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Association Analysis for Yield and its Components in Sesame Genotypes

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A B S T R A C T

In the present experiment analysis of association between various plant characters using correlation and path analysis was studied. Ten sesame genotypes in three replications were evaluated at the research farm of Agriculture College, Ganjbasoda during *kharif* 2018. Observations were recorded for nine characters viz. Plant height, days to 50% flowering, number of primary branches, days to maturity, length of the capsule, number of capsules /plant, number of seeds/ capsule, 1000- grain weight and seed yield/plant. Analysis of variance showed significant differences among all the genotypes for all the characters under study. Correlation studies indicated that Days to 50 % flowering, days to maturity, plant height, number of capsules per plant and 1000 seed weight with seed yield. Number of capsules per plant had the highest direct effect on seed yield per plant followed by plant height, 1000 seed weight, days to maturity and days to 50% flowering.

Introduction

Sesame (*Sesamum indicum* L.) is one of the most important spice and oilseed crop. It is native to tropic and sub-tropic regions. Sesame belongs to pedaliaceae family having chromosome number as (2n=26) and is an annual, self-pollinated oil seed crop. It's known by various names such as sesamum, til, gingelly, simsim, gergelim etc. Sesame is the sixth most important oilseed crop in the world after soybean, rapeseed, cottonseed, sunflower and groundnut. India is the world leader in the area and production of sesame. India is the highest producer of sesame in the world. It is grown as a rain fed crop mainly in the states of Gujarat, West Bengal, Uttar Pradesh, Rajasthan, Madhya Pradesh, Andhra Pradesh, Maharastra, Tamilnadu, Odisha and Karnataka, which account for more than 96% of the total area and production.

Sesame is grown mainly for its seeds that contain approximately 50% oil and 25% protein. Due to the high stability of its oil with distinct sweet flavor, sesamum is regarded as the 'Queen of Oilseeds'. The presence of antioxidants (sesamolin and sesamol) makes the oil to be one of the most stable vegetable oils in the world. Sesamum oil is highly resistant to oxidative deterioration even though oleic and linoleic

acids are the predominant fatty acids (about 80% of its total) of sesame oil, (Uzun *et al.*, 2007). The high level of unsaturated fat increases the quality of sesame oil for human consumption.

Seed yield being a complex character is influenced by various components. Determination of seed yield components and suitable character combination that affects yield to a maximum extent is important in formulating an effective breeding program.

Hence, the present investigation was carried out to gather information on character association and path co-efficient analysis in 10 diverse germplasm collections of sesme.

Materials and Methods

Ten diverse genotypes were evaluated during *kharif* 2018 at Instructional Farm of JNKVV, College of Agriculture, Ganjbasoda. All the genotypes were grown in randomized block design with three replications. Row to row distance of 45 cm. and plant to plant of 10 cm. was maintained. Ten plants from each replication were randomly selected for recording observation.

Observations were recorded for nine characters viz. days to 50% flowering, days to maturity, plant height (cm), number of primary branches/ plants, number of capsules/plants, capsule length (cm.) no. of seeds/capsule, 1000 seed weight (g) and seed yield/plant (g.). Recommended package of practices was adopted in respect of irrigation, weeding and fertilizing.

Results and Discussion

Analysis of variance revealed that highly significant differences among all the characters under study (Table 1) indicating considerable amount of genetic variation present in the material. High magnitude of variation in the experimental material was reflected by high value of mean and range for almost all the characters.

Study of the association of yield components with yield is useful for choosing the characters, which have a definite role in influencing the yield and may aid in selection from the breeding material. A better understanding of the contribution of such traits in building up the genetic makeup of the crop may be obtained through correlation.

Table.1 Analysis of variance for different characters in sesame

Characters	Mean squares
Days to 50% flowering	78.67**
Days to maturity	104.75**
Plant height (cm)	858.92**
No. of primary branches/ plant	1.10*
No. of capsules/ plant	534.90*
Capsule length (cm)	0.08*
No. of seeds/ capsule	431.11**
1000 seed weight (g)	0.41*
Seed yield/ plant (g)	29.65***

Table.2 Phenotypic and genotypic correlation coefficient between seed yield per plants and its components in sesame

Genotypes	Phenotypic/ Genotypic	Days to maturity	Plant height (cm)	No. of primary branches/ plant	No. of capsules/ plant	Capsule length (cm)	No. of Seeds/ capsule	1000 seed weight (g)	Seed yield/ plant (g)
Days to 50% flowering	P	0.83***	0.45*	-0.08	0.29	0.25	0.17	0.10	0.48**
	G	0.87***	0.47*	-0.10	0.29	0.27	0.16	0.11	0.49**
Days to maturity	P		0.52**	-0.17	0.27	0.15	0.04	0.38*	0.47**
	G		0.52**	-0.10	0.20	0.15	0.04	0.39*	0.50**
Plant height (cm)	P			0.55**	073***	-0.30	-0.52	0.23	0.59***
	G			0.58**	0.75***	-0.32	-0.53	0.24	0.61***
No. of primary branches/ plant	P				0.73***	-0.51**	-0.69***	-0.25	0.22
	G				0.75***	-0.61**	-0.73***	-0.27	0.23
No. of capsules/ plant	P					-0.49**	-0.36	0.13	0.76***
	G					-0.53**	-0.37	0.13	0.78***
Capsule length (cm)	P						0.69***	0.18	-0.07
	G						0.73***	0.18	-0.09
No. of seeds/ capsule	P							0.26	0.19
	G							0.26	0.18
1000 seed weight (g)	P								0.55**
	G								0.55**

P = Phenotypic correlation G = Genotypic correlation
* Significant at 5% level, ** Significant at 1% level, *** Significant at 0.1% level

Table.3 Direct (diagonal) and indirect effects of characters on seed yield per plant at Phenotypic and genotypic level in sesame

Genotypes	Phenotypic/ Genotypic	Days to 50% flowering	Days to maturity	Plant height (cm)	No. of primary branches/ plant	No. of capsules/ plant	Capsule length (cm)	No. of Seeds/ capsule	1000 seed weight (g)	Seed yield/ plant (g)
Days to 50% flowering	P	**0.11**	0.09	0.05	-0.01	0.03	0.03	0.02	0.11	0.48
	G	**0.21**	0.19	0.10	-0.02	0.06	0.06	0.03	0.02	0.49
Days to maturity	P	-0.06	**-0.08**	-0.04	0.01	-0.02	-0.01	-0.00	-0.03	0.47
	G	-0.37	**-0.42**	-0.22	0.08	-0.11	-0.06	-0.01	-0.17	0.50
Plant height (cm)	P	0.15	0.17	**0.32**	0.18	0.24	-0.09	-0.17	0.07	0.59
	G	0.02	0.02	**0.04**	0.02	0.03	-0.01	-0.02	0.01	0.61
No. of primary branches/ plant	P	0.00	0.00	-0.02	**-0.04**	-0.02	0.02	0.03	0.01	0.22
	G	0.09	0.17	-0.53	**-0.92**	-0.69	0.56	0.67	0.24	0.22
No. of capsules/ plant	P	0.19	0.17	0.47	0.47	**0.64**	-0.31	-0.23	0.08	0.76
	G	0.45	0.41	1.15	1.16	**1.54**	-0.82	-0.56	0.19	0.78
Capsule length (cm)	P	-0.03	-0.02	0.04	0.07	0.06	**-0.14**	-0.09	-0.02	-0.07
	G	0.07	0.04	-0.08	-0.16	-0.14	**0.27**	0.20	0.05	-0.09
No. of seeds/ capsule	P	0.09	0.02	-0.30	-0.40	-0.21	0.39	**0.57**	0.15	0.18
	G	-0.03	-0.00	0.09	0.13	0.06	-0.13	**-0.18**	-0.05	0.18
1000 seed weight (g)	P	0.03	0.10	0.06	-0.07	0.03	0.05	0.07	**0.26**	0.54
	G	0.02	0.00	0.06	0.06	0.03	0.04	0.06	**0.22**	0.55

P = Phenotypic Correlation, G= Genotypic Correlation

Residual effect for phenotypic path = 0.19, Residual effect for genotypic path = 0.11

Phenotypic and genotypic correlations between seed yield per plant with different yield attributes and among the attributes themselves are presented in Table 2. Days to 50 % flowering showed positive and significant correlation with days to maturity (0.83***, 0.45**), plant height (0.45*, 0.47*) and seed yield per plant (0.48**, 0.49**) at both phenotypic and genotypic level. Thirumala Rao *et al.,* (2013), Vanishree *et al.,* (2013) and Bharathi *et al.,* (2015) also reported positive and significant correlation between days to 50% flowering and for days to maturity.

Days to maturity exhibited positive and significant correlation with plant height (0.52**, 0.52**), 1000 seed weight (0.38*, 0.39*) and seed yield per plant (0.47**, 0.50**) at both phenotypic and genotypic level. These results are in agreement with Vanishree *et al.,* (2013) and Bharathi *et al.,* (2015) for plant height.

Plant height exhibited positive and significant phenotypic and genotypic correlation with number of primary branches per plant (0.55***, 0.58***), number of capsules per plant (0.73***, 0.75***) and seed yield per plant (0.59***, 0.61***). The positive significant association of plant height with number of branches per plant, number of capsules per plant and seed yield per plant was also reported by Fazal *et al.,* (2015).

Positive and highly significant phenotypic and genotypic correlation was observed between number of primary branches per plant and number of capsules per plant (0.73***, 0.75***) while number of primary branches per plant is negatively correlated with capsule length (-0.51**, -0.61**). Gangadhara *et al.,* (2012) also reported Positive and highly significant correlation between number of primary branches per plant and number of seeds per capsule.

Number of capsules per plant is positively correlated with seed yield per plant (0.76***, 0.78***) similar results were reported by Mahmoud *et al.,* (2015) for seed yield. While it is negatively correlated with capsule length (-0.49**, -0.53**)

Positive and highly significant phenotypic and genotypic correlation was observed between capsule length and number of seeds per capsule (0.69***, 0.73***). 1000 seed weight and seed yield per plant is also positively correlated (0.55**, 0.55**). These results are in accordance with Vanishree *et al.,* (2013), Bharathi *et al.,* (2015) and Fazal *et al.,* (2015).

Path coefficient analysis provides a more realistic picture of the relationship, as it considers direct as well as indirect effects of the variables by partitioning the correlation coefficients (Sodavadiya *et al.,* 2009; Ali *et al*, 2009). Thus, it provides a clear idea about the highest contributing character to seed yield and relative importance of each character can then be estimated. Results of path analysis (Table 3) showed that number of capsules per plant had highest direct effect on seed yield per plant followed by plant height, 1000 seed weight, days to maturity and days to 50% flowering. Vanishree *et al.,* (2013), Abate and Mekbib (2015), Bharathi *et al.,* (2015) and Fazal *et al.,* (2015) also reported same findings.

In conclusion the correlation studies indicated that Days to 50 % flowering, days to maturity, plant height, number of capsules per plant and 1000 seed weight with seed yield. Path analysis showed that number of capsules per plant had highest direct effect on seed yield per plant followed by plant height, 1000 seed weight, days to maturity and days to 50% flowering therefore simultaneous selection of these traits will helpful in identifying high yielding genotypes.

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