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RESEARCH ARTICLE

Assessment of genetic variability, correlation for yield and its components characters in dill (*Anethum graveolens* L.)

■ **SIDDHHARTH KUMAR SOLANKI AND N.S. DODIYA**

SUMMARY

Genetic variability, heritability and correlation were estimated among 24 genotypes for 11 characters in dill. Analysis of variance revealed significant differences among the genotypes for days to 50% flowering, plant height, pedicel length, number of primary branches per plant, number of secondary branches per plant, number of umbels per plant, number of umbelletes per umbel, seed yield per plant, harvest index and oil content characters suggesting sufficient amount of variability in the experimental material under study. The estimated of GCV and PCV indicated the existence of fairly high degree of variability for oil content, harvest index, seed yield per plant, number of umbels per plant, number of secondary branches per plant and pedicel length. Lower values of GCV and PCV was recorded in number of umbelletes per umbel, plant height and days to 50% flowering indicating the important role of environment in the expression of the characters. These results indicating the presence of variability for seed yield and related traits in dill. In corollary to high heritability, estimates of genetic advance as per cent of mean was also observed for oil content, harvest index, pedicel length and number of umbels per plant. Similarly high heritability associated with moderate genetic advance was recorded in traits like seed yield per plant and number of secondary branches per plant indicating predominance of additive gene effects for these traits. The association study among characters revealed that seed yield was positively and significantly correlated with harvest index and number of umbelletes per plant and negative and significantly correlated with number of secondary branches per plant.

Key Words : Dill, Genetic variability, Character association, Correlation

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Dill (*Anethum graveolens* L.) is a small annual of the Mediterranean region, the plant is cultivated in Asia Minor, North India and N. Africa. It is a minor spice, which yields oil and is mainly used in medicines. Usually two types of dill seeds exist in cultivation, European dill and Indian dill. European dill is indigenous to the Europe, and is also cultivated in England, Germany, Rome, Turkey, the U.S.A. and Russia. Indian dill is grown in Northern parts of India as a backyard kitchen garden crop or in limited scale on conserved moisture with receding rains and also to some extent in South India. In India, the dill leaves and seeds are also used as spice and condiment in food stuffs.To formulate efficient breeding programme, knowledge about the presence of genetic variability for yield and yield component traits is essential. Superior genotypes can be isolated by selection, if considerable genetic variability exists in the population. The genetic variability along with heritability gives a reliable picture of the genetic advance to be expected for selections while the heritability, coupled with genetic advance aids in predicting the valuable conclusion for effective selection based on phenotypic performance. Correlation will establish the

MEMBERS OF THE RESEARCH FORUM

Author to be contacted :
SIDDHHARTH KUMAR SOLANKI, Department of Plant Breeding and Genetics, Rajasthan College of Agriculture, Maharana Pratap University of Agriculture and Technology, UDAIPUR (RAJASTHAN) INDIA
Email: sidpbg@gmail.com

Address of the Co-authors:
N.S. DODIYA, Department of Plant Breeding and Genetics, Rajasthan College of Agriculture, Maharana Pratap University of Agriculture and Technology, UDAIPUR (RAJASTHAN) INDIA

extent of association between yield and its component characters thus, give a clear understanding of their association with yield.

Keeping this in view, the present investigation was made to explore the genetic variability, by determining the magnitude of genotypic co-efficient of variation, heritability estimates and expected genetic advance of different biometric traits, their correlation and effects in 24 dill genotypes.

MATERIAL AND METHODS

The experimental materials consisted of 24 diverse genotypes. The experiment was laid in Randomized Block Design with 3 replications during late *Kharif*, 2012 at the Instructional farm, Rajasthan College of Agriculture, Maharana Pratap University of Agriculture and Technology, Udaipur. Each entry was planted in 4 rows of 3.0 m. length keeping row to row and plant to plant distance of 30 cm. and 10 cm, respectively. The recommended package of practices was followed to raise a healthy crop. These materials received from RKVY project entitled " Development of Ajwain (*Trachyspermum ammi* L.) and dill (*Anethum graveolens* L.) Cultivars For High Yield Under Conserved Moisture Situation", Department of Plant Breeding and Genetics, Rajasthan College of Agriculture, MPUAT, Udaipur. The observations were recorded on five randomly selected plants from each genotype in each replication for characters *viz*., plant height (cm), pedicel length (cm) number of primary branches per plant, number of secondary branches per plant, number of umbels per plant, number of umbelletes per umbel, harvest index per cent, seed yield per plant (g), oil content per cent, while for days to 50% flowering and days to maturity, the data were recorded on whole plot basis.

Analysis of variance was done by the method suggested by Panse and Sukhatme (1985). The phenotypic and genotypic co-efficient of variation (Burton, 1952), heritability (Burton and Devane, 1953) and genetic advance (Johnson *et al*., 1955) were computed. The correlation co-efficients were calculated as according Al Jibouri *et al*.(1958).

RESULTS AND DISCUSSION

The analysis of variance indicated significant difference among genotypes for most of the traits studied indicating presence of significant variability in the experimental materials. The range, mean and standard error of mean, phenotypic co-efficient of variation (PCV), genotypic co-efficient of variation (GCV), heritability (h^2) in broad sense, genetic advance (GA) and genetic gain as per cent of mean for various characters are presented in Table-1. The range of variability indicated the existence of variability for all the characters.

In general, PCV values were relatively higher than respective GCV values indicating influence of environment on the expression of the character. The estimated of PCV and GCV indicated the existence of fairly high degree of variability.

The highest value of GCV and PCV were observed for oil content, harvest index, seed yield per plant, number of umbels per plant, number of secondary branches per plant and pedicel length. Lower values of GCV and PCV were recorded in number of umbelletes per umbel, plant height and days to 50% flowering indicating the important role of environment in the expression of the character. High magnitude of PCV and GCV was also observed for seed yield per plant by Singh and Choudhary (2008), Dalkani *et al.* (2012),Singh and Mittal (2002) in fennel and Rajput and Singh (2003) in coriander.These results indicating the presence of ampule variability for seed yield and related traits in Ajwain. This observation draws supports from the very high value of heritability (> 70 %) recorded for these traits (Table 1). It is also observed that the traits like oil content, harvest index, seed yield, number of umbels per plant and pedicel length exhibited high GCV also possesses high genetic gain indicating preponderance of additive gene effect for these traits. Similarly high heritability associated with moderate genetic advance was recorded in traits like seed yield per plant and number of

Table 1 : Mean, standard error (SE±) range, genotypic coefficient of variation (GCV), phenotypic coefficient of variation (PCV), heritability % (h2), genetic advance (GA) and genetic gain % (GG) for 11 characters in dill

Characters	Mean ± S E	Range	GCV%	PCV%	h2	GA	GG
Days to flowering	67.71±2.75	61.33-79	6.46	9.55	45.78	6.10	9.01
Days to maturity	178.19±6.32	169-185.67	-	-	-	-	-
Plant height (cm)	124.10±7.48	107-142.33	5.63	11.86	22.55	6.84	5.51
Pedicel length (cm)	19.79±0.71	15.66-21.67	13.52	14.87	82.7	5.01	25.34
No. of primaries branches per plant	5.54±0.34	4.3-6.67	9.69	14.38	45.48	0.75	13.47
No. of secondaries branches per plant	27.15±1.73	21.66-35.33	12.65	16.79	56.77	5.33	19.63
Umbels per plant	40.31±1.96	28-50.33	14.80	17.02	75.58	10.68	26.50
Umbelletes per umbel	17.33±0.66	16-20.33	4.30	7.90	29.69	0.84	4.83
Seed yield per plant (g)	10.01±0.79	7-14.33	15.81	20.85	57.51	2.47	24.71
Harvest index (%)	23.31±0.70	14.13-28.06	19.71	20.38	93.49	9.15	39.26
Oil content (%)	11±0.07	7.27-16.27	22.51	22.54	99.74	5.09	46.32

Table 2 : Genotypic (rg) and phenotypic (rp) correlation coefficients between different characters in dill

Characters Rp / Rg	Days to 50 % flowering	Plant height (cm)	Pedicel length (cm)	No. of primary branches per plant	No. of secondary branches per plant	No. of umbel per plant	No. of umbelletes Per umbel	Harvest index (%)	Oil content (%)	Seed yield per plant (g)
Days to 50 % flowering		0.55**	0.56**	0.39	0.45*	0.29	0.25	-0.04	0.69**	-0.30
Plant height (cm)	(0.25)		0.34	0.14	-0.16	0.54**	1.00	0.10	0.21	0.38
Pedicel length (cm)	(0.35)	(0.18)		0.40	0.36	0.19	0.37	0.03	0.59**	-0.10
No. of primary branches per plant	(0.29)	(0.07)	(0.29)		0.88**	0.88**	-0.45*	-0.30	0.30	-0.19
No. of secondary branches per plant	(0.28)	(-0.16)	(0.28)	(0.52**)		0.99**	-0.66**	-0.37	0.51*	-0.42*
No of umbel per plant	(0.05)	(-0.26)	(0.15)	(0.47*)	(0.64**)		-1.00	-0.28	0.26	-0.36
No. of umbelletes per umbel	(-0.03)	(0.27)	(0.21)	(-0.28)	(-0.40)	(-0.35)		0.65**	0.02	0.45*
Harvest index (%)	(-0.01)	(0.08)	(0.04)	(-0.17)	(-0.29)	(-0.25)	(0.31)		-0.01	0.50*
Oil content (%)	(0.46*)	(0.10)	(0.54**)	(0.21)	(0.39)	(0.22)	(0.01)	(-0.01)		-0.34
Seed yield per plant (g)	(-0.16)	(0.05)	(-0.13)	(-0.11)	(-0.19)	(-0.22)	(0.25)	(-0.44*)	(0.73**)	

* and ** indicate significance of values at P=0.05 and 0.01, respectively.
( ) values in parentheses indicated phenotypic correlation coefficient and values without parentheses indicated genotypic correlation co-efficient

secondary branches per plant.

In corollary to high heritability, estimates of genetic advance as per cent of mean was also observed for indicating predominance of additive gene effects for these traits.

Character association revealed that mutual relationship between two characters and it is important parameter for taking a decision regarding the nature of relation to be followed for improvement in the crop under study. The genotypic and phenotypic correlation among the yield and yield components in dill are presented in Table 2. Significant correlation of characters suggested that there is much scope for direct and indirect selection for further improvement. In general, the estimates of genotypic correlation co-efficient were higher than their corresponding phenotypic one, thereby suggesting strong inherent association among the characters studied. In the present investigation seed yield was positively and significantly correlated with harvest index and number of umbelletes per umbel and negative and significantly correlated with number of secondary branches per plant. Therefore, this character should be considered while making selection for yield improvement in dill. Similar trends of results were supported by Dalkani *et al.* (2011) in ajwain, Singh *et al.* (2006) and Singh and Prasad (2006) in coriander reported positive correlation of most of the traits with seed yield per plant.

The information derived from the correlation studies indicated mutual association among the characters.

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