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DIVERGENCE ANALYSIS IN CORIANDER

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ABSTRACT

Two hundred genotypes of *Coriandrum sativum* L. from Andhra Pradesh, Delhi, Rajasthan, and West Bengal of India and U.S.A. were grouped into six clusters. D^2 values between genotypes ranged from 0.5 to 327. Intracluster D values ranged between 0 and 5.03 and intercluster between 5.26 and 17.30. Genetic diversity and geographic distribution were not related. UD 324 originating from Nagore district of Rajasthan was widely divergent from all others. At least one genotype of Rajasthan was present in all the six clusters. Further, at least one genotype from U.S.A. was present in four of the six clusters. The first two canonical vectors accounted for 78% of total genetic variation.

Key words: Canonical analysis, coriander, *Coriandrum sativum*, D^2 statistic.

Multivariate analysis by means of Mahalanobis D^2 statistic has been recognised as a powerful tool in the hands of breeders to quantify the degree of divergence between genotypes, biological populations at genotypic level, and canonical analysis to assess the relative contributions of different characters to the total variation. The present investigation in coriander (*Coriandrum sativum* L.) has been undertaken to assess the extent of genetic diversity in 200 germplasm lines. It will help in selection of suitable parents for crosses.

MATERIALS AND METHODS

The germplasm comprised 29 US and 171 Indian genotypes maintained at the College of Agriculture, Jobner (Jaipur). It was evaluated for eleven characters in RBD with three replications in plots of 3 x 1.2 m size with 40 cm spacing between rows and 15 cm between plants. The data were subjected to analysis of variance and multivariate analysis of D^2 statistic according to Mahalanobis [1]. The genotypes were grouped into different clusters following the Tocher's method [2]. Principal component (canonical) analysis was done to know the relative contribution of different traits to the total variation. Significance of difference among genotypes was tested using the Wilkin's criterion [3].

RESULTS AND DISCUSSION

Wilks lambda criterion (λ = 0.000123, V_{2189} = 4424.73 and Z = 27.91) revealed that the coriander genotypes studied differed significantly for the eleven characters taken together.

D^2 values between pairs of genotypes ranged from 0.5 (between lines 76 and 200) to 327 (between 16 and 148). Following Tocher's method, 200 entries were grouped into six clusters (Tables 1, 2). Clusters I to VI included 2, 160, 11, 15, 11 and 1 entries respectively (Table 2). Cluster VI which included only one genotype (entry No. 9, 2 accession number UD 324) originating from Nagore, Rajasthan, was widely divergent from all other clusters (Table 1, Fig. 1). The intercluster distance was maximum between clusters I and IV (17.30), followed by that between clusters II and V (16.61).

Table 1. Intracluster (in bold) and intercluster distances (D values) in coriander

Clusters	I	II	III	IV	V	VI
I	**4.25**	8.66	14.21	17.30	14.91	9.47
II		**4.82**	5.74	14.18	16.61	15.42
III			**4.79**	8.24	13.47	16.09
IV				**4.54**	5.26	12.35
V					**5.03**	5.95
VI						**0.00**

Although there were only eleven entries in cluster V, yet intracluster average D value of this cluster was the highest (5.03).

Table 2. Grouping of two hundred coriander lines in six clusters

Cluster	Total	Place of origin
I	2	India (Andhra Pradesh and Rajasthan)
II	160	U.S.A. and India (Andhra Pradesh, Delhi, Rajasthan and West Bengal)
III	11	U.S.A. and India (Rajasthan)
IV	15	U.S.A. and India (Rajasthan)
V	11	U.S.A. and India (Rajasthan)
VI	1	India (Rajasthan)

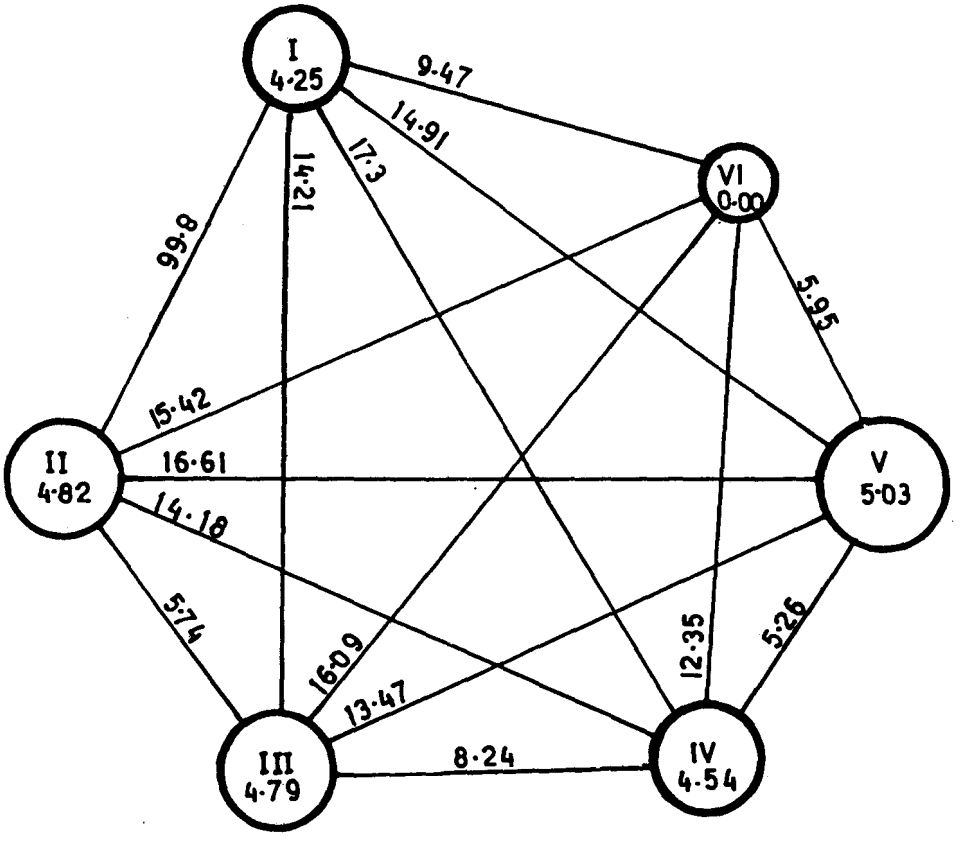

Fig. 1 Intercluster relationship in coriander.

The cluster means (Table 3) revealed that cluster I had high 1000-grain weight and grain yield per plant. Cluster II had high harvest index and minimum days to flowering and maturity. Cluster III had maximum number of umbellets per plant and grains per umbellet. Cluster V had maximum plant height, number of primary branches, days to flowering and maturity, umbels and straw yield per plant.

The mean values of canonical variates for Z_1 and Z_2 axes were obtained. The values of each character in the canonical vectors are presented in Table 4. The grouping of genotypes done by Mahalanobis D^2 statistic was in conformity with the results of canonical analysis. The first canonical root accounted for 67.9% and the second root for 10.1% of variation.

Table 3. Cluster means for eleven characters in coriander

Cluster	Intracluster group means										
	plant height	primary branches	days to flowering	days to maturity	umbels per plant	umbellets per plant	grains per umbellet	1000-grain weight	straw yield	grain yield	harvest index
I	35.8	4.65	84.8	124.3	12.3	38.2	3.88	*20.9*	2.79	*1.77*	42.6
II	37.0	4.10	*80.1*	*120.8*	9.2	31.4	4.52	13.8	1.55	1.30	*46.8*
III	49.4	5.27	88.9	123.1	13.8	*59.5*	*5.58*	9.1	2.64	1.70	40.1
IV	52.1	5.05	98.5	130.7	12.2	52.1	5.32	8.0	2.41	1.52	40.0
V	60.6	5.56	107.4	*142.0*	*14.9*	54.6	5.16	6.5	*2.98*	0.99	27.4
VI	46.6	4.47	104.3	139.3	10.7	44.2	4.20	9.5	2.09	0.71	31.2

In the present study, no close correspondence was noticed between geographic distribution and genetic divergence. While coriander genotypes related by pedigree and/or originating in similar regions tend to occur together in the same cluster, an overall similarity of genotypes in characters is a basic feature common to all the clusters. Genotypes belonging to the same geographic region were distributed in more than one cluster. At least one line from Rajasthan was present in all the six clusters, and at least one genotype from U.S.A. was present in four of the six clusters.

In the present case, crosses involving genotypes between clusters I and IV, II and V, III and VI, and between II and VI should be attempted as these crosses are expected to generate combinations of desirable characters for high grain yield.

Table 4. Coefficients of first two canonical roots which supply best linear functions of variates

Character	Canonical roots	
	I	II
Plant height	0.26	0.11
Number of primary branches	–0.01	0.15
Days to fifty per cent flowering	–0.09	0.01
Days to maturity	0.79	0.35
Umbels per plant	0.24	0.41
Umbellets per plant	–0.07	0.04
Grains per umbellet	0.05	–0.09
Thousand seed weight	0.10	–0.19
Straw yield per plant	–0.46	0.78
Grain yield per plant	–0.12	0.15
Harvest index	–0.06	0.02
Sum of all canonical roots	3823.2	
Value of first canonical root	2594.2	
Value of second canonical root	387.1	
Percentage of variation observed by first root	67.8	
Percentage of variation observed by second root	10.1	

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