Assessment of genetic variability, correlation and path analysis in sesame (Sesamum indicum L.)

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Abstract
A total of 33 sesame genotypes including three checks were grown in Randomized Block Design in three replications for evaluation of yield and yield attributing traits. Data was recorded for different yield attributing traits from all the genotypes viz., days to 50 % flowering, number of productive branches, plant height, height of 1st capsule bearing node, number of capsules per plant, number of seeds per capsule, capsule length, inter-node length, days to maturity, 1000-grain weight, per cent of oil and yield. Analysis of variance revealed significant differences among the genotypes for all the characters. The magnitude of phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV) was larger for seed yield, number of productive branch and inter-node length. Genetic advance as per cent of mean for seed yield, numbers of productive branches, height of 1st node from ground and internode length were higher in sesame genotypes. Correlation exhibited significant and high positive for number of productive branches, number of capsules per plant, number of seeds per capsule and days to maturity with seed yield. Path analysis indicated that the traits such as number of productive branches, number of capsules per plant, days to maturity, number of seeds per capsule had high positive direct effect on seed yield. These traits are to be given due importance in the selection process of sesame breeding programme.

Keywords: PCV, GCV, Sesame, Genetic Advance, Correlation, Path analysis

INTRODUCTION
Sesame (Sesamum indicum L.) is an ancient oilseed crop belonging to family Pedaliaceae with diploid (2n = 26) chromosome. The genus Sesamum contains more than 30 species of which Sesamum indicum is the most cultivated species (Nayar and Mehra, 1970). It is economically very important crop as it contains high oil of about 40-60% and good quality of 20-40% protein. It is called “Queen of Oilseeds” for its high quality and stability of oil which is due to the presence of saturated and unsaturated fatty acids in balanced form and antioxidants in the oil imparts stability.

Yield is a complex trait, and it is very much affected by the environmental factors. For improvement in a particular trait of sesame crop, genetic variability present in the crop needs to be exploited. Variability may be naturally present, or breeder may create it through several means. Analysis of variance, PCV, GCV, heritability, genetic advance and correlation coefficient is helpful parameters to understand the relationship of yield with other characters. The genotypic and phenotypic correlation coefficients are divided into direct and indirect effects through path coefficient analysis which play very important role to
increase yield. Path coefficient analysis is helpful to the breeder in identification of the direct influence of variables.

**MATERIALS AND METHODS**

The investigation was carried out at the research farm of Bihar Agricultural University, Sabour, Bhagalpur, Bihar in 2019-20 (summer season). Sabour is geographically situated between 25° 15’40” N latitude to 87°2’42” E longitude at 46 m above mean sea level. The experiment was laid in Randomized Block Design with 33 genotypes including three checks GT-10 and TKG-22 varieties were used as national check, while JTS-8 was the zonal check. Plot area was 3.6 m² with plant-to-plant distance of 10 cm and row to row distance of 30 cm. Data of twelve traits has been recorded, it was recorded on five randomly selected plants in each genotype in all three replications.

List of genotypes included in the study is presented in Table 1.

Genotypic and phenotypic correlation between yield and its component traits were worked out as per the method suggested by Johnson et al. (1955) and Al-jibouri et al. (1958). The significance of correlation coefficient was tested by referring to the standard table given by Fisher and Yates (1938). Path coefficient analysis was carried out as suggested by Dewey and Lu (1959).

**RESULTS AND DISCUSSION**

The mean sum of square due to genotypes was significant for all the characters studied (Table 2). This revealed that considerable amount of variability was present in the genotypes for all the characters. Hence, there is a scope for inclusion of promising genotypes in breeding program for yield and its component characters. Results of investigation revealed that all twelve characters are individually significant. Similar results for the studied traits were also observed by Parameshwarappa et al. (2009), Sumathi and Muralidharan (2010), Spandana et al. (2012) & Yirgalem et al. (2013) worked on sesame crop.

The estimates of phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV) for all the twelve characters studied are presented in Table 3. PCV ranged from 6.81 (days to maturity) to 32.31 per cent (seed yield), while GCV varied from 5.9 (days to maturity) to 31.36 percent (seed yield). These results were in accordance with the similar findings were exhibited by Parameshwarappa et al. (2009), Sumahi and Muralidharan (2010), Siva et al. (2013), Tripathi et al. (2013). Higher magnitude of both PCV and GCV was recorded for seed yield (32.31%), and (31.36%) and number of productive branches per plant (25.97%), moderate estimates were recorded for height of 1st capsule bearing node (17.19%), inter node length (14.01%), number of capsules per plant (13.11%) and days to maturity Bharathi et al. (2014) and Singh et al. (2018) in sesame.

A perusal of data (Table 3) it is evident that the heritability (broad sense) estimated for the twelve quantitative characters, ranged from 42.97 (capsule length) to 94.25 per cent (seed yield). High heritability was observed for the traits viz., seed yield (94.25%), number of productive branches per plant (94.02%), days to 50% flowering (93.80%) and inter node length (85.34%). The characters

Table 1. List of Sesame genotypes used in the study

| S. No. | Genotype     | Source               | S. No. | Genotype     | Source           |
|--------|--------------|----------------------|--------|--------------|------------------|
| 1      | JLS-120      | ORS, Jalgaon, Maharashtra | 18     | RAMA         | IAS, Kolkata      |
| 2      | AT-255       | ARS, Amreli          | 19     | AT-324       | ARS, Amreli, Gujarat |
| 3      | TKG-523      | AICRP, Tikamgarh, MP | 20     | SHT-01       | RARS, Assam      |
| 4      | TKG-525      | AICRP, Tikamgarh, MP | 21     | KALIKA       | OUAT, Bhubaneswar |
| 5      | AT-337       | ARS, Amreli, Gujarat | 22     | OSM-170      | OUAT, Bhubaneswar |
| 6      | AT-331       | ARS, Amreli, Gujarat | 23     | Suprava      | IAS, Kolkata      |
| 7      | TKG-15-01    | AICRP, Tikamgarh, MP | 24     | CUHY-57      | IAS, Kolkata      |
| 8      | DS-17-28     | UAS, Dharwad         | 25     | JCS2696      | AICRP, Jagtial, Telangana |
| 9      | JCS-DT-26    | AICRP, Jagtial, Telangana | 26     | BRT-04       | Collection from Purnea |
| 10     | AT-336       | ARS, Amreli, Gujarat | 27     | BRT-06       | Jharkhand        |
| 11     | TKG-518      | AICRP, Tikamgarh, MP | 28     | BRT-08       | Slmla, Himachal Pradesh |
| 12     | JLS-408-2    | ORS, Jalgaon, Maharashtra | 29     | BRT-09       | Dhaka            |
| 13     | JLS-708      | PC unit, Jabalpur, Madhya Pradesh | 30     | BRT-10       | Supaul, Bihar    |
| 14     | EC-370840    | PC unit, Jabalpur, Madhya Pradesh | 31     | GT-10 (NC)   | ARS, Amreli, Gujarat |
| 15     | PC-14-1      | PC unit, Jabalpur, Madhya Pradesh | 32     | TKG-22 (NC)  | AICRP, Tikamgarh, MP |
| 16     | AT-287       | ARS, Amreli, Gujarat | 33     | JTS-8 (ZC)   | AICRP, Tikamgarh, MP |
| 17     | OSM-22       | OUAT, Bhubaneswar    |        |              |                  |
Table 2. Analysis of variance of twelve quantitative characters of sesame

| S. No. | Characters                                      | Replication Mean sum of square | Genotype Mean sum of square | Error Mean sum of square |
|-------|------------------------------------------------|------------------------------|----------------------------|--------------------------|
| 1     | Days to 50% flowering                           | 0.848485                     | 56.801**                   | 1.223485                 |
| 2     | Number of productive branches                   | 0.208182                     | 4.144**                    | 0.085994                 |
| 3     | Plant height                                    | 31.084510                    | 202.900**                  | 41.485634                |
| 4     | Height of 1st capsule bearing node              | 0.671312                     | 68.039**                   | 12.32870                 |
| 5     | Number of capsules per plant                    | 33.093040                    | 532.096**                  | 46.373445                |
| 6     | Number of seeds per capsule                     | 6.447020                     | 84.863**                   | 11.938978                |
| 7     | Capsule length                                  | 0.117577                     | 0.222402**                 | 0.068222                 |
| 8     | Inter node length                               | 0.021168                     | 1.0639**                   | 0.057618                 |
| 9     | Days to maturity                                | 22.97980                     | 88.385101**                | 8.708965                 |
| 10    | 1000-seed weight                                | 0.069543                     | 0.190243**                 | 0.023881                 |
| 11    | Oil content                                     | 0.450840                     | 57.8919**                  | 5.573269                 |
| 12    | Seed yield                                      | 7662.3100                    | 265751.14**                | 5300.408253              |

** Significant at 1 per cent level

Table 3. Genetic variability parameters of twelve quantitative traits of sesame genotype

| S. No. | Characters                                           | $\sigma^2_s$ | $\sigma^2_p$ | $\sigma^2_e$ | ECV (%) | GCV (%) | PCV (%) | $h^2$ (broad sense) (%) | Genetic advance | Genetic advance as % mean |
|--------|------------------------------------------------------|--------------|--------------|--------------|---------|---------|---------|-------------------------|-----------------|--------------------------|
| 1      | Days to 50% flowering                               | 1.22         | 18.53        | 19.75        | 3.08    | 11.98   | 12.37   | 93.80                   | 8.59            | 23.89                    |
| 2      | Number of productive branches                       | 0.09         | 1.35         | 1.44         | 6.55    | 25.97   | 26.78   | 94.02                   | 2.32            | 51.87                    |
| 3      | Plant height                                        | 41.49        | 53.81        | 95.29        | 6.42    | 7.307   | 9.73    | 56.46                   | 11.35           | 11.31                    |
| 4      | Height of 1st capsule bearing node                  | 12.32        | 18.57        | 30.89        | 14.01   | 17.19   | 22.18   | 60.11                   | 6.88            | 27.46                    |
| 5      | Number of capsule/plants                            | 46.37        | 161.91       | 208.28       | 7.02    | 13.11   | 14.87   | 77.74                   | 23.11           | 23.81                    |
| 6      | Number of seeds per capsule                         | 11.94        | 24.31        | 36.25        | 6.45    | 9.20    | 11.24   | 67.06                   | 8.32            | 15.53                    |
| 7      | Capsule length                                      | 0.0682       | 0.0514       | 0.1196       | 9.50    | 8.25    | 12.58   | 42.97                   | 0.3061          | 11.14                    |
| 8      | Inter node length                                   | 0.0576       | 0.3355       | 0.8534       | 5.81    | 14.01   | 15.17   | 85.34                   | 1.10            | 26.66                    |
| 9      | Days to maturity                                    | 8.71         | 26.56        | 35.27        | 3.38    | 5.91    | 6.81    | 75.31                   | 9.21            | 10.56                    |
| 10     | 1000-seed weight                                    | 0.0239       | 0.0555       | 0.0793       | 4.79    | 7.30    | 8.73    | 69.90                   | 0.4056          | 12.57                    |
| 11     | Oil content                                         | 5.57         | 17.44        | 23.013       | 5.54    | 9.81    | 11.26   | 75.78                   | 7.49            | 17.58                    |
| 12     | Seed yield                                          | 5300.41      | 86816.91     | 92117.32     | 7.75    | 31.37   | 32.31   | 94.25                   | 589.26          | 62.73                    |

viz., yield kg/ha, number of productive branches, days to 50 % flowering, inter node length, number of capsules per plant and height of 1st capsule bearing node showed high heritability coupled with high genetic advance as percent mean. High estimates of heritability for days to maturity was reported by Haibru et al. (2018) and high heritability for percentage of oil reported by Bindu et al. (2014). Panse and Sukhatme (1985) reported that characters showing high heritability were governed predominantly by additive gene action and could be improved through individual plant selection. High genetic advance as per cent of mean was observed for seed yield (62.73%) and number of productive branches (51.87%). High heritability coupled with high genetic advance as per cent of mean for number of productive branches, plant height, number of capsules per plant, oil content and seed yield also reported by Bindu et al. (2014). These results are in accordance with the results of Ismaila and Usman (2014), Prithviraj and Parmeshwarappa (2017) and Haibru et al. (2018) in sesame. The results for these characters indicated that heritability is most likely due to additive gene effects
and selection may be effective. This type of characters could be improved by mass selection and other breeding methods based on progeny testing.

In the present study, correlation coefficient analysis measures the reciprocal relationship between twelve different quantitative traits to estimate the component trait on which selection may be emphasized for yield improvement. The phenotypic and genotypic correlation coefficients are shown in Tables 4 & 5, respectively. In most of the situations, the measures of genotypic correlation coefficients were higher than the respective phenotypic correlation.

Seed yield exhibited positive and significant correlation with the number of productive branches, number of capsules per plant, number of seeds per capsule and days to maturity. Gangadharma et al. (2012) & Abhijatha et al. (2017) were also reported same results in sesame. Goudappagoudra et al. (2011), Fazal et al. (2015) and Patil and Lokesha (2018) also reported significant positive correlation of seed yield with number of productive branches, number of capsules per plant and number of seeds per plant. It also showed negatively significant correlation with height of 1st capsule bearing node with this results in accordance Ismaila and Usman (2014) in sesame. The highly significant and positive correlation

### Table 4. Phenotypic correlation of twelve quantitative parameters of sesame genotypes

|       | NPB    | PH     | HFCBN  | NCPP   | NSPC   | CL     | IL     | DM     | GW     | OC     | Y      |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| D50F  | 0.0718 | 0.0531 | 0.2145 | *      | 0.0592 | 0.1279 | 0.0221 | 0.3983 | **      | 0.5857 | **      | -0.0672 | -0.1369 | -0.1152 |
| NPB   | 0.0604 | -0.3139 | **      | 0.5276 | **      | 0.5908 | 0.1372 | 0.0607 | 0.3726 | **      | 0.0603 | -0.1270 | 0.7648** |
| PH    | 0.3708 | 0.0425 | -0.0031 | 0.2545 | *      | 0.1495 | 0.1166 | 0.3960 | 0.4588 | **      | -0.0049 |
| HFCBN | -0.3021 | -0.1089 | -0.0219 | 0.2031 | *      | 0.0573 | 0.1374 | 0.2058 | -0.3463 | **      |         |
| NCPP  | 0.3089 | 0.1428 | -0.0283 | 0.1895 | -0.0522 | -0.2830 |         |         |         |         |         |
| NSPC  | 0.0106 | -0.2282 | *      | 0.2279 | *      | 0.0544 | -0.2105 |         | 0.5837** |         |         |
| CL    | 0.2572 | 0.0846 | 0.2165 | *      | 0.2934 | **      | 0.1004 |         |         |         |         |
| IL    | 0.3704 | 0.0364 | 0.2910 | **      | 0.0631 |         |         |         |         |         |         |
| DM    | 0.1577 | -0.0029 | 0.3171** |         |         |         |         |         |         |         |         |
| GW    | 0.5694 | 0.0078 |         |         |         |         |         |         |         |         |         |
| OC    | -0.1353 |         |         |         |         |         |         |         |         |         |         |

** Significant at 1 per cent level ; * Significant at 5 per cent level

D50F = Days to 50% flowering, NPB = Number of productive branches, PH = Plant height, HFCBN = Height of 1st capsule bearing node, NCPP = Number of capsules per plant, NSPC = Number of seeds per capsules, CL = Capsule length, IL = Inter node length, DM = Days to maturity, GW = 1000- Seed weight, OC = Oil content, Y = Seed yield

### Table 5. Genotypic Correlation coefficient of twelve quantitative characters of sesame genotypes

|       | NPB    | PH     | HFCBN  | NCPP   | NSPC   | CL     | IL     | DM     | GW     | OC     | Y      |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| D50F  | 0.0673 | 0.0444 | 0.2591 | 0.0761 | 0.1454 | 0.0616 | 0.4262 | 0.6763 | -0.1104 | -0.1709 | -0.1273 |
| NPB   | -0.0026 | -0.4371 | 0.5464 | 0.6939 | 0.1660 | 0.0685 | 0.4317 | 0.0070 | -0.2050 | 0.7993 |         |
| PH    | 0.5918 | -0.1053 | -0.2218 | 0.2940 | 0.2710 | 0.1434 | 0.3724 | 0.4175 | -0.0921 |         |         |
| HFCBN | -0.4408 | -0.2370 | -0.0826 | 0.2506 | 0.0514 | 0.1757 | 0.2607 | -0.4867 |         |         |         |
| NCPP  | 0.3285 | 0.1088 | -0.0033 | 0.1926 | -0.2158 | -0.4913 |         |         | 0.6925 |         |         |
| NSPC  | -0.2216 | -0.2499 | 0.3829 | -0.1883 | -0.5836 | 0.6578 |         |         |         |         |         |
| CL    | 0.4717 | 0.1274 | 0.1156 | 0.1499 | 0.0873 |         |         |         |         |         |         |
| IL    | 0.4441 | 0.1354 | 0.4376 | -0.0789 |         |         |         |         |         |         |         |
| DM    | 0.4441 | 0.1354 | 0.4376 | -0.0789 |         |         |         |         |         |         |         |
| GW    | 0.5085 | -0.0638 |         |         |         |         |         |         |         |         |         |
| OC    | -0.2383 |         |         |         |         |         |         |         |         |         |         |

D50F = Days to 50% flowering, NPB = Number of productive branches, PH = Plant height, HFCBN = Height of 1st capsule bearing node, NCPP = Number of capsules per plant, NSPC = Number of seeds per capsules, CL = Capsule length, IL = Inter node length, DM = Days to maturity, GW = 1000- Seed weight, OC = Oil content, Y = Seed yield

https://doi.org/10.37992/2022.1301.029
showed by number of productive branches with number of capsules per plant, number of seeds per capsule and days to maturity. The results were in accordance with the findings of Shekhawat et al. (2013), Khinaya (2017) and Ismaila & Usman (2017) for number of capsules per plant and Kumhar et al. (2008) for number of seeds per capsule. Number of capsules/plants showed positively high significant correlation with number of seeds per capsule indicated that number of capsules per plant will accommodate a greater number of seeds per capsule leading to ultimate increase in seed yield. These results agreed with the findings of Gangadhara et al. (2012), Bharathi et al. (2015) and Fazal et al. (2015) in sesame.

The direct and indirect effect of different traits on yield is depicted in Tables 6 & 7. Path analysis revealed the number of productive branches had high positive direct effect on seed yield. However, it exhibited high indirect effect on seed yield via height of 1st capsule bearing node, number capsules per plant, number of seeds per capsule, inter node length and days to maturity. Similar results were found by Gangadhara et al. (2012), Kumhar et al. (2008), Bharathi et al. (2015), Fazal et al. (2015) and Abate and Mekbib (2015) in sesame. Number of capsules per plant was reported positive direct effect on seed yield, whereas it exhibited high indirect effect on seed yield via number of productive branches, height of 1st capsule bearing node, number of seeds per capsule, days to maturity and 1000-seed weight. Subashini (2003) and Navaneetha et al. (2019) had also found similar results in sesame crop. Days to maturity (0.2861) had positive direct effect on seed yield, whereas it exhibited high positive indirect effect on seed yield via number of productive branches, number of capsules per plant, number of seeds per capsule and inter node length. Parameshwarappa et al. (2009), Sudhakar et al. (2007), Chandra Mohan (2014), Gangadhara et al. (2012), Shekhawat et al. (2013), Bharathi et al. (2015) and Abate and Mekbib (2015) were reported similar results in sesame. Number of seeds per capsule had high positive direct effect on seed yield However, it had high positive indirect effect on seed yield via number of productive branches, plant height, height of 1st capsule bearing node, number of capsules per plant and days to maturity. Similar results were found by Vanishree et al. (2011), Ibrahim and Khidir (2012), Shekhawat et al. (2013), Bharathi et al. (2015) and Fazal et al. (2015) in sesame.

The estimation of high heritability value coupled with high genetic advance as percent mean was recorded for the characters seed yield, number of productive branches, days to 50 % flowering, inter node length, number of capsules per plant and height of 1st capsule bearing node. These characters would be more effective for desired genetic improvement. Correlation analysis indicated that the characters viz., number of productive branches, number of capsules per plant, number of seeds per capsule and days to maturity are inter correlated among themselves. Therefore, these traits are to be given priority during selection for improvement of yield. Path analysis revealed that the trait number of productive branches had very high direct effect on yield followed

### Table 6. Direct (diagonal) and indirect effects of different characters attributing to grain yield in sesame at phenotypic level

|        | D5OF | NPB  | PH    | HFCBN | NCPP | NSPC | CL    | IL    | DM    | GW   | OC   |
|--------|------|------|-------|-------|------|------|-------|-------|-------|------|------|
| **D5OF** | -0.35 | -0.0251 | -0.0186 | -0.0751 | -0.0207 | 0.0448 | -0.0077 | -0.1394 | -0.205 | 0.205 | 0.0235 | 0.0479 |
| **NPB**  | 0.0259 | 0.3603 | 0.0218 | -0.1131 | 0.1901 | 0.2129 | 0.0494 | 0.0219 | 0.1343 | 0.0217 | -0.0457 |
| **PH**   | -0.0021 | -0.0024 | -0.0017 | 0.0017 | 0.0001 | 0.0103 | -0.0006 | -0.0047 | -0.016 | -0.0185 |
| **HFCBN** | -0.0086 | 0.0126 | -0.0149 | -0.0403 | 0.0122 | 0.0044 | 0.0009 | -0.0082 | -0.0023 | -0.0055 | -0.0083 |
| **NCPP** | 0.0192 | 0.1708 | 0.0138 | -0.0978 | 0.3237 | 0.1 | 0.0462 | -0.0091 | 0.0613 | -0.0169 | -0.0916 |
| **NSPC** | 0.0355 | 0.1642 | -0.0009 | -0.0303 | 0.0858 | 0.2779 | 0.0029 | -0.0634 | 0.0633 | 0.0151 | -0.0585 |
| **CL**   | -0.0003 | -0.002 | -0.0037 | 0.0003 | -0.0021 | -0.0002 | -0.0144 | -0.0036 | -0.0012 | -0.0031 | -0.0042 |
| **IL**   | 0.0046 | 0.0007 | 0.0017 | 0.0023 | -0.0003 | -0.0026 | 0.0029 | 0.0116 | 0.0043 | 0.0004 | 0.0034 |
| **DM**   | 0.1676 | 0.1066 | 0.0334 | 0.0164 | 0.0542 | 0.0652 | 0.0242 | 0.106 | 0.2861 | 0.0451 | -0.0008 |
| **GW**   | 0.008 | -0.0071 | -0.0469 | -0.0163 | 0.0062 | -0.0064 | -0.0256 | -0.0043 | -0.0187 | -0.1184 | -0.0674 |
| **OC**   | -0.0149 | -0.0138 | 0.0498 | 0.0223 | -0.0307 | -0.0228 | 0.0318 | 0.0316 | -0.0003 | 0.0618 | **0.1086** |

**Correlation co-efficient for seed Yield**

-0.1152 | 0.7648** | -0.0049 | -0.3463** | 0.6166** | 0.5837** | 0.1004 | -0.0631 | 0.3171** | 0.0078 | -0.1353

**RESIDUAL EFFECT = 0.4850**

D5OF = Days to 50 per cent flowering, NPB = Number of productive branches, PH = Plant height, HFCBN = Height of 1st capsule bearing node, NCPP = Number of capsules per plant, NSPC = Number of seeds/capsules, CL = Capsule length, IL = Inter node length, DM = Days to maturity, GW = 1000-seed weight, OC = Oil content, Y = Seed yield
Table 7. Direct (diagonal) and indirect effects of different characters attributing to grain yield in sesame at genotypic level

|       | D50F  | NPB   | PH    | HFCBN | NCPP  | NSPC  | CL    | IL    | DM    | GW    | OC    | Y     |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| D50F  | -0.2742 | -0.0185 | -0.0122 | -0.071 | -0.0209 | -0.0399 | -0.0169 | -0.1169 | -0.1854 | 0.0303 | 0.0469 | -0.1273 |
| NPB   | -0.0095 | -0.1413 | 0.0004 | 0.0617 | -0.0772 | -0.098 | -0.0234 | -0.0097 | -0.061 | -0.001 | 0.029 | 0.7993 |
| PH    | -0.0075 | 0.0004 | -0.1678 | -0.0993 | 0.0177 | 0.0372 | -0.0493 | -0.0455 | -0.0241 | -0.0625 | -0.0701 | -0.0921 |
| HFCBN | 0.0198 | -0.0333 | 0.0451 | 0.0763 | -0.0336 | -0.0181 | -0.0063 | 0.0191 | 0.0039 | 0.0134 | 0.0199 | -0.4867 |
| NCPP  | 0.0608 | 0.4363 | -0.0841 | -0.352 | 0.7985 | 0.2623 | 0.0869 | -0.0026 | 0.1538 | -0.1723 | -0.3923 | 0.6925 |
| NSPC  | 0.1195 | 0.57  | -0.1822 | -0.1947 | 0.2698 | 0.8215 | -0.1821 | -0.2053 | 0.3146 | -0.1547 | -0.4794 | 0.6578 |
| CL    | 0.0174 | 0.0469 | 0.083  | -0.0233 | 0.0307 | -0.0626 | 0.2824 | 0.1332 | 0.036  | 0.0326 | 0.0423 | 0.1159 |
| IL    | -0.1236 | -0.0199 | -0.0786 | -0.0727 | 0.001  | 0.0725 | -0.1368 | -0.29  | -0.1288 | -0.0393 | -0.1269 | -0.0789 |
| DM    | 0.185  | 0.1181 | 0.0392 | 0.0141 | 0.0527 | 0.1048 | 0.0348 | 0.1215 | 0.2736 | 0.0516 | -0.0018 | 0.3483 |
| GW    | 0.0171 | -0.0011 | -0.0577 | -0.0272 | 0.0335 | 0.0292 | -0.0179 | -0.021  | -0.0292 | -0.155  | -0.0788 | -0.0638 |
| OC    | -0.1321 | -0.1584 | 0.3227 | 0.2015 | -0.3797 | -0.4511 | 0.1159 | 0.3382 | -0.005 | 0.393  | 0.7729 | -0.2383 |

RESIDUAL EFFECT = 0.1947

D50F = Days to 50 per cent flowering, NPB = Number of productive branches, PH = Plant height, HFCBN = Height of 1st capsule bearing node, NCPP = Number of capsules/plants, NSPC = Number of seeds/capsules, CL = Capsule length, IL = Inter node length, DM = Days to maturity, GW =1000- Seed weight, OC = Oil content, Y = Seed yield

by number of capsules per plant, days to maturity and number of seeds per capsule. As far as indirect effects are considered, the trait number of productive branches had high indirect positive effect on seed yield followed by number of capsules per plant, number of seeds per capsule and days to maturity. The study revealed that the traits number of productive branches, number of capsules per plant and number of seeds per capsule to be given more importance during selection programme for seed yield improvement in sesame.

ACKNOWLEDGEMENT

Authors are thankful to Bihar Agricultural University, Sabour, Bhagalpur for providing financial support. We would like to also thank Dr. Rajani Bisen, PC unit Jabalpur for providing seeds for research.

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