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RESEARCH PAPER

Character association and path analysis studies on seed yield and its yield attributing traits in *Kharif* sesame (*Sesamum indicum* L.)

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Abstract : The experiment was carried out to determine the character association and path analysis with 20 genotype including national check namely GT-10, TKG-22, zonal check JTS-8. The genotype was grown in (RBD) design with 3 Replication during *Kharif* 2020 at BTC College of Agriculture and Research station Bilaspur CG. The data were collected for nine quantitative and yield attributing traits. The correlation co-efficient analysis is the index of relationship among two variables. These have been dealing in all possible combinations for important traits at genotypic and phenotypic levels. Seed yield plant^{-1} was highly significant and positively correlated with plant height, followed by number of primary branches plant^{-1}, capsules length, number of capsules plant^{-1}, number of seed capsule^{-1} days to maturity at genotypic and phenotypic levels. Path analysis at phenotypic level among the characters studied, plant height (cm) had the highest direct effect (0.7479) towards seed yield per plant followed by number of primary branches plant^{-1} (0.5868) capsule length (0.3827) no of capsule plant^{-1} (0.3521) number of seed capsule^{-1} (0.2818) days to maturity (0.289) negative direct effect were recorded for days to 50% flowering (-0.0327) 1000 seed weight (-02147). Demonstrating the fact that there was a real and positive connection between these characters will help determine which type of character is needed for crop improvement.

Key Words : Correlation, Path analysis, Sesame

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INTRODUCTION

Sesame (*Sesamum indicum* L.) (2n=2x=26) is a completely ancient oilseed crop grown subsequent to groundnut, in the course of rainy season in India, it is one of the maximum important oilseed crop, native to India Simmonds and Smartt (1976). It is largely considered a crop of tropical and sub-tropical climate, but it has also unfold to temperate components of the world. It belongs family pedaliaceae.

It is mainly grown in different states like Madhya Pradesh, Rajasthan, Uttar Pradesh, West Bengal, Gujarat, Maharashtra and Tamil Nadu etc. In India, it is grown in an area of 14.19 lakh/ha. With the production of 68.93 lakh tonnes and the productivity is 485 kg/ha. (Anonymous, 2019) Madhya Pradesh is the leading

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producer of sesame with an area about 3.65 lakh/ha. producing about 15.70 lakh tonnes of seed with a productivity of 430 kg/ha.(Anonymous, 2017) While in Chhattisgarh it is grown in an area of 17.74 lakh/ha area and production of 4.58 MT and productivity is 258 kg/ha. in the year 2016-17. (Anonymous, 2018).

Sesame is economically very important crop, due to its high oil (fatty acid), and content about 40-62 % and 20-24. % protein. It is variously termed as gingelly, til, simsim, gerglin and beniseed in different regions. It contains about 50 per cent of high quality edible oil and is a good source of protein, vitamins and minerals its oil is mainly used for cooking purposes, pharmaceuticals, cosmetics, perfumery industries and the manufacture of soap, paints and pesticide (Shin *et al.,* 2003).

It is also known as the "Queen of oil seeds" because of its excellent qualities of the oil and seed, its oil consist of antioxidant called sesamol which imparts a high degree of resistance against oxidative rancidity. The test of seed it contain belilier turbidity temperature test (BTTT) sesame cake is nutritious feed for dairy cattle and it can also be used as fertilizer (Ashri, 1989).

Knowledge on the magnitude and type of association between seed yield and its contributing characters will very much help in evaluating the contribution different component trait toward seed yield. This will help in selection of best genotypes by giving importance to the trait contributing for yield improvement. As the productivity in bilaspur region is quitr low due to the unavability of high yielding varieties, the above trial has been devised to study the high yielding characters for the enhancement of breeding work of sesame.

MATERIAL AND METHODS

The experiment was conducted at Instructional Farm of BTC College of Agriculture and Research Station, Bilaspur, a constituent college of Indira Gandhi Krishi Vishwavidyalaya, Raipur (Chhattisgarh). Bilaspur district is located in NW part of Chhattisgarh and is bounded by North latitudes 21°47' and East longitudes 23°8' and 81°14' and 83°15' with an altitude of 265 meters above the mean sea level. This place falls under "Plains of Chhattisgarh". Chhattisgarh state comes under dry moist, sub humid zone and termed as the seventh agro climatic zone of India *i.e.* Eastern plateau and hills. South-Western monsoon is source of rainfall.

The field experiment was carried out during *Kharif* 2020 at the Instructional Farm of BTC CARS, Bilaspur, C.G. 20 Genotype including 3 checks with three replication were imposed in Randomized Block Design (RBD). The experimental material sesame obtained from (IVT) Intial Varietal Trial of All Indian coordinated research projects on sesame and Niger Jawaharlal Nehru Krishi Vishwavidyalaya Jabalpur (M.P.)

The plot size 2.5m x 3.0 m entry represented 8 row of 4-meter lengths with spacing 30x15cm apart. Recommended agronomic practices were adopted to raise the crop. Excluding border rows five randomly selected plants were used to record observation on 9 characters *viz.,* Days to 50 % flowering, days to maturity, plant height (cm), number of primary branches per plant, number of capsule per plant, capsule length (cm), number of seed per capsule, 1000 seed weight (g), seed yield per plot (g).

The correlation co-efficients between all possible pairs of characters were computed at phenotypic level (Searle, 1961). The phenotypic correlation co-efficient were tested for their significance against calculated 'r' value from table 'r' value of (Fisher and Yates, 1963) at (g-2) degree of freedom, at 5% and 1% level of significance. Path co-efficient analysis was done by following Wright (1921) and elaborated by Dewey and Lu (1959) method. The ranges of direct/indirect effects were explained by the ways of (Lenka and Mishra, 1973).

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Correlation between characters :

Association analysis is a very important approach in the breeding programme. It gives an idea of the relationship and decides the characteristics of the components on which selection can be based for improvement in the yield. The degree of correlation also affects the efficiency of selection process. The relationship among any two variables is referred as simple correlation or absolute correlation or zero order correlation co-efficient. It is of three type *viz.,* genotypic and phenotypic correlations. The correlation co-efficient analysis is the index of relationship among two variables. These have been dealing in all possible combinations for important traits at genotypic and phenotypic levels.

The plant height (cm) (rg = 0.748**, rp =0.748**) was positively and highly significantly associated with

seed yield per plot followed by no. of primary branches per plant (rg =0.587**, rp =0.416), capsule length (cm) (rg =0.383, rp =0.425), no. of seed capsule^{-1} (rg =0.282, rp =0.313), days to maturity (rg = 0.289, rp = 0.274).

Days to 50 per cent flowering was positively and significantly associated with days to maturity. (rg = 0.722**, rp = 0.668**) at genotypic and phenotypic level followed by no. of primary branches per plant (rg = 0.869**, rp = 0.576**) followed by plant height (cm) (rg = 0.465*, rp = 0.396). It was positively associated with number of seed/capsule (rg = 0.178, rp = 0.152), no. of capsule per plant (rg = 0.146, rp = 0.137), capsule length (cm) (rg = 0.016, rp = 0.021) at both genotypic and phenotypic level.

Days to maturity was positively and highly significantly associated with no. of primary branches per plant (rg = 0.914**, rp = 0.593**) followed by plant height (rg = 0.634**, rp = 0.566**), number of capsule/plant

Table 1 : Genotypic and phenotypic co-efficients of correlation among different traits in sesame

Characters		Days to 50 % flowering	Days to maturity	Plant height (cm)	No. of primary branches plant^{-1}	No. of capsules plant^{-1}	Capsule length (cm)	No. of seed capsule^{-1}	1000 seed weight (g)	Seed yield per plot (g)
Days to 50 %	G	1.000	0.722**	0.465**	0.869**	0.146	0.016	0.178	-0.017	-0.033
flowering	P	1.000	0.668**	0.396*	0.576**	0.137	0.021	0.152	-0.009	-0.039
Days to Maturity	G	-	1.000	0.634**	0.914**	0.421*	0.296	0.365	-0.194	0.289
	P	-	1.000	0.566**	0.593**	0.276	0.230	0.338	-0.179	0.274
Plant height (cm)	G	-	-	1.000	0.814**	0.525**	0.570**	0.432*	-0.188	0.748**
	P	-	-	1.000	0.578**	0.514**	0.549**	0.471**	-0.181	0.748**
No. of primary	G	-	-	-	1.000	0.066	0.054	0.244	-0.304	0.587**
branches plant^{-1}	P	-	-	-	1.000	0.151	0.133	0.261	-0.116	0.416**
No. of Capsules	G	-	-	-	-	1.000	0.752**	0.345	0.362	0.352
plant^{-1}	P	-	-	-	-	1.000	0.575**	0.324	0.204	0.386*
Capsule length	G	-	-	-	-	-	1.000	0.630**	0.201	0.383*
(cm)	P	-	-	-	-	-	1.000	0.564**	0.144	0.425*
No. of seed	G	-	-	-	-	-	-	1.000	0.203	0.282
capsule^{-1}	P	-	-	-	-	-	-	1.000	0.136	0.313
1000 seed weight	G	-	-	-	-	-	-	-	1.000	-0.215
(g)	P	-	-	-	-	-	-	-	1.000	-0.210
Seed yield Per plot	G	-	-	-	-	-	-	-	-	1.000
(g)	P	-	-	-	-	-	-	-	-	1.000

* and ** indicate significance of values at P=0.05 and 0.01, respectively

Table 2 : Direct and indirect effect on eighth character on seed yield per plot at phenotypic level of sesame

Characters	Days to 50 % flowering	Days to maturity	Plant height (cm)	No. of primary branches/ plant	No. of capsules / plant	Capsule length (cm)	No. of seed / capsule (cm)	1000 seed weight (g)	Phenotypic correlation with seed yield/plot (g)
Days to 50 % flowering	1.1939	0.8622	0.5554	1.0377	0.1742	0.0192	0.2128	-0.0206	-0.0327
Days to maturity	-1.2794	-1.7716	-1.1225	-1.6192	-0.7467	-0.5243	-0.6467	0.344	0.289**
Plant height (cm)	-0.1263	-0.1721	-0.2716	-0.2211	-0.1424	-0.1549	-0.1173	0.051	0.7479**
No of primary branches	-0.1699	-0.1787	-0.1592	-0.1955	-0.0129	-0.0105	-0.0476	0.0595	0.5868**
No of capsule/plant	0.4313	1.2463	1.5509	0.1956	2.9568	2.2238	1.0215	1.0692	0.3521**
Capsule length (cm)	-0.0304	-0.5594	-1.0781	-0.1013	-1.4215	-1.89	-1.1904	-0.3796	0.3827**
No of seed per capsule	0.0789	0.1616	0.1912	0.1079	0.1529	0.2787	0.4425	0.0897	0.2818**
1000 seed wight (g)	0.0269	0.3027	0.2928	0.4746	-0.5637	-0.3131	-0.3159	-1.5589	-0.2147
Seed yield per plot (cm)	-0.0327	0.289	0.7479	0.5868	0.3521	0.3827	0.2818	-0.2147	1.000

Residual factor =0.0000 ** indicate significance of value at P=0.01

(rg = 0.421, rp = 0.276), number of seed/capsule (rg = 0.365, rp = 0.338), length of capsule (rg = 0.296, rp = 0.230) both at genotypic and phenotypic level, respectively.

Plant height was positively and highly significantly associated with seed yield/plot (rg = 0.748**, rp = 0.748**) followed by no. of primary branches/plant (rg = 0.814**, rp = 0.578**), capsule per plant (rg = 0.525*, rp = 0.514*) followed by length of capsule (rg =0.570**, rp = 0.549*) at both genotypic and phenotypic level, respectively.

At the genotypic and phenotypic levels, the number of primary branches per plat was positively and highly significantly associated with plant height (cm) (rg = 0.814**, rp = 0.578**), followed by seed yield per plot (rg = 0.587**, rp = 0.416).

No. of capsules per plant (rg = 0.525*, rp = 0.514*) was associated with the Plant height in a positive and highly significant, followed by seed yield plot^{-1} (rg = 0.352, rp = 0.386), days to 50 % flowering (rg = 0.146, rp = 0.137) no. of primary branches per plant (rg =0.066, rp = 0.151), 1000 seed weight (rg = 0.203, rp = 0.136) both at genotypic and phenotypic level, respectively.

Capsule length (cm) was associated with capsule per plant (rg = 0.752**, rp = 0.575**) in a positive and highly significant. followed by plant height (rg = 0.570**, rp = 0.549*), seed yield plot^{-1} (rg = 0.383, rp = 0.425), no. of primary branches per plant (rg =0.054, rp = 0.133), days to 50 per cent flowering (rg = 0.016, rp = 0.021) at both genotypic and phenotypic level, respectively.

At both the genotypic and phenotypic levels, 1000 seed weight was positively and significantly associated with no. of capsules per plant (rg =0.362, rp = 0.204), followed by no. of seeds per capsule (rg = 0.203, rp = 0.136). Days to 50 per cent flowering (rg = -0.017, rp = -0.009) and days to maturity (rg = -0.194, rp = -0.179).

Path co-efficient analysis:

The study of the path co-efficient is essentially a partial co-efficient of regression, which divides the correlation into direct and indirect results. Wright (1921) introduced the idea of path analysis and Dewey and Lu (1959) first used the method to evaluate yield-contributing characters. In order to prepare an efficient selection strategy, it is important to get knowledge about the relative importance of the direct and indirect effects of characters, seed yield per hectare. Path analysis at phenotypic level among the characters studied, plant height (cm) had the highest direct effect (0.7479) towards seed yield per plant followed by number of primary branches plant^{-1} (0.5868) capsule length (0.3827) no of capsule plant^{-1} (0.3521) number of seed capsule^{-1} (0.2818) days to maturity (0.289) negative direct effect were recorded for days to 50% flowering (-0.0327) 1000 seed weight (-02147). The result indicates the indirect causal factors are to be considered simultaneously for selection.

Conclusion:

The genotypic correlation co-efficients were higher in magnitude than their corresponding phenotypic variation of all studied traits except days to 50 per cent flowering and 1000 seed test weight (g). The analysis of the path co-efficient value showed that the main characters *viz.*, plant height (cm), number of primary branches plant^{-1}, capsule length (cm), number of seed capsule^{-1}, number of capsule plant^{-1} days to maturity, showed a high direct effect on seed yield (g) with positively significant feature. The screened characters will help to speed the breeding programme and will help to distinguish early and advanced genotype with high yield attributes.

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