Plant Archives Vol. 25, Supplement 1, 2025 pp.948-952 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org
DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2025.v25.supplement-1.128

STUDY OF CORRELATION AND PATH ANALYSIS IN SESAME (*SESAMUM INDICUM* L.)

P. Maheetha[1]*, J.E. Jahagirdar[2] and D.P. Deshpande[3]
[1] Department of Genetics and Plant Breeding, College of Agriculture, Latur-413512, Maharashtra, India
[2] Ex-Director of Research, V.N.M.K.V., Parbhani, Maharashtra, India.
[3]Assistant Breeder, Groundnut, Oilseed Research Station, Latur, Maharashtra, India
*Corresponding author Email: pudimaheetha36381@gmail.com
(Date of Receiving : 10-08-2024; Date of Acceptance : 14-10-2024)

ABSTRACT

38 genotypes of sesame were evaluated for correlation and path analysis for the quantitative traits *viz.,* days to 50% flowering, days to maturity, plant height, number of branches per plant, number of capsules per plant, capsule length, number of seeds per capsule, 1000 seed weight, oil content and seed yield per plant. Correlation analysis revealed that the genotypes, capsule length and number of seeds per capsule were positive significantly correlated with seed yield per plant. Days to 50 per cent flowering, days to maturity and oil content have negative significant correlation with seed yield per plant. Whereas, the traits *viz.,* plant height, number of branches per plant, number of capsules per plant and 1000 seed weight showed positive significant correlation at phenotypic level and positive non-significant correlation at genotypic level. Path coefficient analysis revealed that there is positive direct effect with seed yield per plant through the characters, number of branches per plant and number of capsules per plant. And there is negative direct effect through the traits, days to 50% flowering, 1000 seed weight and oil content.
Keywords **:** Correlation, Path analysis, Sesame

Introduction

Sesame (*Sesamum indicum* L.) is an important ancient oilseed crop which is self-pollinated which belongs to the family Pedaliaceae (2n=26). Most wild species of the genus sesame are native to Sub-Saharan Africa. S. indicum, the cultivated type is originated in India. Sesame is also known as Benne, Gingelly, Til, Tila, Simsim, Gergelim *etc.,* Sesame seeds contain 44-63 per cent oil content and 18-20 per cent protein content. Sesame oil is rich in linoleic and oleic acids, protein is rich in tryptophan and sulphur containing amino acids like methionine. India is the third leading producer of sesame in the world after Myanmar and China. India is second largest in area after Sudan

The degree and direction of relationship among yield and its components and their intensity can be measured by correlation coefficient which is vital in planning an efficient breeding programme. Path coefficient analysis measures the association, direct and indirect effects of independent variables on dependent variables so that it helps in indirect selection for genetic improvement of yield.

Materials and Methods

This experiment of evaluating correlation and path analysis of 38 sesame genotypes was carried out at Oilseed Research Station, Latur during *summer* 2023. Each genotype is sown in two rows with a spacing of 45 cm between the rows and 10 cm between the plants in a Randomised Block Design (RBD) in two replications. Necessary cultural and agronomic practices are followed for the experimental units. Mean performance was recorded for all the genotypes from five randomly selected plants in each plot of each genotype. The correlation and path analysis is analysed for the quantitative traits *viz.,* days to 50% flowering, days to maturity, plant height, number of branches per plant, number of capsules per plant, capsule length, number of seeds per capsule, 1000 seed weight, oil

content and seed yield per plant. Correlation of different yield contributing characters was worked out according to Johnson *et al*. (1955). Path coefficient analysis was carried out according to Dewey and Lu (1959).

Result and Discussion

The analysis of variance (ANOVA) revealed that all the treatments had high significant differences for all the characters studied. This shows that there is sufficient variation for effective selection. ANOVA is presented in Table 1.

Seed yield is a complex character and is influenced by different yield components. So, selection of genotypes based on only seed yield is not effective, so their interrelationship is to be studied for desirable selection and simultaneous improvement of yield components. For that, correlation studies are undertaken to know the association of seed yield with its component traits.

Genotypic and phenotypic correlation coefficients between yield and its component traits along with inter correlation among the traits is shown in Table 2. The characters *viz.,* days to 50 per cent flowering (r_g =-0.467, r_p = -0.523), days to maturity (r_g = -0.586, r_p = -0.613) and oil content (r_g = -0.805, r_p = -0.776) were observed to have negative significant correlation at both genotypic and phenotypic levels with seed yield per plant. Correlation was positive significant with seed yield per plant through the characters capsule length (r_g = 0.270, r_p = 0.341) and number of seeds per capsule (r_g = 0.235, r_p = 0.361) at both genotypic and phenotypic levels. The traits plant height (r_g = 0.150, r_p = 0.297) and number of branches per plant (r_g = 0.160, r_p = 0.318), number of capsules per plant (r_g = 0.137, r_p = 0.255) and 1000 seed weight (r_g = 0.042, r_p = 0.244) were positive and positive significant with seed yield per plant respectively.

Negative significant association with seed yield per plant through days to 50 per cent flowering was reported by Ahmed *et al.* (2022), through days to maturity was reported by Aye *et al.* (2024). Positive significant association of number of seeds per capsule was shown by Kante *et al.* (2022).

Through this, it can be concluded that the yield components, days to 50 per cent flowering, days to maturity, oil content, capsule length and number of seeds per capsule can be considered for selection of plant type for yield improvement.

Genetic correlation of yield with its component traits can be partitioned into direct and indirect effects through path analysis. The direct and indirect effects of different characters on seed yield per plant is briefed in Table 3. Genotypic and phenotypic path analysis are shown in figures 1&2.

Path analysis showed that there was positive direct effect of number of branches per plant (0.1407, 0.1269) and number of capsules per plant (0.1439, 0.0573) on seed yield per plant and these results were similar with Patel *et al.* (2022) and Sasipriya *et al.* (2022) for number of branches per plant. Same results were obtained by Kumar *et al.* (2022), Patel *et al.* (2022) and Srikanth and Ghodke (2022) for number of capsules per plant.

Days to 50 per cent flowering exerted positive indirect effect on seed yield per plant through 1000 seed weight. Days to maturity had positive indirect effect through number of capsules per plant and 1000 seed weight on seed yield per plant. Highest positive indirect effect was observed for plant height through the traits, days to maturity, oil content, number of branches per plant, number of seeds per capsule and number of capsules per plant. Positive indirect effect was shown on seed yield per plant by the character number of branches per plant through days to maturity, number of capsules per plant, number of seeds per capsule and oil content. The trait number of capsules per plant had positive indirect effect on seed yield per plant through the characters number of branches per plant and 1000 seed weight. The character capsule length had positive indirect effect on seed yield per plant through the traits days to maturity, number of branches per plant, number of capsules per plant and oil content. High positive indirect effect was recorded by number of seeds per capsule through the characters days to maturity, plant height, number of capsules per plant and oil content. 1000 seed weight exhibited higher positive indirect effect through the traits, days to 50 per cent flowering, plant height, capsule length, number of seeds per capsule and oil content. Oil content showed positive indirect effect on seed yield per plant through 1000 seed weight.

Conclusion

For obtaining high yielding genotypes, more emphasis for selection should be given to the traits *viz.,* capsule length, number of seeds per capsule, days to 50 per cent flowering, days to maturity and oil content while considering character association. While considering path analysis, more focus should be on the characters, number of branches per plant and number of capsules per plant.

Table 1: Analysis of variance (ANOVA) for yield and yield component traits in sesame (*Sesamum indicum* L.).

Sr. No.	Source of variation	D. F.	Days to 50% flowering	Days to maturity	Plant height (cm)	No. of branches per plant	No. of capsules per plant	Capsule length (cm)	No. of seeds per capsule	1000 Seed weight (g)	Oil content (%)	Seed yield per plant (g)
1	Replication	1	2.22	0.32	7.57	0.30	1.77	0.004	0.013	0.021	0.67	0.004
2	Treatment	37	17.54**	19.64**	106.3**	0.57**	103.86**	0.48**	42.38**	0.157**	14.74**	8.57**
3	Error	37	2.84	3.38	35.86	0.16	15.83	0.030	14.60	0.051	0.33	0.84

* Indicates significance at 5% level
** Indicates significance at 1% level

Table 2: Estimates of genotypic (G) and phenotypic (P) correlations for yield and yield contributing traits in sesame (*Sesamum indicum* L.)

Sr. No.	Name of the Character		Days to 50% flowering	Days to maturity	Plant height (cm)	No. of branches per plant	No. of capsules per plant	Capsule length (cm)	No. of seeds /capsule	1000 Seed weight (g)	Oil content (%)	Seed yield/ plant (gm)
1	**Days to 50% flowering**	r_g	1.000	0.980**	0.428**	0.301**	0.253*	0.075	0.412**	-0.342**	0.503**	-0.467**
		r_p	1.000	0.940**	-0.031	-0.110	-0.005	-0.090	-0.028	-0.485**	0.500**	-0.523**
2	**Days to maturity**	r_g		1.000	0.394**	0.160	0.272*	0.119	0.394**	-0.377**	0.646**	-0.586**
		r_p		1.000	-0.076	-0.162	0.008	-0.051	-0.079	-0.522**	0.624**	-0.613**
3	**Plant height (cm)**	r_g			1.000	0.032	0.084	0.381**	-0.109	-0.362**	-0.178	0.150
		r_p			1.000	0.336**	0.315**	0.432**	0.300**	0.142	-0.236*	0.297**
4	**No. of branches per plant**	r_g				1.000	0.261*	0.100	-0.006	-0.502**	-0.050	0.160
		r_p				1.000	0.375**	0.236*	0.292*	0.082	-0.128	0.318**
5	**No. of capsules per plant**	r_g					1.000	0.711**	0.644**	-0.385**	0.050	0.137
		r_p					1.000	0.694**	0.619**	-0.004	-0.039	0.255*
6	**Capsule length (cm)**	r_g						1.000	0.577**	-0.155**	-0.185	0.270*
		r_p						1.000	0.535**	0.666	-0.220	0.341**
7	**No. of seeds /capsule**	r_g							1.000	-0.473**	-0.124	0.235*
		r_p							1.000	0.101	-0.185	0.361**
8	**1000 Seed weight (g)**	r_g								1.000	-0.297**	0.042
		r_p								1.000	-0.309**	0.244*
9	**Oil content (%)**	r_g									1.000	-0.805**
		r_p									1.000	-0.776**
10	**Seed yield/ plant (gm)**	r_g										1.000
		r_p										1.000

* Indicates significance at 5% level ** Indicates significance at 1% level

Table 3: Genotypic and phenotypic path analysis for direct (Diagonal) and indirect (off diagonal) effects of yield components on seed yield in sesame (*Sesamum indicum* L.).

Sr. No.	Name of the Character		Days to 50% flowering	Days to maturity	Plant height (cm)	No. of branches per plant	No. of capsules per plant	Capsule length (cm)	No. of seeds per capsule	1000 Seed weight (g)	Oil content (%)	Correlation with seed yield per plant (g)
1	**Days to 50% flowering**	G	**-1.3564**	1.4486	-0.0619	0.0424	0.0364	-0.0041	-0.0455	0.0703	-0.597	-0.4673
		P	**-0.0547**	-0.2054	-0.001	-0.0139	-0.0003	-0.0041	-0.0039	0.0529	-0.292	-0.5228
2	**Days to maturity**	G	-1.3297	**1.4777**	-0.057	0.0226	0.0391	-0.0065	-0.0436	0.0774	-0.766	-0.5860
		P	-0.0515	**-0.2186**	-0.002	-0.0205	0.0004	-0.0023	-0.0109	0.0569	-0.364	-0.6134
3	**Plant height (cm)**	G	-0.5802	0.5824	**-0.144**	0.0045	0.0121	-0.0209	0.0121	0.0743	0.2107	0.1502
		P	0.0017	0.0167	**0.0346**	0.0427	0.0181	0.0197	0.0415	-0.015	0.1376	0.2970
4	**No. of branches per plant**	G	-0.4088	0.2371	-0.004	**0.1407**	0.0376	-0.0055	0.0006	0.1030	0.0597	0.1598
		P	0.0060	0.0354	0.0116	**0.1269**	0.0215	0.0107	0.0403	-0.009	0.0748	0.3182
5	**No. of capsule per plant**	G	-0.3428	0.4016	-0.012	0.0368	**0.1439**	-0.0390	-0.0711	0.0791	-0.059	0.1369
		P	0.0003	-0.0017	0.0109	0.0476	**0.0573**	0.0316	0.0855	0.0004	0.0228	0.2546
6	**Capsule length (cm)**	G	-0.1016	0.1756	-0.055	0.0140	0.1023	**-0.0548**	-0.0615	0.0319	0.2192	0.2699
		P	0.0049	0.0112	0.0150	0.0299	0.0398	**0.0455**	0.0739	-0.007	0.1284	0.3413
7	**No. of seeds per capsule**	G	-0.5587	0.5826	0.0158	-0.0008	0.0926	-0.0305	**-0.1105**	0.0972	0.1471	0.2348
		P	0.0015	0.0173	0.0104	0.0370	0.0355	0.0244	**0.1380**	-0.011	0.1080	0.3612
8	**1000 Seed weight (g)**	G	0.4645	-0.5568	0.0523	-0.0706	-0.0554	0.0085	0.0523	**-0.205**	0.3521	0.0417
		P	0.0265	0.1140	0.0049	0.0105	-0.0002	0.0030	0.0139	**-0.109**	0.1807	0.2442
9	**Oil content (%)**	G	-0.6826	0.9540	0.0257	-0.0071	0.0072	0.0101	0.0137	0.0610	**-1.186**	-0.8047
		P	-0.0274	-0.1364	-0.008	-0.0163	-0.0022	-0.0100	-0.0255	0.0338	**-0.584**	-0.7761

Residual (G): **0.5533** Residual (P): **0.5293** Diagonal entries (bold figures) are direct effects, off diagonal entries are indirect effects.

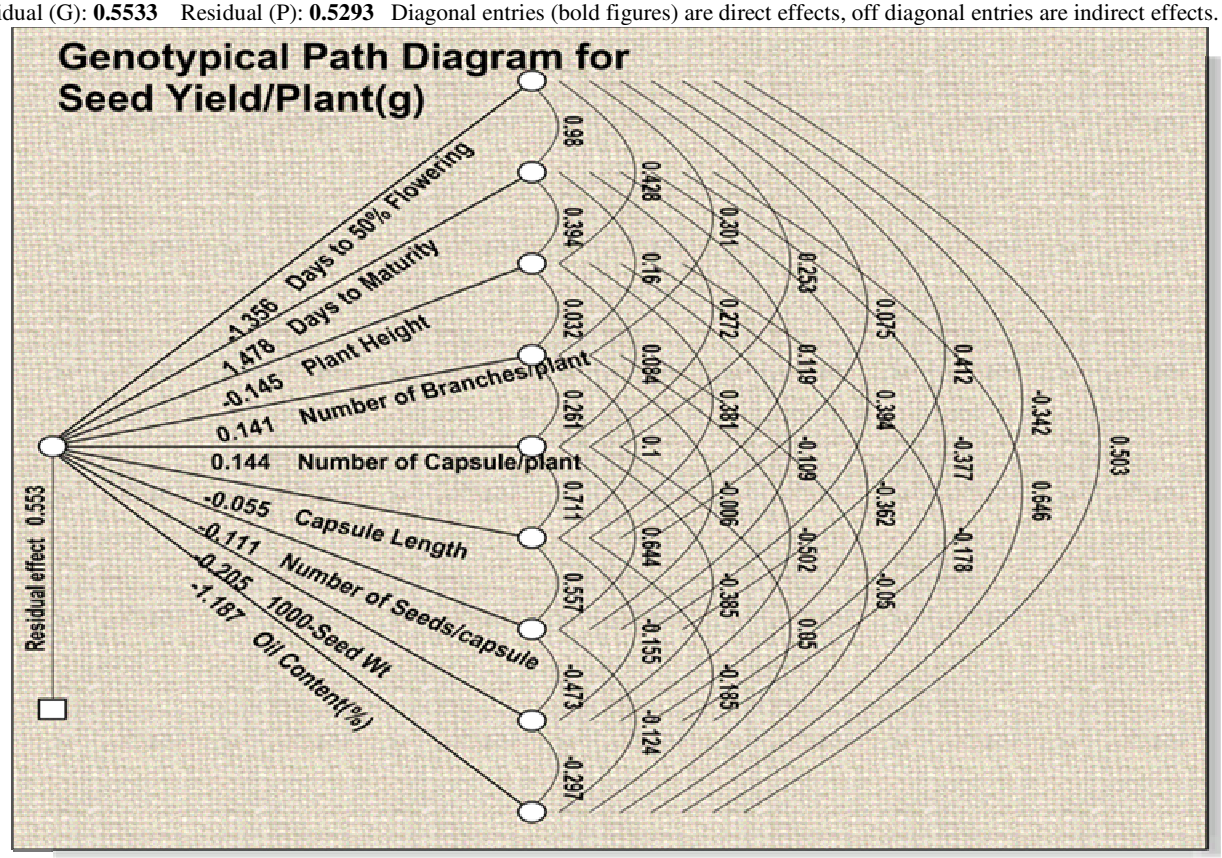

Fig. 1 : Genotypic path analysis for direct (diagonal) and indirect (off diagonal) effects of yield components on seed yield in sesame.

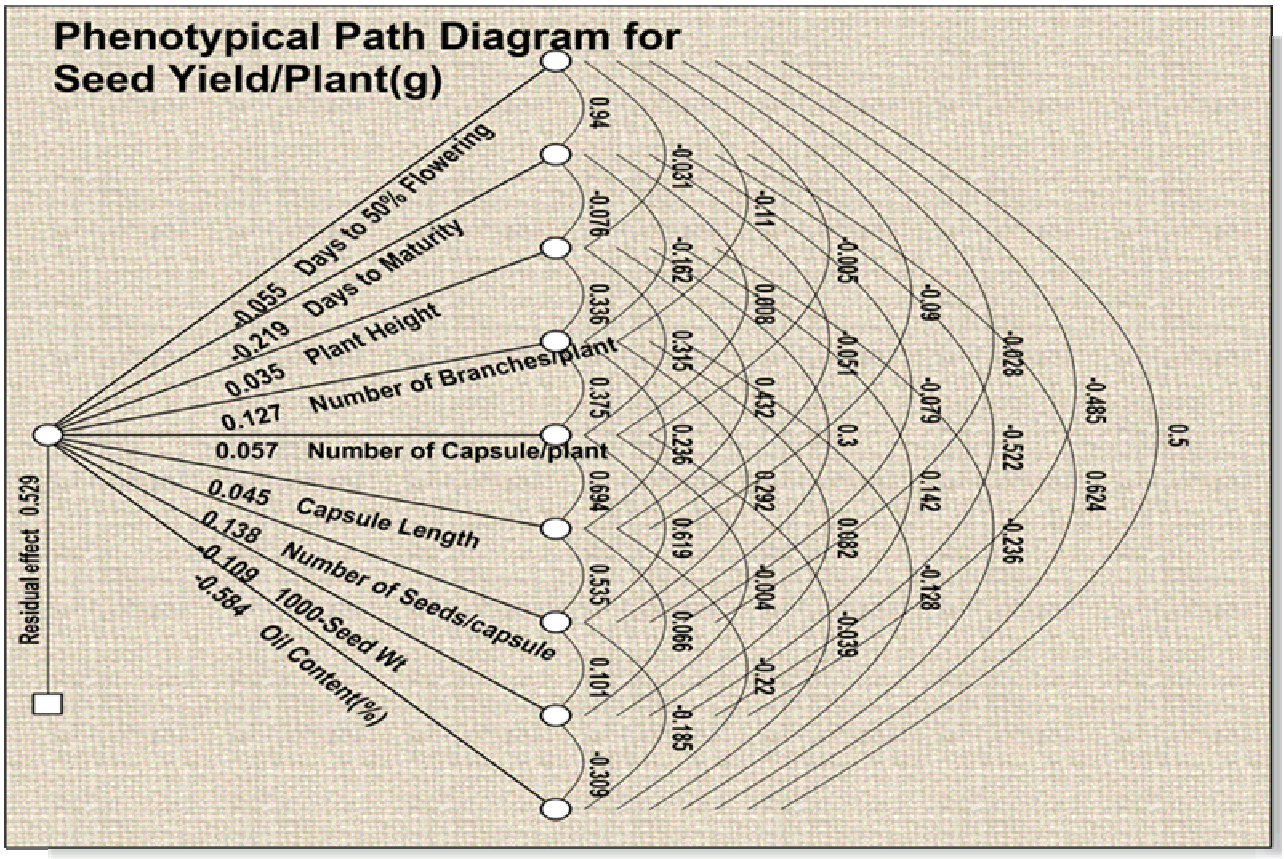

Fig. 2 : Phenotypic path analysis for direct (diagonal) and indirect (off diagonal) effects of yield components on seed yield in sesame.

Acknowledgement

I am grateful to my guide and my committee members for providing me the material for my research and supporting me throughout the experiment.

References

Ahmed, A.S.N., Das, S., Saharia, D.D., Sarma, M.K., Nath, M.P. and Talukdar, J.C. (2022). Assessment of Genetic Variability and Character Association for Morpho-Physiological Attributes and Seed Yield in Sesame (*Sesamum indicum* L.). *Biological Forum-An International Journal*. **14**(2): 425-430.

Aye, K.M., Sreewongchai, T., Phumichai, C., Mathayatthaworn, W., Kumdee, O., Ratanapongsai, Y. and Kaedphol, R. (2024). Assessment of Genetic Diversity, Correlation and Path Coefficient Analysis in Sesame (*Sesamum indicum* L.). *Science & Technology Asia*. 225-236.

Dewey, D.H. and Lu K.H. (1959). A Correlation and Path Coefficient Analysis of Components of Crested Wheatgrass Seed Production. *Agron. J*. **51**: 515-518.

Johnson, H.W., Robinson, H.F., and Comstock, R.E. (1955). Estimates of Genetic and Environmental Variability in Soyabean. *Agronomy Journal*. **47**: 314-318.

Kante, S., Wadikar, P.B., Sargar, P.R. and Patil, S.S. (2022). Correlation Analysis for Seed Yield and its Related Attributes in Genotypes of Sesame (*Sesamum indicum* L.). *International Journal of Plant and Environment*. **8**(01): 87-90.

Kumar, V., Sinha, S., Sinha, S., Singh, R.S. and Singh, S.N. (2022). Assessment of Genetic Variability, Correlation and Path Analysis in Sesame (*Sesamum indicum* L.). *Electronic Journal of Plant Breeding*. **13**(1): 208-215.

Patel, N.B., Acharya, R.R., Acharya, V.R., Patil, K., Patel, D.A. and Parmar, D.J. (2022). Assessment of Genetic variability, Correlation and Path Analysis in Sesame (*Sesamum indicum* L.). *Biological Forum-An International Journal*. **14**: 496-501.

Sasipriya, S., Parimala, K., Balram, M., and Eswari, K.B. (2022). Variability and Character Association in Sesame (*Sesamum indicum* L.). *The Pharma Innovation Journal*. **11**(1): 299-302.

Srikanth, K. and Ghodke, M.K. (2022). Genetic Diversity Studies in Sesame (*Sesamum indicum* L.) Genotypes. *The Pharma Innovation Journal*. **11**(3): 1486-1491.