International Journal of Environment and Climate Change

Volume 13, Issue 11, Page 3420-3425, 2023; Article no.IJECC.104074
ISSN: 2581-8627
(Past name: British Journal of Environment & Climate Change, Past ISSN: 2231–4784)

Studies on Correlation and Path Analysis of Yield and its Contributing Traits in Sesame (*Sesamum indicum*)

B. Madhu [a], D. Padmaja [b++*], T. Srikanth [a] and N. Balram [b#]

[a] Agricultural College, PJTSAU, Polasa, Jagtial, Telangana, India.
[b] Regional Agricultural Research Station (RARS), PJTSAU, Polasa - 505 529, Jagtial, Telangana, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IJECC/2023/v13i113516

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/104074

Original Research Article

Received: 10/06/2023
Accepted: 16/08/2023
Published: 21/11/2023

ABSTRACT

The purpose of the present investigation was to examine the relationships between seed yield and yield-attributing characters in sesame (*Sesamum indicum* L.) as well as evaluating their direct and indirect effects. Results indicated that number of capsules per plant (0.806) and 1000-seed weight (0.657) showed positive correlation with seed yield per plant . Path coefficient analysis indicated that number of capsules per plant (0.806) and 1000 seed weight (0.111) exhibited positive direct effect on seed yield. Positive indirect effect was observed through number of branches per plant via number of capsules per plant (0.657). Number of capsules per plant exhibited positive indirect effect via 1000 seed weight (0.111). Since, it showed strong correlation and direct effect on seed yield per plant, selecting for this trait may leads to improvement of seed yield per plant. Present study revealed that the traits viz., number of capsules per plant and 1000 seed

---

[++] *Scientist (Plant Breeding);*
[#] *Scientist (Plant Pathology);*
**Corresponding author: E-mail: suhanigpb@gmail.com;*

weight association was highly desirable as the improvement in any of the yield components results into overall increase in seed yield. Selection among genotypes based on this analyses can be made for further improvement in seed yield per plant and its contributing characters.

Keywords: Correlation; path analysis; sesame; phenotypic; genotypic.

1. INTRODUCTION

Sesame, also known as the "Queen of oilseeds," is one of the oldest oilseed crops, valued for its ability to resist oxidation and its nutritional richness. Sesame seeds contain 40 to 60% oil, consisting of significant oleic and linoleic acids content. In the Indian state of Telangana, sesame is grown in a limited area due to a restricted genetic pool, which hampers its development and production.

"Sesame occupies an area of 0.34 lakh ha with production and productivity of 0.260 lakh tonnes and 766 kg ha^{-1} respectively in Telangana" (www.indiastat.com, 2022). It is grown as summer crop in Northern Telangana districts *viz.,* Adilabad, Jagtial, Karimnagar and Nizamabad. However, the development of improved plant cultivars and increasing the production is restricted mainly due to narrow genetic pool, which results in limited possibility to restructure the sesame crop.

Yield in sesame is a quantitative attribute that is strongly impacted by environmental factors. Opting for a selection process solely based on yield has proven to be ineffective. Selection based on its components increases yield as they are not only less complex but also relatively simply inherited and are much less influenced due to environmental deviations. In reality, yield is a complex characteristic that emerges from the interaction of various contributing traits, some of which may have either positive or negative correlations with each other and with the overall yield. Consequently, assessing the degree of correlation between these diverse traits and the yield offers significant support for implementing indirect selection methods to enhance yield.

Analyzing correlations and conducting path analysis offer a deeper insight into the connections between various characteristics and their influence on seed yield. Path coefficient analysis allows for the separation of the correlation coefficient into direct and indirect effects through associated traits, as outlined by Dixit and Dubey [1]. When crafting selection strategies for crop improvement, it is of paramount importance to consider the relationship between yield and other traits. Relying solely on seed yield as a selection criterion for white-seeded sesame, without taking into consideration the contributing traits, proves ineffective. This is because seed yield is an outcome that is influenced by a multitude of other characteristics, as pointed out by Thouseem et al., [2]. In this current study, we employed correlation and path analysis on 106 sesame genotypes to identify the specific traits that play a role in determining seed yield.

2. MATERIALS AND METHODS

The present investigation was carried out at Regional Agricultural Research Station, Polasa, Jagtial, during late *kharif,* 2019. The experiment was laid out in Augmented block design (ABD) and 106 genotypes were sown in four blocks with inter-row spacing of 30 cm and intra-row spacing of 10 cm with plot size of 9.3 x 3 m. All the standard packages of practices were followed during the crop growth period. The experimental material used in the present investigation consisted of 106 genotypes i.e. 50-Germplasm lines, 50-Advanced breeding lines and two National Checks i.e. TKG 22 and GT 10 and four Local checks i.e. YLM 11, YLM 66, Swetha thil and Hima of sesame. This investigation was carried out to select out the better genotypes for seed yield and its components.

2.1 Statistical Analysis

The correlation and path coefficients were estimated by using the mean values through Windsostat software.

3. RESULTS

The observations recorded on 106 genotypes for seven characters viz., Days to 50% flowering ,days to maturity, plant height, number of branches per plant, number of capsules per plant, 1000-seed weight and seed yield per plant were analyzed statistically for correlation and path studies.

Table 1. Estimates of correlation coefficients for yield and it's component characters

Trait	Days to 50% flowering	Days to maturity	Plant height (cm)	Number of branches per plant	Number of capsules per plant	1000 seed weight (g)	Seed yield per plant
Days to 50% flowering	**1.00**	0.675*	0.157	-0.165	-0.245*	-0.024	-0.129
Days to maturity		**1.00**	0.091	-0.174	-0.133	-0.014	-0.015
Plant height (cm)			**1.00**	0.041	0.113	-0.047	0.052
Number of branches per plant				**1.00**	0.031	-0.023	0.047
Number of capsules per plant					**1.00**	0.264*	0.759**
1000 seed weight (g)						**1.00**	0.592**
Seed yield per plant							**1.00**

**- significance at 5% level (0.190) **- significance at 1% level (0.249)*

Table 2. Genotypic path coefficients among yield attributes in 106 sesame genotypes

Trait	Days to 50% flowering	Days to maturity	Plant height (cm)	Number of branches per plant	Number of capsules per plant	1000 seed weight (g)	Seed yield per plant(g)
Days to 50% flowering	**-0.014**	0.066	-0.001	-0.008	**-**0.161	-0.010	-0.129
Days to maturity	-0.009	**0.098**	-0.001	-0.009	-0.088	-0.005	-0.015
Plant height (cm)	-0.002	0.009	**-0.001**	0.002	0.074	-0.019	0.052
Number of branches per plant	0.002	-0.0172	-0.000	**0.052**	0.001	0.657	0.112
Number of capsules per plant	0.003	-0.013	-0.001	0.001	**0.657**	0.111	0.759**
1000 seed weight (g)	0.000	-0.001	0.000	-0.001	0.173	**0.420**	0.592**

Residual effect = 0.4998

**- significance at 5% level (0.190) **- significance at 1% level (0.249)*

Seed yield per plant exhibited a positive and significant correlation with the number of capsules per plant (0.75) and 1000-seed weight (0.592). Plant height and the number of branches per plant had non-significant associations and negative correlations with days to 50% flowering and days to maturity.

Direct effects: Days to maturity (0.098), number of branches per plant (0.052), number of capsules per plant (0.657) and 1000 seed weight (0.111) exhibited positive direct effect on seed yield (Table 2), whereas negative direct effect was observed for days to fifty percent flowering (-0.014) and plant height (-0.001).

Indirect effects: Maximum positive indirect effect was exerted by number of branches per plant via number of capsules per plant (0.657). Number of capsules per plant exerted positive indirect effect via 1000 seed weight (0.111)

4. DISCUSSION

The results suggest that traits like the number of capsules per plant and 1000-seed weight have a positive and significant impact on seed yield, which makes them valuable for selection criteria. Hence greater emphasis must be given on these associated traits as criteria for selection to target improvement of seed yield per plant. Similar results have been reported by Abate et al. [3] for number of capsules per plant and Vanishree et al. [4] for 1000 seed weight. Hence improvement of number of capsules per plant results in improvement of seed yield. These results are in accordance with studies of sesame genotypes of Saxena and Bisen [5], Agarwal et al. [6] and Bhagwat Singh and Rjani Bisen [7]. Similarly, the number of branches per plant and plant height, while non-significant, can still be considered as yield-contributing factors which were corroborated with the results of [8] for number of branches per plant and Agrawal et al. [6] for plant height. Therefore, these characters may also be given emphasis to improve seed yield per plant (SYP) by considering them in selection criteria. Number of capsules per plant exhibited the highest direct positive effect and indirect effect through other characters like 1000-seed weight and number of branches per plant. “Since this trait has a strong correlation and direct effect on seed yield per plant, selecting for this trait may greatly contributes to seed yield per plant”. [9] These results are in agreement with Abate and Mekbib [10] and Srikanth and Ghodke [11]. “Days to maturity influenced seed yield per plant by low positive direct effect at both levels. Days to 50% flowering influenced seed yield per plant negatively direct effect at both levels”. [10]. Plant height also showed negative direct effect on seed yield at both levels, these results are in congruence with Sasipriya *et al*.,[12]. “The results suggested that those characters with positive association have shown high direct effects. Hence, number of capsules and 1000-seed weight has high direct effects and correlation values”. [9]

The residual factor was low (0.4998) in the genotypes which suggested that, the variables choosen in the present study were sufficient to explain seed yield per plant with different characters. The results of path analysis revealed that number capsules per plant and 1000 seed weight were most important yield determining factors, as they showed high direct effects via many other yield improving characters and indirect contribution of these characters towards the yield is negligible by Lule et al., [13]. “This suggests that importance must be given on such traits while exercising selection to improve the yield in sesame” [14-20, 9].

5. CONCLUSION

In conclusion, selecting sesame genotypes based on the number of capsules per plant and 1000-seed weight is recommended for improving seed yield. These traits showed significant positive associations and strong direct effects on seed yield, making them key factors in enhancing sesame crop productivity.

ACKNOWLEDGEMENT

The authors would like to acknowledge the PJTSAU University, RARS, Polasa, Jagtial staff for their extended support, PC Unit, AICRP on Sesame and Niger ,Jabalpur and ICAR-IIOR Oilseeds.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Dixit P, Dube DK. Coheritable Variations In Lentil (*Lens Culinaris* Med.). Bionature. 1984;4(2):75–77.
2. Thouseem N, Arya K, Gayathri G and Anju Mariam Joseph. Genetic variability, heritability and genetic advance for seed yield and yield associated traitsin White seeded sesame (*Sesamum indicum* L.). The Pharma Innovation Journal. 2022;11(6): 385-388.
3. Abate M. Correlation and path coefficient analysis in mid-altitude sesame (*Sesamum indicum* L.) germplasm collection of Ethiopia. Journal of Plant Science Current Research. 2018;2(1): 1-7.
4. Vanishree, Lokesha R, Diwan JR, Ravi MV. Study on character association and contribution of yield related traits to seed yield in segregating generations (F2) of sesame (*Sesamum indicum* L.). Electronic Journal of Plant Breeding. 2011;2(4):559-562.
5. Saxena K, Bisen R. Genetic variability, correlation and path analysis studies for yield and yield component traits in sesame (*Sesamum indicum* L.). International Journal of Agriculture Sciences. 2016;8(61):3487-3489.
6. Agrawal MM, Singh S, Wawge MN, Macwana S, Sasidharan N. Correlation and path analysis for seed yield and yield attributing traits in sesame germplasm (*Sesamum indicum* L.). International Journal of Chemical Studies. 2017;5 (4):1099-1102.
7. Bhagwat Singh, Rjani Bisen. Association and path analysis of yield and yield attributing traits in sesame (*Sesamum indicum* L.). International Journal of Current Microbiology and Applied Sciences. 2018;7(7): 4041-4048.
8. Srikanth K, Ghodke MK. Correlation and Path Analysis in Sesame (*Sesamum indicum* L.) Genotypes. International Journal of Plant & Soil Science. 2022 May 11;34(18):228-35.
9. Dewey DI and Lu KH. A correlation and path-coefficient analysis of components of crested wheatgrass seed production. Agr. Journal. 1959;51:515-518.
10. Abate M, Mekbib F. Assessment of genetic variability and character association in Ethopian low-altitude sesame (*Sesamum indicum* L.) genotypes. Journal of Advanced Studies in Agricultural, Biological; 2015
11. Srikanth K, Ghodke MK. Correlation and path analysis in sesame (*Sesamum indicum* L.) Genotypes. International Journal of Plant & Soil Science. 2022;34(18):228-235.
12. Sasipriya S. Correlation and path analysis for seed yield and its components in sesame (*Sesamum indicum* L.). Elec. J. of Pl. Breed. 2018;9(4):1594-9.
DOI: 10.5958/0975-928X.2018.00199.0
13. Lule D, Tesfaye K, Fetene M, De Villiers S. Inheritance and association of quantitative traits in finger millet (*Eleusine coracana* Subsp. Coracana) landraces collected from eastern and south eastern Africa. International Journal of Genetics. 2012;2(2):12-21.
14. Abhijatha A, Arya K, Madhukar K, Srinivas G. Evaluation of sesame (*Sesamum indicum* L.) genotypes to the shaded uplands of Southern region. International Journal of Current Microbiology and Applied Sciences. 2017;6(7):332-339.
15. Bamrotiya MM, Patel JB, Ashok M, Chetariya CP, Ahir D, Kadiyara J. Genetic variability, character association and path analysis in sesame (*Sesamum indicum* L.). International Journal of Agriculture Sciences. 2016;8(54):2912-2916.
16. Bhagwat Singh, Rjani Bisen. Association and path analysis of yield and yield attributing traits in sesame (*Sesamum indicum* L.). International Journal of Current Microbiology and Applied Sciences. 2018;7(7):4041-4048.
17. Dewey JR, Lu KH. Correlation and path coefficient analysis of components of crested wheat grass seed production. Agronomy Journal. 1959;51:515-518.
18. Divya K, Shobha Rani T, Kiran Babu T, Padmaja D. Assessment of genetic variability, heritability and genetic gain in advanced mutant breeding lines of sesame (*Sesamum indicum* L.). International Journal of Current Microbiology and Applied Sciences. 2018;7(6):1565-1574.
19. Fisher RA, Yates F. Statistical tables for biological, agricultural and medical research. Oliver and Boyd, Edinberg; 1963.

20. Teklu DH, Kebede SA, Gebremichael DE. Assessment of genetic variability, genetic advance, correlation and path analysis for morphological traits in sesame genotypes. International Journal of Novel Research in Life Sciences. 2017;4(2):34-44.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/104074