Indian J. Genet., **51** (3): 289–291 (1991)

ANALYSIS OF GENETIC DIVERGENCE IN CUMIN (*CUMINUM CYMINUM* L.)

R. AVATAR, S. L. DASHORA, R. K. SHARMA AND M. M. SHARMA

Department of Genetics and Plant Breeding, S. K. N. College of Agriculture, Jobner 362001

(Received: September 4, 1989; accepted: August 9, 1990)

ABSTRACT

Genetic divergence estimated employing D^2 technique among 30 genotypes of cumin (*Cuminum cyminum* L.) based on 13 morphological traits. All the genotypes were grouped into five clusters, of which clusters I and II were closest. Evidence for and against the assumption that the genetic diversity is related to geographical origins were found. Grain yield contributed maximum to genetic diversity.

Key words: *Cuminum cyminum*, cumin, genetic divergence.

Cumin is an important spice crop in India. It also has many medicinal properties. The improvement work done in this crop is limited. At the S. K. N. College of Agriculture, Jobner, germplasm of cumin has been collected and is being maintained. Initial evaluation of the germplasm has shown that the variability is limited in this crop [1]. Thus, a study was conducted to determine the extent of genetic divergence, so that more or less homogenous groups can be made for making appropriate choice of the parents for developing varieties.

MATERIALS AND METHODS

Twenty seven lines from Rajasthan and one each from Palanpur (Gujarat), Egypt and Libya were taken from the cumin germplasm and evaluated in R.B.D. with three replications during 1987-88. Each plot had three rows, each 4 m long, with 30 x 10 cm spacing. Observations were recorded on 13 traits (Table 2). Data were analysed by Mahalanobis D^2 statistic as described by Rao [2].

RESULTS AND DISCUSSION

All the 30 genotypes were grouped into five clusters (Table 1). Cluster I was the largest with 24 genotypes. The cluster II had only three lines, while clusters III, IV and V had one line each. Interestingly, almost all the collections from Rajasthan clustered together, while

Table 1. Cluster composition in cumin

Cluster	No. of lines	Lines (origin)
I	22	**Rajasthan (21) and Gujarat (1):** UC-150, UC-207, UC-210, UC-216, UC-217, UC-218 (Tonk); UC-211, UC-212, UC-213, UC-215, (Barmer); UC-203, UC-204, UC-205, UC-206 (Jalore); UC-12, UC-19, UC-178 (Jaipur); UC-38 (Ajmer); UC-208 (Jodhpur); UC-149 (Pali); UC-78 (Sirohi); (all from Rajasthan); and UC-154 (Palanpur, Gujarat)
II	3	UC-182 (Pali); UC-183 (Alwar), UC-185 (Jaipur) (all from Rajasthan)
III	1	UC-187 (Jaipur, Rajasthan)
IV	1	UC-199 (Libya)
V	1	UC-198 (Egypt)

the exotic collection from Libya and Egypt grouped into separate clusters. This clearly shows that the geographic diversity is related to genetic diversity. But exceptions to this generalization were also found. The accession UC-187, a collection from Jaipur, clustered separately (cluster III). It is possible that UC-187 was also originally an exotic collection. Similarly, UC-154 from Gujarat clustered together with the genotypes from Rajasthan in cluster I and may have possibly originated from Rajasthan.

Cluster means and relative contribution of each character are given in Tables 2 and 3, respectively. A perusal of data indicated that grain yield contributed maximum to the genetic divergence, followed by days to flowering. Wilt incidence contributed minimum to

Table 2. Cluster means of thirteen characters in cumin

Character	Character means in different clusters				
	I	II	III	IV	V
Wilt incidence	30.2	27.9	41.6**	17.7*	27.5
Powdery mildew	19.1	26.4	33.3**	14.7*	16.6
Days to flowering	74.8**	71.8	74.3	71.0*	72.3
Days to maturity	107.4**	104.5	106.7	102.7*	106.3
Plant height, cm	24.9	22.3*	25.3	26.9	27.8**
Primary branches/plant	4.8	4.0*	4.8	4.5	5.5**
Umbels/plant	14.2*	15.9	27.3**	25.5	23.1
Umbellets/umbel	4.6	4.3	4.3*	4.6	4.9**
Grains/umbel	27.1**	22.9	21.9	24.1	21.2*
Grain yield of 5 plants, g	5.1*	5.9	8.3	9.2	15.0**
Harvest index, %	54.4*	59.5**	56.5	55.0	55.4
Test weight, g	4.0	4.3**	3.9	3.7*	3.8
Grain yield/plot, g	119.2	122.7	111.6	105.0*	210.0**

*Minimum and **maximum character means over clusters.

the total genetic divergence; followed by umbels per plant. Arunachalam and Sharma [3] were of the view that those characters which are important to fitness and natural selection provide a good choice for classification of genotypes. The V-statistic (998.2) was highly significant (Z-31.3, 337 degrees of freedom), which indicated real differences among the cumin lines.

Table 3. Contribution of different characters towards genetic divergence in cumin

Character	Contribution, %
Grain yield	25.7
Days to flowering	23.0
Powdery mildew	12.6
Plant height	10.3
Grain yield/plot	5.5
Grains/umbel	5.1
Days to maturity	4.6
Test weight	4.4
Primary branches/plant	3.7
Umbellets/umbel	1.8
Harvest index	1.4
Umbels/plant	1.1
Wilt incidence	0.7

The inter- and intracluster D^2 values (Table 4) show that cluster V was the farthest from clusters I, II, III and IV. This is expected, as cluster V contains the genotype from Egypt. Cluster IV was also farthest from clusters I, II and III but the D^2 values were nearly half as compared to that of cluster V. Clusters I, II and III with genotypes from Rajasthan had lower D^2 values. Both clusters I and II have lower intracluster distances, suggesting that the genotypes grouped in these clusters are related.

Table 4. Average inter- and intracluster (in bold) D^2 values in cumin

Clusters	I	II	III	IV	V
I	**38.6**	73.6	91.1	102.5	307.1
II		**41.9**	55.3	75.0	287.0
III			**00.0**	60.2	208.6
IV				**00.0**	147.9
V					**00.0**

As already pointed out, the variation within the germplasm is limited. Therefore, efforts should be made to increase the genetic variability. One way to achieve this objective will be hybridization and this could be more fruitful if the crossses are made between the unrelated or distantly related genotypes, e.g. between the strains belonging to clusters I and IV or V.

REFERENCES

1. Anonymous. 1975-82. Annual Report of All-India Coordinated Spices and Cashewnut Improvement Project. Agril. Exptl. Station, Univ. of Udaipur, Jobner Campus.

2. C. R. Rao. 1948. The utilization of multiple measurements in problem of biological classification. J. Roy. Stat. Soc., **10-B**: 159–203.

3. V. Arunachalam and J. R. Sharma. 1967. Geographical diversity in relation to genetic divergence in cultivated sorghum. Indian J. Genet., **27**: 309–380.