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ASSOCIATION ANALYSIS IN CORIANDER

M. M. BHANDARI AND ADARSH GUPTA

Bioenergy Centre, College of Technology and Agriculture Engineering, Udaipur 313001

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ABSTRACT

Two hundred genotypes of *Coriandrum sativum* exhibited genetic variability for plant height, primary and effective branches, days to flowering and maturity, umbels and umbellets per plant, grains per umbellet, thousand seed weight, straw yield and grain yield per plant and harvest index. Heritability estimates were high for days to flowering, 1000-grain weight and days to maturity; moderate for plant height, straw yield, umbels and umbellets and number of primary branches; and low for harvest index, effective branches, grain yield, and grains per umbellet. Genotypic correlations of grain yield per plant were moderate with umbellets per plant, umbels per plant, number of effective branches, straw yield per plant, number of primary branches and plant height. Maximum direct contribution to grain yield per plant was made by umbellets per plant, followed by straw yield per plant, umbels per plant and grains per umbellet. Umbellets per plant made sizeable indirect effect via straw yield per plant. Straw yield per plant made sizeable indirect contribution via umbellets per plant.

Key words: Coriander, *Coriandrum sativum*, correlation, path analysis, variability.

Genetic variation in crop plants for characters of agronomic importance leading to the determination for complex character yield forms the base to improve grain yield per plant. Synthesis of ideotype requires the quantitative assessment of available variability in respect of the important yield contributing characters. Such information can be gathered from a study based on large number of varieties. Simply inherited characters which are less affected by environment their direct and indirect effects on yield need to be studied.

MATERIALS AND METHODS

Two hundred genotypes of coriander (29 entries from U.S.A. and 171 entries from different states of India) were evaluated in RBD with three replications in plots of 3 x 1.2 m size, accommodating 3 m long three rows spaced 40 cm apart with 15 cm plant-to-plant spacing.

The phenotypic and genotypic coefficients of variation, broad sense heritability, genetic advance [1], phenotypic and genotypic correlations [2] and path coefficients [3] were calculated.

RESULTS AND DISCUSSION

Analysis of variance indicated that genotypic means differ significantly for all the twelve characters. High heritability was observed (Table 1) for days to flowering, thousand seed weight and days to maturity. Moderate heritability was observed for plant height, straw yield per plant, umbels per plant, umbellets per plant and number of primary branches. Low heritability was observed for harvest index, number of effective branches, grain yield per plant and grains per umbellet.

Table 1. Range, mean, variances, coefficients of variation, heritability and genetic advance of twelve characters studied in coriander

Character	Range	Mean ± SE	Variance		Coefficients of variation		Heritability (broad sense) (%)	Genetic advance (%)
			genotypic	phenotypic	genotypic	phenotypic		
Plant height, cm	11.8-86.1	40.2 ± 6.2	81.9	139.5	22.5	29.4	58.7	14.3
No. of primary branches	1.4-8.6	4.3 ± 0.7	0.6	1.4	17.7	27.0	43.1	1.0
No. of effective branches	1.1-8.4	3.9 ± 0.8	0.6	1.5	19.5	31.2	38.9	1.5
Days to flowering	65.0-118.0	83.7 ± 0.8	77.9	90.1	10.5	11.3	86.4	16.9
Days to maturity	112.0-145.0	123.8 ± 3.1	44.4	58.8	5.4	6.2	75.5	11.9
Umbels per plant	3.2-39.3	10.1 ± 3.1	12.4	27.1	34.9	51.5	45.8	4.9
Umbellets per plant	7.1-177.8	37.0 ± 13.0	202.8	458.5	38.5	57.9	44.2	19.5
Grains per umbellet	1.7-11.8	4.7 ± 0.9	0.6	1.8	16.3	28.9	31.9	0.9
1000-grain wt., g	5.0-22.1	12.8 ± 1.4	10.6	13.4	25.3	28.5	79.0	5.9
Straw yield/plant, g	0.2-7.8	1.8 ± 0.8	0.9	2.0	54.0	78.5	47.4	1.4
Grain yield/plant, g	0.1-5.9	1.3 ± 0.6	0.3	0.9	43.1	70.4	37.5	0.7
Harvest index, %	8.9-84.8	44.0 ± 7.9	61.6	155.1	17.8	28.3	39.7	10.2

Genotypic correlations (Table 2) of grain yield per plant were moderate (0.38 to 0.66) with umbellets per plant, umbels per plant, number of effective branches, straw yield per plant, number of primary branches, and plant height. Thousand-seed weight exhibited negative correlation with all characters except grain yield per plant and harvest index. Harvest index was negatively associated with all characters except thousand seed weight

Table 2. Phenotypic (upper) and genotypic correlation coefficients (lower values) among twelve characters of coriander

Characters	No. of primary branches	No. of effective branches	Days to flowering	Days to maturity	Umbels per plant	Umbellets per plant	Grains per umballets	1000-grain weight	Straw yield per plant	Grain yield per plant	Harvest index
Plant height	0.67**	0.64**	0.42**	0.47**	0.62**	0.67**	0.44**	–0.32**	0.62**	0.44**	0.28**
	0.77	0.70	0.67	0.68	0.67	0.74	0.51	–0.53	0.68	0.38	–0.49
No. of primary branches		0.91**	0.27*	0.34**	0.68**	0.68**	0.46**	–0.17*	0.57**	0.54**	–0.14*
		0.94	0.53	0.59	0.79	0.83	0.50	–0.33	0.74	0.55	–0.38
No. of effective branches			0.18*	0.26**	0.66**	0.69**	0.50**	–0.12	0.59**	0.59**	–0.12
			0.43	0.51	0.77	0.82	0.49	–0.25	0.70	0.61	–0.28
Days to flowering				0.76**	0.18**	0.25**	0.09	–0.58**	0.22**	–0.05	–0.31**
				0.90	0.38	0.50	0.31	–0.69	0.40	0.02	–0.51
Days to maturity					0.33**	0.35**	0.06	–0.40**	0.30**	0.08	–0.26**
					0.48	0.55	0.23	–0.52	0.46	0.11	–0.46
Umbels per plant						0.83**	0.33**	–0.12	0.64**	0.65**	–0.10
						0.88	0.38	–0.23	0.75	0.64	–0.31
Umbellets per plant							0.40**	–0.20**	0.66**	0.65**	–0.13*
							0.49	–0.39	0.77	0.65	–0.33
Grains per umbellet								–0.24**	0.35**	0.31**	–0.11
								–0.48	0.44	0.27	–0.32
1000-grain weight									–0.14*	0.11	0.37**
									–0.23	0.15	0.51
Straw yield/plant										0.58**	–0.45**
										0.60	–0.53
Grain yield/plant											0.29**
											0.23

*, **Significant at 5% and 1% levels, respectively.

and grain yield per plant. The absence of correlation between umbels per plant and thousand seed weight makes these two traits suitable for combining them through hybridization.

Positive association of grain yield with plant height, number of branches, flowering umbels, fruiting umbels and hundred fruit was reported earlier [4]. Sevda [5] reported very low positive correlation of grain yield with plant height and days to flowering in one

Table 3. Direct (in bold) and indirect effects of six important economic influencing grain yield at genotypic level in coriander

Character	Plant height	No. of primary branches	Umbels per plant	Umbellets per plant	Grains per umbellet	Straw yield per plant	Correlation with grain yield
Plant height	**0.018**	0.001	0.033	0.225	0.0313	0.067	0.375
No. of primary branches	0.014	**0.001**	0.039	0.334	0.0308	0.129	0.548
Umbels/plant	0.012	0.001	**0.149**	0.323	0.0233	0.132	0.640
Umbellets/plant	0.014	0.001	0.043	**0.430**	0.0304	0.134	0.652
Grains/umbellet	0.009	0.007	0.019	0.061	**0.1029**	0.076	0.269
Straw yield/plant	0.012	0.001	0.037	0.253	0.0269	**0.274**	0.605
Residual path	0.6502						

environment. However, in another environment they reported high positive correlation of grain yield with plant height and negative correlation with days to flowering.

Variables found significant in correlation studies (Table 2) were included in path analysis (Table 3). Partitioning total genotypic association between grain yield per plant and other characters revealed that maximum direct contribution was made by umbellets per plant. Direct effects of straw yield per plant, umbels per plant and grains per umbellet were appreciable. Straw yield per plant also made sizeable indirect contribution via umbellets per plant. The indirect effects of number of primary branches, umbels per plant and plant height via umbellets per plant were more than their direct effects. The indirect effects of number of primary branches, umbels and umbellets per plant via straw yield were appreciable. All the direct and indirect effects were positive. Sharma and Sharma [6] found large number of negative direct and indirect effects. They reported 43 of the 81 direct and indirect effects to be negative. They found 1.683 and -0.701 direct effects of umbellets and umbels per plant on grain yield.

Therefore, umbellets per plant is the prime important component character of grain yield per plant. It is also positively associated with most other characters. This character should be given due attention in making selection for grain yield. However, it should be borne in mind that this character is influenced by environment. Straw yield per plant, umbels per plant and are the other traits which could be used in a selection programme. The ideotype to achieve high yield in coriander should have more umbellets, straw and umbels per plant.

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