed yield, alone, is not possible through phenotypic selection because of polygenic nature and low heritability. Hence, resorting to selection through correlated response entailing several contributing factors which influence seed production both directly and indirectly shall be most appropriate.

Therefore, understanding of relationship between yield and its components is fundamental for selection process and its relationship can be explained by means of correlation and path coefficient analysis. Correlation studies enable breeders to know the strength of the relationship between various characters as well as direction of changes expected during selection. The path coefficient analysis provides a more realistic picture of the relationship as it considers direct as well as indirect effects of the variables by partitioning the correlation coefficients. More often correlation and path analysis using a set of genotypes is routine, but understanding the relationship in segregating families is also important. With this in view, a study was conducted to determine the interrelationship and contribution of certain yield components towards seed yield in segregating generation ($F_4$ generation) in sesame.

The material for the study consisted of 124 $F_4$ families of sesame derived from straight and reciprocal crosses made between the parents E-8 (a white seeded, an agronomical superior cultivar of national importance) and Tamil Nadu Local (a brown seeded land race; TNL); of which 103 families were from straight cross (E-8 X TNL) and 21 families were from reciprocal cross (TNL X E-8). The field experiment was laid out in augmented design at UAS campus, Raichur during *kharif*-2010. Seeds of $F_4$ families along with six checks *viz.,* Dhauri Local, RT-54, MT-75, DSS-13, SSD-5 and JTS-8 were sown in rows with spacing of 45 cm between the rows and 20 cm between the plants. Normal recommended cultural practices and plant protection

measures, if necessary, were followed throughout the cropping period. A minimum of five plants in each family were selected at random and observations were recorded on ten quantitative characters *viz.,* days to 50 per cent flowering, days to maturity, plant height, number of branches per plant, number of capsules per plant, capsule length, distance from ground to first capsule, number of seeds per capsule, 1000 seed weight and plant yield.

The data were analysed through INDOSTAT statistical package. Correlation coefficients for yield and yield attributes were computed. Further partitioning of correlation in to direct and indirect effects by path coefficient analysis was done

Number of capsules per plant exhibited highly significant and very high magnitude of positive correlation with seed yield per plant (Table 1). This apparently indicates that increased capsule number shall increase seed yield directly, hence while making selection for seed yield emphasis to this character may be given. Similar association was observed by Uzun and Carigan (2001). Days to 50% flowering, days to maturity, plant height, number of branches per plant, capsule length and number of seeds per capsule also have highly significant positive association with seed yield while distance from ground to first capsule and 1000 seed weight had non significant but positive correlation to seed yield. Number of capsules per plant had positive correlation with all other characters studied except 1000 seed weight. Similar result has been reported by Sumati *et al.* (2007).

Path coefficient analysis (Table 2) revealed that number of capsules per plant had maximum direct effect on seed yield per plant followed by number of seeds per capsule and 1000 seed weight which contributed equally to seed yield per plant. This indicates that, if other characters are held constant, improvement in these characters shall reflect in an increased seed yield. This is in accordance with the findings of Patil and Sheriff (1996) and Tomar *et al*. (1999). Other characters *viz.,* days to 50% flowering, days to maturity, plant height and capsule length had positive direct effect. Similar results were reported by Mishra *et al*. (1995) and Parameshwarappa *et al*. (2009). Negative direct effects were recorded for number of branches per plant and distance from ground to first capsule indicating a genotype that produce capsule close to ground and/or monoculms shall be high yielding. As a corollary, most land races are low yielders and highly branching types. Such negative direct effect was reported by Patil and Sheriff (1996) for number of branches per plant and for distance from ground to first capsule by Godawat and Gupta (1986). Compared to other characters studied, number of capsules per plant had highest indirect effect on seed yield per plant through days to maturity, number of branches per plant, days to 50% flowering and plant height. Tak (1997) also recorded similar results. The residual effect observed was 0.1728 indicating that other important yield contributing characters need to be included.

Besides the findings of present study, other authors have opined the highest positive direct and indirect effect of number of capsules per plant on seed yield per plant (Vanishree, 2011). Thus, while formulating genetic improvement programme through phenotypic selection, number of capsules per plant can be taken as an important character for bringing improvement in seed yield. However, 1000 seed weight and number of seeds per capsule are another two characters that has been reported to have high direct and indirect effects. Therefore, besides number of capsules per plant, these two characters can also be considered as important traits while selection for higher seed yield.

From the results of present study with the above evidences it can be inferred that number of capsule per plant, seeds per capsule and 1000 seed weight may be considered as efficient alternate criteria of selection for selecting high yielding sesame genotypes. Thus, selection indices may be formulated by including all these characters for bringing improvement in seed yield.

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Table 1. Correlation coefficients between yield components and with seed yield in sesame.

| Yield components | Days to maturity | Plant height (cm) | Number of branches plant$^{-1}$ | Number of capsules plant$^{-1}$ | Capsule length (cm) | Distance from ground to first capsule (cm) | Number of seeds capsule$^{-1}$ | 1000 seed weight (g) | Seed yield plant$^{-1}$ (g) |
|---|---|---|---|---|---|---|---|---|---|
| Days to 50% to flowering | 0.897** | 0.143 | 0.926** | 0.561** | -0.016 | 0.155 | -0.061 | -0.202* | 0.493** |
| Days to maturity | - | 0.175* | 0.885** | 0.635** | 0.010 | 0.180* | -0.044 | -0.210* | 0.567** |
| Plant height (cm) | | - | 0.150 | 0.356** | 0.213* | 0.299** | 0.249** | 0.013 | 0.401** |
| Number of branches plant$^{-1}$ | | | - | 0.581** | -0.006 | 0.122 | -0.053 | -0.121 | 0.523** |
| Number of capsules plant$^{-1}$ | | | | - | 0.145 | 0.099 | 0.003 | -0.189* | 0.932** |
| Capsule length (cm) | | | | | - | -0.016 | 0.608** | 0.2232* | 0.347** |
| Distance from ground to first capsule (cm) | | | | | | - | 0.064 | -0.222* | 0.051 |
| Number of seeds capsule$^{-1}$ | | | | | | | - | 0.225** | 0.260** |
| 1000 seed weight (g) | | | | | | | | - | 0.052 |

* Significant at 5 percent level ** Significant at 1 percent level

**Table 2.** Direct and indirect effects of nine characters on seed yield per plant at phenotypic level in sesame.

| | Days to 50% flowering | Days to maturity | Plant height (cm) | Number of branches plant$^{-1}$ | Number of capsules plant$^{-1}$ | Capsule length (cm) | Distance from ground to first capsule (cm) | Number of seeds capsule$^{-1}$ | 1000 seed weight (g) |
|---|---|---|---|---|---|---|---|---|---|
| Days to 50% to flowering | **0.0394** | 0.0354 | 0.0056 | 0.0365 | 0.0221 | -0.0006 | 0.0061 | -0.0024 | -0.0080 |
| Days to maturity | 0.0225 | **0.0250** | 0.0044 | 0.0222 | 0.0159 | 0.0003 | 0.0045 | -0.0011 | -0.0053 |
| Plant height (cm) | 0.0009 | 0.0011 | **0.0066** | 0.0010 | 0.0023 | 0.0014 | 0.0020 | 0.0016 | 0.0001 |
| Number of branches plant$^{-1}$ | -0.0522 | -0.0499 | -0.0085 | **-0.0563** | -0.0328 | 0.0003 | -0.0069 | 0.0030 | 0.0068 |
| Number of capsules plant$^{-1}$ | 0.5344 | 0.6052 | 0.3396 | 0.5541 | **0.9525** | 0.1388 | 0.0945 | 0.0033 | -0.1809 |
| Capsule length (cm) | -0.0009 | 0.0006 | 0.0118 | -0.0003 | 0.0080 | **0.0552** | -0.0009 | 0.0336 | 0.0123 |
| Distance from ground to first capsule (cm) | -0.0030 | -0.0035 | -0.0059 | -0.0024 | -0.0019 | 0.0003 | **-0.0196** | -0.0013 | 0.0044 |
| Number of seeds capsule$^{-1}$ | -0.0113 | -0.0082 | 0.0456 | -0.0097 | 0.0006 | 0.1111 | 0.0117 | **0.1826** | 0.0411 |
| 1000 seed weight (g) | -0.0369 | -0.0383 | 0.0025 | -0.0221 | -0.0346 | 0.0406 | -0.0404 | 0.0410 | **0.1821** |

Reasidual effect = 0.1728; Diagonol values show direct effect, others indirect effect.