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RESEARCH ARTICLE

Path analysis studies for quantitative traits in sesame (*Sesamum indicum* L.)

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SUMMARY

The present investigation on path analysis studies for quantitative traits in sesame (*Sesamum indicum* L.) was undertaken at experimental farm of AICRP on Safflower, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra. The experimental material consisted of Thirty four sesame germplasm lines including one check evaluated during *Kharif* , 2016 in Randomized Block Design with three replications. The observations were recorded on 12 characters *viz*., days to 50 per cent flowering, plant height, number of primary branches per plant, number of capsules per plant, capsule length, capsule breadth, number of seeds per capsule, 1000 seed weight, days to maturity, oil content, seed yield per plant and per ha. The path co-efficient analysis revealed that, days to 50% flowering (G-2.9535) exerted the highest positive direct effect on seed yield per hectare followed by number of seeds per capsule (G-0.4577), seed yield per plant (G-0.3793), number of primary branches per plant (G-0.3587) and number of capsules per plant (G-0.0175).

Key Words : Path analysis, Sesame, Genotype, Direct effect, Indirect effect

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Sesame is one of the most ancient and important oilseed crop due to suitability of its healthy oil, easiness of extraction and resistant to drought. Sesame (*Sesamum indicum* L.) is a diploid species with 2n = 26 chromosomes. It is a self pollinated crop and belongs to the family Pedaliaceae. Sesame is considered as a nutritious oilseed crop being rich source of protein (18-25%), carbohydrate (13.5%), minerals and polyunsaturated fatty acids. Sesame ranks fifth for important edible oil and as a spice. In India, sesame is cultivated on an area of 17.46 m.ha. with a production of 8.27 lakh tonnes and productivity of 474 kg per ha. (*www.indiastat.com*, 2016). It is widely cultivated in the states of Rajasthan, Uttar Pradesh, Madhya Pradesh, Gujrat, West Bengal, Tamil Nadu, Andhra Pradesh and Karnataka.

Path analysis measures the direct and indirect effects of independent variables on the dependent

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variables. To work out the cause and effect, knowledge of this relationship makes selection more effective. Selection for high yield is made difficult by the complex nature of trait in sesame. Hence, knowledge on the magnitude and type of association between seed yield and its components will greatly help in evaluating the contribution of different component traits towards seed yield.

MATERIAL AND METHODS

The material for the study comprised of 35 germplasm collections of sesame received from Project co-ordinating Unit, Jabalpur, Madhya Pradesh representing diverse eco-geographical origin. The experimental material was evaluated in Randomized Block Design with three replications under rainfed condition at experimental farm of AICRP on safflower, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra. Sowing was carried out at the spacing of 30 cm and 15 cm between the rows and plants, respectively.

The observations were recorded on 12 characters *viz*., days to 50 per cent flowering, plant height, number of primary branches per plant, number of capsules per plant, capsule length, capsule breadth, number of seeds per capsule, 1000 seed weight, days to maturity, oil content, seed yield per plant and seed yield (kg/ha). Observations were recorded on five plants selected at random from each genotype in each replication and their average was recorded.

Path co-efficient analysis was carried out and the simple correlation co-efficients (genotypic) were partitioned into direct and indirect effect by path analysis as suggested by Dewey and Lu (1959). The characters in addition to the seed yield per plant were selected for path analysis and all possible simple correlation co-efficients them were worked out.

The concept behind path analysis is that, the yield is function of various components like X_1, X_2, X_3 and X_4 etc. a path diagram is constructed using simple correlation co-efficients among various characters under study. It helps in setting up simultaneous equations, which are used for the estimation of direct effects.

The direct path co-efficients were obtained by solving a set of ‘p’ simultaneous equation by the abbreviated poolittle technique.

$$r_{01} = P_{01}+P_{02}+r_{12}+\ldots\ldots\ldots\ldots\ldots P_{op}r_{1p}$$
$$r_{02} = P_{01}+r_{12}+P_{02}+\ldots\ldots\ldots\ldots\ldots P_{op}r_{2p}$$
$$r_{0p} = P_{01}r_{1p}+P_{02}r_{2p}+\ldots\ldots\ldots\ldots\ldots P_{op}$$

where,

P_{01}, P_{02}............ P_{op} are the path effect of 1, 2 …p variables (independent), on ‘o’ variable (dependent).

r_{12}, r_{13}.................r_{1p}........r_p(p-1) are the possible correlation co-efficient between various independent variables.

r_{01}, r_{02}..............r_{op} are the correlation co-efficient of independent variable with dependent variable.

The indirect effect of a particular character through other character was obtained by multiplication of direct path effect and particular characters, respectively.

From the simultaneous equation, it is clear that correlation co-efficient is the sum of direct and indirect path co-efficient.

Calculation of residual effect (r) :

The residual effect permits precise explanation about the pattern of interaction of other possible components of yield. In other words, residual effect measures the role of other independent variables which were not included in the study on the dependent variable.

RESULTS AND DISCUSSION

Path co-efficient analysis is a standardized partial regression and measures the direct influence of one variable upon another and permits the separation of the correlation co-efficient into components of direct and indirect effects. Thus, path analysis measures the direct and indirect effects of independent variables on the dependent variables. To work out the cause and effect, knowledge of this relationship makes selection more effective.

The path co-efficient at genotypic level indicated that the days to 50% flowering (2.9535) exerted the highest positive direct effect on seed yield (kg/ha) followed by number of seeds per capsule (0.4577) and seed yield per plant (0.3793), number of primary branches per plant (0.3587) then number of capsules per plant (0.0175). These results are in close agreement with Saxena and Bisen (2016) who reported the positive direct effect of days to 50% flowering and number of primary branches per plant on seed yield. Abate and Mekbib (2015) also reported the direct positive effect of number of capsules per plant. Similar results were also supported by Engin *et al.* (2010) who observed the direct positive effect on seed yield by days to 50% flowering and number of capsules per plant. The direct negative influence was

Table 1 : Genotypic path co-efficient analysis showing direct (diagonal and bold) and indirect effects of different characters on seed yield kg per hectare in thirty five genotypes of sesame

Sr. No.	Characters	Days to 50 % flowering	Days to maturity	Plant height (cm)	Number of primary branches / plant	Number of capsules / plant	Capsule length (cm)	Capsule breadth (cm)	Number of seeds /capsule	1000 seed weight (g)	Oil content (%)	Seed yield / plant (g)
1.	Days to 50 % flowering	2.9535	2.9432	-0.3734	-0.5629	-0.9323	-0.665	0.5183	0.3765	0.4986	0.031	-0.1889
2.	Days to maturity	-2.8077	-2.8175	0.4298	0.4218	0.7849	0.5992	-0.6604	-0.4891	-0.6038	-0.1431	0.1787
3.	Plant height	0.0105	0.0126	-0.0827	-0.0291	0.0008	-0.026	-0.0233	0.0156	-0.0087	0.0022	-0.0368
4.	Number of primary branches / plant	-0.0684	-0.0537	0.1263	0.3587	0.26	0.0875	0.1499	-0.0312	0.0757	0.0766	0.1799
5.	Number of capsules / plant	-0.0055	-0.0049	-0.0002	0.0127	0.0175	-0.0079	-0.006	-0.0017	0.0035	-0.0008	0.0076
6.	Capsule length (cm)	0.0481	0.0454	-0.0672	-0.0521	0.0967	-0.2137	-0.1186	0.0111	-0.0731	0.0382	-0.0895
7.	Capsule breadth (cm)	-0.0026	-0.0035	-0.0042	-0.0063	0.0051	-0.0083	-0.015	-0.0019	-0.0081	0.0045	-0.0074
8.	Number of seeds / capsule	0.0583	0.0795	-0.0863	-0.0398	-0.045	-0.0238	0.0568	0.4577	0.0981	0.0511	0.1129
9.	1000 seed weight (g)	-0.009	-0.0115	-0.0056	-0.0113	-0.0106	-0.0183	-0.029	-0.0115	-0.0535	0.0034	-0.033
10.	Oil content (%)	-0.0022	-0.0106	0.0055	-0.0446	0.0098	0.0373	0.0631	-0.0233	0.0133	-0.209	0.061
11.	Seed yield / plant (g)	-0.0243	-0.024	0.1686	0.1902	0.164	0.1588	0.187	0.0936	0.2335	-0.1108	0.3793
12.	Seed yield kg per hectare	0.1507	0.155	0.1107	0.2373	0.351	-0.0802	0.1228	0.3958	0.1754	-0.2567	0.5639
	Partial R^2	0.4452	-0.4367	-0.0091	0.0851	0.0062	0.0171	-0.0018	0.1811	-0.0094	0.0536	0.2139

Residual effect = 0.6744

observed for days to maturity, (-2.8175), plant height (-0.0827), capsule length (-0.2137), capsule breadth (-0.015), 1000 seed weight (-0.0535) and oil content (-0.2090). These results are in close agreement with Kanak and Rajani (2016) Meena Kumari and Ganesamurthy (2015) and Azeez and Morakinyo (2009) also observed that seed yield had negative direct effect through number of days to maturity. These findings are also in conformity with Kumhar *et al.* (2008). Number of capsules per plant (-0.3510) showed negative indirect effect on seed yield. Similar results were reported by Azeez and Morakinyo (2011).

The present investigation clearly revealed that the character days to 50% flowering, number of seeds per capsule, seed yield per plant, number of primary branches per plant and number of capsules per plant showed higher direct positive effects and indirect effects via other components traits. These indicated that direct selection for these characters will enhance the breeding efficiency for seed yield in sesame. Hence, for a plant breeder engaged in the improvement of sesame yield, it would be necessary to lay the maximum emphasis on above mentioned characters.

REFERENCES

Abate, M. and Mekbib, F. (2015). Assessment of genetic variability and character association in Ethiopian low altitude sesame (*Sesamum indicum* L.) genotypes. *J. Adv. Studies Agric., Biol. & Environ. Sci.*, **2**(3):55-66.

Azeez, M.A. and Morakinyo, J.A. (2009). Character association and path analysis of yield and its components in sesame (Genera Sesamum and Ceratotheca) seed. Proc. Of the 33rd Annual Conf. of Genetics Society of Nigeria, 27-30 Sept, 2009, Ilorin, Nigeria.

Azeez, M.A. and Morakinyo, J.A. (2011). Path analysis of the relationships between single plant seed yield and some morphological trait in sesame (*Genera Sesamum* and Ceratotheca). *Internat. J. Plant Breed. & Genet.*, **5** (4) : 358-368.

Dewey, D.R. and Lu, K.H. (1959). A correlation and path co-efficient analysis of components of crested wheat grass seed production. *Agron. J.*, **51** : 515-518.

Engin, Y., Emre, K., Seymus, F. and Biilent, U. (2010). Assessment of selection criteria in sesame by using correlation co-efficient, path and factor analysis. *Australion J. Crop Sci.*, **4**(8) : 598-602.

Kumhar, S.R., Solanki, Z.S. and Choudhary, B.R. (2008). Studies on genetic variability, character association and path co-efficient analysis in sesame (*Sesamum indicum* L.) *J. Plant Genet. Resour.*, **21**(1): 56-58.

MeenaKumari, B. and Ganesamurthy, K. (2015). Studies on variability, correlation and path analysis in sesame (*Sesamum indicum* L.). *Adv. Appl. Res.*, **7**(2) : 116-120.

Ministry of Agriculture and Farmers Welfare, GOI: 2016, (www.indiastat.com)

Saxena, K. and Bisen, R. (2016). Genetic variability, correlation and path analysis studies for yield and yield component traits in sesamum (*Sesamum indicum* L.). *Internat. J. Agric. Sci.,* **8**(61) : 3487-3489.