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Correlation and Path Analysis for Seed Yield and its Contributing Traits in Sesame (*Sesamum indicum* L.)

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ABSTRACT: A total 500 accessions were evaluated to determine the associationship among the traits along with their direct and indirect effects on seed yield. Observations were recorded on twelve traits *viz.*, days to flower initiation, days to fifty percent flowering, days to maturity, plant height (cm), number of primary branches per plant, number of secondary branches per plant, number of capsules per plant, number of seeds per capsule, capsule length (cm), 1000 seed weight (g), seed yield per plant (g) and oil content (%). The experiment results revealed that Seed yield per plant exhibited significant positive correlation with number of seeds per capsule followed by capsule length and number of capsules per plant. Path analysis showed that number of seeds per capsule had the high positive direct effect on seed yield followed by number of capsules per plant. On the basis of correlation and path analysis number of seeds per capsule, number capsules per plant and capsule length were observed as the most important traits and selection of these traits would be helpful in crop improvement.

Keywords: Sesame, correlation, path analysis.

INTRODUCTION

Sesame (*Sesamum indicum* L.) known as "queen of oilseeds" is one of the oldest oilseed crops cultivated in India, with diploid chromosome number of cultivated sesame 2n=26 (Joshi *et al.,* 1961). Sesame is cultivated in many countries of the world and Ethiopia, India, Nigeria, Tanzania, Burkina Faso, Mozambique and China are major exporting countries. Sesame is a major source of edible oil and it is widely used in different industries *i.e.,* pharmaceutical and confectionary industries. Sesame seeds are rich source of amino acids *viz*., methionine and tryptophan which are missing in many vegetable proteins (Quasem *et al.,* 2009). Sesame oil has excellent stability because of Sesamin, Sesamolin, Sesamol (Brar & Ahuja, 1979). Characterization and evaluation are the pre requisites for effective utilization of genotypes and to find the source of favorable genes. Knowledge on correlation and path coefficient maybe helpful for the selection of traits in the population which is useful for the improvement of crop yield. Correlation coefficient analysis can help to find out the associationship among the different traits. The experimental result of correlation coefficients is of great value in the determination of most effective statistics for selection of superior genotypes. Path analysis is a standardized partial regression analysis, which separates the correlation coefficients into direct and indirect effects of yield attributing traits on seed yield (Wright, 1921). So, enable the breeders to decide about the importance traits during selection. Hence, present investigation was carried out to find out correlation and path analysis among the traits in sesame germplasm accessions.

MATERIALS AND METHODS

A total of five hundred accessions were assessed during *Kharif*, 2019 in un-replicated Augmented design at BSP (Groundnut) farm, JNKVV, Jabalpur. These genotypes were collected from Project coordinating unit, AICRP on Sesame and Niger, JNKVV campus, Jabalpur. Recommended cultivation practices were followed to raise healthy crop. Observations were recorded on 12 traits *viz.*, days to flower initiation, days to fifty percent flowering, days to maturity, plant height (cm), number of primary branches per plant, number of secondary branches per plant, number of capsules per plant,

number of seeds per capsule, capsule length (cm), 1000 seed weight (g), seed yield per plant (g) and oil content (%). Correlation coefficients were calculated to know the degree of association of seed yield per plant and its components and path analysis were computed to estimate the direct and indirect effects of the yield attributing traits. Statistical analyses for the above characters were done following Singh and Chaudhary (1995) for correlation coefficient and Dewey and Lu (1959) for path analysis.

RESULTS AND DISCUSSION

The correlation coefficients among the traits play a crucial in plant breeding. It can be used as tool for indirect selection. Correlation studies help the breeder at the time of selection and give an idea about yield components. The correlation coefficients among the traits were estimated and genotypic correlation coefficients was slightly higher than phenotypic correlation coefficients in two environments.

Correlations of different traits are presented in Table 1. The experimental results obtained for correlation and path analysis in this investigation for correlation coefficient elucidated below.

Seed yield per plant exhibited significant positive correlation with number of seeds per capsule (0.55) followed by capsule length (0.43), number of capsules per plant (0.34), number of primary branches (0.20), plant height (0.12) and number of secondary branches per plant (0.09).

These results are in accordance with the earlier results of Ismalia and Usman (2014) for capsule length and plant height, Bharathi *et al.* (2015), Fazal *et al.* (2015) and Mahmoud *et al.* (2015) for number of capsule and number of seeds per capsule, Saravanan *et al.* (2020) for number of capsules per plant and plant height, Roy and Pal (2019) for number of branches per plant, number of capsules per plant and number of seeds per capsule.

Table 1: Correlation coefficient analysis for yield and its related traits in Sesame.

Traits	FI	FF	DM	PH	PB	SB	CP	CL	SC	TW	OC	SPY
FI	1	0.71**	0.66**	0.09*	-0.03	0.05	0.07	0.01	0.04	0.05	0.03	-0.01
FF		1	0.63**	0.06	-0.03	0.06	0.07	-0.03	-0.05	0.02	-0.02	-0.07
DM			1	0.05	0.01	0.05	0.08	-0.04	-0.06	0.01	0.01	-0.07
PH				1	0.26**	0.24**	0.22**	0.05	0.04	0	0.12**	0.12**
PB					1	0.53**	0.44**	0.1	0.12**	-0.06	0.06	0.20**
SB						1	0.30**	0.01	0.01	-0.09	0.07	0.09*
CP							1	0.11*	0.16**	-0.02	0.09*	0.34**
CL								1	0.71**	-0.03	0	0.43**
SC									1	-0.05	0.02	0.55**
TW										1	-0.02	-0.05
OC											1	0.06
Significance level at 0.05*, at 0.01**												

Days to flower initiation exhibited significant positive association with days to fifty flowering (0.71), days to maturity (0.66) and Plant height (0.09).

Days to fifty percent flowering showed significant positive correlation with days to maturity (0.63). Similar results were observed by Thirumala Rao *et al.* (2013), Lokesha *et al.* (2013) and Bharati *et al.* (2015).

The trait plant height shows significant positive correlation with number of primary branches per plant (0.26), number of secondary branches per plant (0.24), number of capsules per plant (0.22) and oil content (0.12). Similar findings were reported by Fazal *et al.* (2015) for number of branches and number of capsules per plant.

Number of primary branches exhibited significant positive correlation with number of secondary branches (0.53), number of capsules per plant (0.44) and number of seeds per capsule (0.12). Number of secondary branches shows significant positive correlation with number of capsules per plant (0.30). Similar track of results is reported by Shekhawat *et al.* (2013) for number of capsules per plant. Gangadhara *et al.* (2012) and Gnanasekaran *et al.* (2008) for number of seeds per capsule. Capsule length shows significant positive association with number of seeds per capsule (0.71).

Number of capsules per plant shows significant positive association with capsule length (0.11), number of seeds per capsule (0.16) and oil content (0.09). Similar results have been observed by Tripathy *et al.* (2016) for oil content.

Nandan *et al.*, (2010) revealed that, when many traits are affecting an assumed character, splitting the total correlation into direct and indirect effects of cause would give more meaningful understanding to the cause of association between the dependent trait like yield and independent trait like yield component trait (Moosavi *et al.*, 2015). As simple correlation doesn't provide the contribution of traits towards seed yield per plant, these correlations were divided into direct and indirect effects through path coefficient analysis. It allows separating correlations into direct and indirect effects through other yield attributes (Wright, 1921). In case of Path analysis (Table 2), the results revealed that number of seeds per capsule exhibited high positive direct effect

(0.442) on seed yield followed by number of capsules per plant (0.248), capsule length (0.081), plant height (0.042), oil content (0.022), number of primary branches (0.021) and days to flower initiation (0.011). similar results have been observed by Parimala and Mathur (2006), Parameshwarappa *et al.* (2010) and Aremu *et al*. (2011) for number of capsules per plant, Sudhakar *et al.* (2007) for plant height, Muhamman *et al*. (2010) for plant height and number of branches, Yol *et al*. (2010) for plant height, Ibrahim and Khidir (2012) for number of capsules per plant and number of primary branches per plant. Goudappagoudra *et al.* (2011) for number of capsules per plant, plant height and number of branches per plant. Bharathi *et al*. (2015) for capsule length.While days fifty percent flowering (-0.045), days to maturity (-0.040), thousand seed weight (-0.019) and secondary branches (-0.010) exhibited negative direct effect on seed yield per plant. Similar results were obtained by Gangadhara *et al*. (2012) and Kumar and Vivekanandan (2009) for days to maturity, Sasipriya (2018) for days to 50% flowering, Kiruthika *et al*. (2020) for days to maturity, number of secondary branches per plant and thousand seed weight.

Table 2: Path coefficient analysis for yield and its related traits in Sesame.

Trait	FI	FF	DM	PH	PB	SB	CP	CL	SC	TW	OC
FI	**0.011**	-0.032	-0.027	0.004	-0.001	0.000	0.017	0.001	0.018	-0.001	0.001
FF	0.008	**-0.045**	-0.025	0.003	-0.001	-0.001	0.017	-0.002	-0.022	0.000	0.000
DM	0.007	-0.029	**-0.040**	0.002	0.000	0.000	0.020	-0.003	-0.027	0.000	0.000
PH	0.001	-0.003	-0.002	**0.042**	0.005	-0.002	0.055	0.004	0.018	0.000	0.003
PB	0.000	0.001	0.000	0.011	**0.021**	-0.005	0.109	0.008	0.053	0.001	0.001
SB	0.001	-0.003	-0.002	0.010	0.011	**-0.010**	0.074	0.001	0.004	0.002	0.002
CP	0.001	-0.003	-0.003	0.009	0.009	-0.003	**0.248**	0.009	0.071	0.000	0.002
CL	0.000	0.001	0.002	0.002	0.002	0.000	0.027	**0.081**	0.314	0.001	0.000
SC	0.000	0.002	0.002	0.002	0.003	0.000	0.040	0.058	**0.442**	0.001	0.000
TW	0.001	-0.001	0.000	0.000	-0.001	0.001	-0.005	-0.002	-0.022	**-0.019**	0.000
OC	0.000	0.001	0.000	0.005	0.001	-0.001	0.022	0.000	0.009	0.000	**0.022**
Residual 0.621											

CONCLUSION

Correlation coefficients and path analysis were computed on different traits *viz.*,days to flower initiation, days to fifty percent flowering, days to maturity, plant height (cm), number of primary branches per plant, number of secondary branches per plant, number of capsules per plant, number of seeds per capsule, capsule length (cm), 1000 seed weight (g), seed yield per plant (g), oil content (%). Results revealed that, on the basis of correlation and path analysis number of seeds per capsule, number capsules per plant and capsule length were determined the most critical traits. Selection of these traits can be helpful for a breeder to improve the crop yield.

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