P-ISSN: 2349-8528

E-ISSN: 2321-4902

www.chemijournal.com

IJCS 2020; 8(3): 2130-2133

© 2020 IJCS

Received: 14-03-2020

Accepted: 18-04-2020

Moti Ram Natwaria

M.Sc. Student, Sri Karan

Narendra Agriculture

University, Jobner, Rajasthan,

India

DK Gothwal

Professor, Sri Karan Narendra

Agriculture University, Jobner,

Rajasthan, India

Sohan Lal Kajla

Ph.D., Student, Swami

Keshwanand Rajasthan

Agricultural University, Bikaner,

Rajasthan, India

Variability parameters, character association and genetic divergence studies in coriander accessions

Moti Ram Natwaria, DK Gothwal and Sohan Lal Kajla

DOI: <https://doi.org/10.22271/chemi.2020.v8.i3ad.9525>

Abstract

The present study was conducted with the objective to know the extent of variability parameters, correlation, path coefficient and genetic divergence in a set of 216 accessions of coriander in an Augmented Complete Block Design (including eight checks) during *rabi* 2015-16. Analysis of variance showed significant differences among the accessions for all the characters studied except 1000-seed weight and days to maturity while, significant variability among checks were noted with respect to all the characters except umbellate per umbel and days to maturity. The high estimates of heritability and genetic advance were found for the characters seed yield per five plants and seeds per umbel. The highest percentage of PCV and GCV was observed for seed yield per five plants. Correlation studies revealed that seed yield per five plants exhibited highly significant and positive correlation with umbels per plant, 1000-seed weight and umbellets per umbel. Path analysis at both genotypic and phenotypic levels indicated that the magnitude of both direct and indirect effects were generally low. The direct effect of umbels per plant was found to be positive and highest. Based on the mean performance of the accessions, UD-431, UD-423 and UD-409 were found superior over check. Genetic divergence analysis revealed that accessions were grouped into eleven clusters and among them, the accessions of cluster VII had higher seed yield, 1000 seed weight and umbels per plant.

Keywords: Coriander, accessions, heritability, genetic advance, cluster analysis

Introduction

Coriander (*Coriandrum sativum* L.) also known as 'Dhania' is an important spice crop belonging to the family Apiaceae. It is a cross pollinated diploid species, possesses 22 chromosomes and plant is smooth, erect annual herb. It is one of the first spices to be consumed by human being as a common flavoring substance. Coriander is believed to have originated in Mediterranean region. A pleasant aromatic odor is present in the stem, leaves and fruits of the coriander, which is due to an essential oil containing α -linalool or coriandrol (Pruthi, 1976) ^[1]. Coriander is mainly a crop of tropics and sub-tropics. In India, it is mainly cultivated in the states of Rajasthan, Andhra Pradesh, Madhya Pradesh, Gujarat and Tamil Nadu covering an area of 447140 hectares with an annual production of 313640 tones and productivity 701 kg ha⁻¹ (Anonymous, 2014). Breeding efforts have contributed substantially to improve yield potential, regional adaptation through resistance or tolerance to abiotic and biotic stresses, plant type and grain characteristics. Quantum of genetic variability and the extent, to which heritable and non-heritable variations are related to the characters, determine the extent of genetic amelioration. Understanding of the association of different component characters towards yield forms the basic requirement for any selection programme. Path coefficient analysis is a standard tool for splitting the total correlation into direct and indirect effects of yield components on yield and this is more useful in identifying suitable selection indices. The crosses between parents with maximum genetic divergence are generally the most responsive for genetic improvement (Arunachalam 1981) ^[2]. The D² technique is based on multivariate analysis developed by Mahalanobis (1936) ^[9] had been found to be a potent tool in quantifying the degree of divergence in germplasm. Joshi and Dhawan (1966) ^[7] reported that genetic diversity was very much important factor for any hybridization programme aiming at genetic improvement of yield especially in self-pollinated crops.

Corresponding Author:**Moti Ram Natwaria**

M.Sc. Student, Sri Karan

Narendra Agriculture

University, Jobner, Rajasthan,

India

Materials and Methods

The materials for the present investigation consisted of 216 accessions maintained under “All India Coordinated Research Project on Spices” at S. K. N. College of Agriculture, Jobner. The accessions were evaluated during *Rabi* season (2015-16) at Research Farm in an augmented block design (Federer, 1956) [4]. The material was divided into 3 blocks. Each group of accessions was assigned to each block. Eight check varieties *i.e.* RCr-20, RCr-41, RCr-435, RCr-436, RCr-475, RCr-480, RCr-728 and Local check were also assigned randomly to each block. Each row was 3.0 m long and spaced 30 cm apart. Plant to plant distance was kept to 10 cm by thinning at 25th day after sowing. Five plants were randomly selected from each plot to record the data on plant height, branches per plant, umbels per plant, umbellets per umbel, seeds per umbel, test weight and seed yield per five plants,

while data on days to 50% flowering and days to maturity were recorded on whole line basis. The correlation coefficients and path coefficient were calculated as per methods given by Johnson *et al.* (1955) [6] and Dewey and Lu (1959) [3] respectively. The genetic divergence was estimated by Mahalanobis D² statistics (1936) [9].

Results and Discussion

The analysis of variance revealed that significant amount of variability was present in the accessions for all the yield and yield attributing characters through days to 50% flowering, plant height, branches per plant, umbels per plant, seeds per umbel and seed yield showed significant differences. The phenotypic variances were higher than genotypic variance indicating the role of environmental factors on the characters expression.

Table 1: Variability parameters for different characters in Coriander

S. No.	Characters	Mean	Range	GCV	PCV	Heritability (%)	GA as % of mean
1	Days to 50% flowering	71.50	60.63-96.33	6.82	9.26	54.25	10.34
2	Plant height (cm)	109.44	67.33-157.33	11.89	15.35	59.96	18.96
3	Branches per plant	6.14	4.68-9.33	9.79	13.26	54.48	14.88
4	Umbels per plant	21.66	13.24-35.67	14.65	18.52	62.55	23.87
5	Umbellate per umbel	5.90	3.89-8.41	5.02	10.48	22.98	4.96
6	Seeds per umbel	31.41	16.15-58.53	17.62	20.06	77.14	31.88
7	1000-seed weight	11.64	4.49-14.10	11.75	17.34	45.90	16.39
8	Days to maturity	136.80	131.67-145.79	0.40	1.36	8.48	0.24
9	Seed yield per five plants	16.57	1.99-39.92	35.67	40.44	77.79	64.81

Variability parameters

The expected genetic advance expressed as percentage of mean was observed to be high for seed yield followed by seeds per umbel, which are in accordance with the earlier report of Jain *et al.* (2003) [5] and Rajput and Singh (2003) [12].

Character association and path analysis

The seed yield per plant had positive and significant association with umbels per plant, 1000 seed weight and umbellate per umbel, whereas branches per plant and seeds per umbel showed positive and non-significant association

(Table 2). Similarly, days to 50% flowering and days to maturity had negative and significant association with seed yield per plant. Sharma and Sharma (1989) [13], Kumar (2012) [8] and Meena *et al.* (2014) [10] commonly reported such associations in coriander. Path coefficient analysis indicated that maximum direct contribution to seed yield was through umbels per plant followed by 1000 seed weight (Table 3). However, the attributes like umbels per plant had highest positive correlation with seed yield and had high positive direct effect on seed yield. These findings are in accordance with the report of Singh *et al.* (2006) [4].

Table 2: Correlation coefficient between different characters in coriander at genotypic and phenotypic level

		Plant height	Branches per plant	Umbels per plant	Umbellate per Umbel	Seeds per umbel	1000- seed weight	Days to maturity	Seed yield per five plant
Days to 50% flowering	G	0.4925	0.2302	-0.0105	-0.2147	0.0768	-0.2749	0.6845	-0.1754
	P	0.4920**	0.2300**	-0.0100	-0.2140**	0.0760	0.2740**	0.6810**	-0.1750**
Plant height	G	1.0000	0.4299	0.1628	-0.1657	0.1407	-0.2294	0.3916	0.0265
	P	1.0000	0.4290**	0.1630*	-0.1650*	0.1390*	0.2290**	0.3890**	-0.0260
Branches per plant	G		1.0000	0.4660	0.0666	0.1100	-0.0077	0.0753	0.0954
	P		1.0000	0.4660**	0.0660	0.1090	-0.0070	0.0740	0.0950
Umbels per plant	G			1.0000	0.3393	0.0972	0.1238	-0.2061	0.3301
	P			1.0000	0.3380**	0.0970	0.1230	-0.2050**	0.3300**
Umbellets per umbel	G				1.0000	0.1856	0.1943	-0.1188	0.1662
	P				1.0000	0.1890**	0.1940**	-0.1120	0.1660*
Seeds per umbel	G					1.0000	0.0197	0.0467	0.0090
	P					1.0000	0.0200	0.0480	0.0090
1000- seed weight (g)	G						1.0000	-0.3124	0.2694
	P						1.0000	-0.3100**	0.2690**
Days to maturity	G							1.0000	-0.1539
	P							1.0000	-0.1520*

* Significant at P=0.05 and ** Significant at P=0.01, G= Correlation coefficient at genotypic level and P= Correlation coefficient at phenotypic level

Table 3: Direct (diagonal) and indirect effects (non-diagonal) of different characters on seed yield in coriander at genotypic and phenotypic level

		Days to 50% flowering	Plant height	Branches per plant	Umbels per plant	Umbellets per Umbel	Seeds per umbel	1000- seed weight	Days to maturity	Correlation with seed yield per five plant
Days to 50% flowering	G	-0.1948	0.0205	-0.0089	-0.0036	0.0016	-0.0014	-0.0598	0.0709	-0.1754**
	P	-0.1945	0.0205	-0.0089	-0.0034	0.0016	-0.0014	-0.0597	0.0704	-0.1750**
Plant height	G	-0.0959	0.0417	-0.0167	0.0550	0.0012	-0.0026	-0.0499	0.0406	-0.0265
	P	-0.0958	0.0415	-0.0167	0.0553	0.0013	-0.0025	-0.0498	0.0402	-0.0260
Branches per plant	G	-0.0448	0.0179	-0.0389	0.1576	-0.0005	-0.0020	-0.0017	0.0078	0.0954
	P	-0.0448	0.0179	-0.0388	0.1577	-0.0005	-0.0020	-0.0017	0.0077	0.0950
Umbels per plant	G	0.0021	0.0068	-0.0181	0.3381	-0.0025	-0.0018	0.0269	-0.0213	0.3301**
	P	0.0020	0.0068	-0.0181	0.3382	-0.0026	-0.0018	0.0269	-0.0212	0.3300**
Umbellets per umbel	G	0.0418	-0.0069	-0.0026	0.1147	-0.0074	-0.0034	0.0422	-0.0123	0.1662**
	P	0.0418	-0.0069	-0.0026	0.1144	-0.0075	-0.0034	0.0422	-0.0116	0.1660*
Seeds per umbel	G	-0.0150	0.0059	-0.0043	0.0329	-0.0014	-0.0182	0.0043	0.0048	0.0090
	P	-0.0148	0.0058	-0.0043	0.0329	-0.0014	-0.0181	0.0044	0.0050	0.0090
1000- seed weight (g)	G	0.0535	-0.0096	0.0003	0.0419	-0.0014	-0.0004	0.2174	-0.0324	0.2694**
	P	0.0535	-0.0095	0.0003	0.0419	-0.0015	-0.0004	0.2172	-0.0321	0.2690**
Days to maturity	G	-0.1333	0.0163	-0.0029	-0.0697	0.0009	0.0009	-0.0697	0.1036	-0.1539**
	P	-0.1325	0.0162	-0.0029	-0.0695	0.0009	-0.0009	-0.0674	0.1033	-0.1520*

Genotypic Residual effect = 0.904329 and Phenotypic Residual effect = 0.904325

Genetic divergence

The accessions were grouped into 11 clusters with the cluster I having 111, cluster II having 39, cluster III having 41, cluster IV having 11 and cluster V having 8 accessions while, clusters VI, VII, VIII, IX, X and XI had one accession each. A reference of Table 4 indicated that the intra cluster distance

ranged from 0.00 to 24.37. Inter cluster distance ranged from 18.74 to 93.26. The maximum inter cluster distance was observed between cluster IX and XI, whereas minimum inter cluster distance was observed between cluster VIII and cluster XI. The maximum intra cluster distance was observed within cluster IV.

Table 4: Average intra and inter-cluster distance based on corresponding D² values

Clusters	I	II	III	IV	V	VI	VII	VIII	IX	X	XI
I	288.49 (16.98)	611.89 (24.73)	940.34 (30.66)	563.72 (23.74)	551.58 (23.48)	1719.55 (41.46)	1795.49 (42.37)	1809.46 (42.53)	1855.44 (43.07)	1573.23 (39.66)	3017.69 (54.93)
II		294.19 (17.15)	2112.78 (45.96)	888.57 (29.80)	947.26 (30.77)	3204.77 (56.61)	3503.87 (59.19)	3514.76 (59.28)	749.89 (27.38)	2800.35 (52.91)	5244.12 (72.41)
III			443.80 (21.06)	1309.46 (36.18)	983.55 (31.36)	674.97 (25.98)	775.99 (27.85)	692.17 (26.30)	4352.16 (65.97)	1085.80 (32.95)	1243.50 (35.26)
IV				593.91 (24.37)	992.09 (31.49)	2048.46 (45.25)	1955.22 (44.21)	1863.13 (43.16)	1997.09 (44.68)	1346.07 (36.68)	3090.84 (55.59)
V					481.53 (21.94)	1343.87 (36.65)	2150.72 (46.37)	2036.13 (45.12)	2228.93 (47.21)	1676.24 (40.94)	3144.51 (56.07)
VI						00.00 (00.00)	1240.87 (35.22)	646.72 (25.43)	5498.97 (74.15)	639.78 (25.29)	1048.66 (32.38)
VII							00.00 (00.00)	513.82 (22.66)	6596.66 (81.21)	1261.33 (35.51)	419.58 (20.48)
VIII								00.00 (00.00)	6140.91 (78.36)	702.28 (26.50)	351.36 (18.74)
IX									00.00 (00.00)	4628.38 (68.03)	8697.44 (93.26)
X										00.00 (00.00)	1301.39 (36.07)

Note: The values in parenthesis represent the D-values i.e. $\sqrt{D^2}$ **Acknowledgement**

The sole author is thankful to Dr. D.K. Gothwal, Professor for providing facilities Department of Plant Breeding and Genetics, S.K.N.A.U. Jobner, Jaipur (Rajasthan) for providing necessary facilities.

References

- Anonymous. Paradism in Seed Spices Research, ICAR-All India Coordinated Research Project on Spices, Jobner, 2014, 7.
- Arunachalam V. Genetic divergence in plant breeding. Indian Journal of Genetics and Plant Breeding. 1981; 14:226-236.
- Dewey DR, Lu KH. A correlation and path coefficient analysis of components of crested wheat grass seed production. Agronomy Journal. 1959; 51:515-518.
- Federer WT. Augmented Design. Hawain Planters Record. 1956; 20:191-207.
- Jain UK, Singh D, Amrita. Correlation and path analysis for certain metric traits in coriander. Progressive Agriculture. 2003; 3(1/2):86-88.
- Johnson HW, Robinson HF, Comstock RE. Estimates of genetic and environmental variability in soybean. Agronomy Journal. 1955; 47:314-318.
- Joshi AB, Dhawan NL. Genetic improvement of yield with special reference to self-fertilizing crops. Indian

- Journal of Genetics and Plant Breeding. 1966; 26:101-113.
8. Kumar S, Singh JP, Singh D, Tiwari A, Singh RK. Character association for seed yield improvement in coriander (*Coriandrum sativum*). National Seminar on Harnessing Seed Spices for better socio-economic well being held at Ajmer, 2012, 126.
 9. Mahalanobis PC. On the generalized distance in statistics. Proceeding of National Institute of Sciences, India. 1936; 2:49-55.
 10. Meena YK, Kale VS, Meena OP. Correlation coefficient and path analysis in coriander. International Journal of Scientific and Research Publications. 2014; 4(6):2250-3153.
 11. Pruthi JS. Spices and Condiments. National Book Trust of India, New Delhi, 1976, 105-107.
 12. Rajput SS, Singh D. Variability in coriander for yield and yield component. Journal of Spices and Aromatic Crops. 2003; 12(2):162-164.
 13. Sharma KC, Sharma RK. Variation and character association of grain yield and its component characters in coriander. Indian Journal of Genetics. 1989; 19(1):135-139.
 14. Singh D, Jain UK, Rajput SS, Khandelwal V, Shiva KN. Genetic variation for seed yield and its component traits and their association in coriander (*Coriandrum sativum* L.) germplasm. Journal of Spices and Aromatic Crop. 2006; 15(1):25-29.