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Variability and character association studies in leafy coriander (*Coriandrum sativum* L.)

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Abstract
The present study on variability and character association studies in leafy coriander (*Coriandrum sativum* L.) genotypes was conducted at the Horticultural College and Research Institute, Periyakulam with the objective to estimate the extent of genotypic and phenotypic coefficient of variation, correlation and path analysis among coriander genotypes. A remarkable variability was observed among the coriander genotypes for all the characters. In all the cases, phenotypic variance was higher than the genotypic variance. Also, phenotypic coefficient of variation was found higher than genotypic coefficient of variation for all the traits. The high heritability coupled with moderate genetic advance as per cent over mean was observed in the traits such as high heritability along with moderate genetic advance as per cent over mean recorded for the characters such as number of secondary branches, number of primary branches, leaf yield per plot which might be assigned to additive gene effect governing their inheritance and these traits are more reliable for direct selection, whereas the lowest values were noticed in number of leaves per plant (4.73), days taken for germination (8.47). Thus, it indicated better scope for improvement of these traits through selection programme. Leaf yield per plot has significantly and positively correlated with plant weight (0.770), number of leaves per plant (0.766), plant height (0.749), number of secondary branches (0.519) and number of primary branches (0.315). Hence, it might be inferred that these traits could be considered as the most important yield contributing traits in coriander. Path coefficient analysis showed that yield per plot contributed the maximum positive direct effect.

Keywords: Coriander genotypes, variability, heritability, genetic advance, correlation

Introduction
Coriander (*Coriandrum sativum*) generally known as Dhania belongs to the family Apiaceae. Among the seed spices, coriander seed is one of the most important spices. Coriander is used as spice and condiment for its medicinal properties as well as culinary purposes (Farooqi, 2005) [9]. Besides seeds, green leaves of coriander are also extensively used for culinary purposes. In India, coriander is cultivated in almost all states accounting for more than half of the total area under seed spices. India is the largest producer, consumer and exporter of the spices. Approximately 80 per cent of the world total coriander seed is produced from India. The country's annual production of coriander seeds that year was over 765 thousand metric tonnes during 2019-20. Major growing states are Rajasthan, Gujarat, Andhra Pradesh, Tamil Nadu, Karnataka, Madhya Pradesh and Uttar Pradesh.

India is the largest producer of coriander in the world, but the average yield is very low. The whole plant of coriander is used in preparing chutney and the leaves are used for its flavouring the curries, sauce and soups. The volatile essential oils compositions present in coriander such as terpenoids and phenolic constituents, which are of great importance in pharmacology. Menon and Khader (1997) [16] suggested that leaf plucking of coriander seed crop at early stages can provide an extra income to the growers. There is a great demand for leaf during summer months from March to June, as production is limited to only a few areas of the country, where summer temperatures are low. The production of greens in the off-season will fetch premium price in the market especially during summer months. The shade net houses during off season reduce the temperature up to 5˚C and increase the relative humidity, thereby providing optimum environmental conditions for the growth of coriander.

Exploitation of genetic potential for leaf yield varieties for enhancing the productivity of a crop, in coriander high genetic variation exists for yield and yield contributing traits. An estimation of variability parameters viz., genotypic coefficient of variation (GCV), phenotypic coefficient of variation (PCV), heritability and genetic advance as per cent of mean of the

important yield contributing traits suggest the strategy to be adopted for its utilization in genetic improvement (Ullah *et al*., 2012) [25]. The magnitude of variability and its quantitative estimation for each character would indicate the potential of each tree and scope for improving the desirable and economic characters through selection. Knowledge regarding association and path coefficient analysis between yield and its components traits are important in determining the component characters that could be used as selection parameters for effective improvement of the crop. With this background, the present investigation on genetic variability, correlation and path analysis in leafy coriander was carried out at the Horticultural College and Research Institute, Periyakulam.

Materials and Methods

The present field experiment was conducted at Horticultural College and Research Institute, Periyakulam during the months of April to June (summer months). The objective of the present study is to assessing the genetic relatedness among the leafy coriander genotypes. Sixteen leafy coriander genotypes and two released varieties used for this study. This experiment was laid out in a Randomized block Design (RBD) with 24 genotypes (treatments) and replicated thrice as per the method was suggested by Panse and Sukhatme (1985) [18]. The cultural practices as per the Crop Production Guide, 2014 were followed. The split seeds of the coriander were sown at a spacing of 20 x 15 cm in flat beds size of 2.5 x 4 m during summer months of April to June and water-soaked seeds were sown in 50% shade net house. Coriander variety CO (CR) 4 used for this study. Source of collection of twenty-four leafy coriander genotypes are given in Table 1. Recommended package of practices was followed uniformly for all the plots. Depending on the soil and climatic conditions irrigation intervals were scheduled as once in four or five days. Physiologically matured leaves were harvested from 45th days after sowing. The genotypic and phenotypic coefficient of variation (GCV & PCV), heritability and genetic advance were estimated for eight agronomic characters which included plant height (cm), number of leaves, leaf yield per plot (kg) leaf yield per ha (t/ha) from ten randomly selected representative samples. The biometrical analyses were carried out according to estimation of genotypic and phenotypic coefficients of variation (Burton and De Vane, 1953) [7], heritability in broad sense (Hanson *et al*., 1956) [11], genetic advance and genetic advance over per cent mean (Johnson *et al*., 1955) [13], correlation studies (Al-Jibouri *et al*., 1958) [2] and path co-efficient analysis (Dewey and Lu, 1959) [8] to partition the genotypic correlation coefficient into measures direct and indirect effects.

Table 1: Source of collection of eighteen leafy coriander genotypes

Sl. No.	Genotypes	Source of collection of genotypes
1.	CS - 1	HC&RI, TNAU, Coimbatore
2.	CS - 2	HC&RI, TNAU, Coimbatore
3.	CS - 38	HC&RI, TNAU, Coimbatore
4.	LCC-210	Lam, Guntur
5.	LCC-212	Lam, Guntur
6.	LCC-219	Lam, Guntur
7.	LCC-224	Lam, Guntur
8.	LCC-225	Lam, Guntur
9.	LCC-226	Lam, Guntur
10.	LCC-227	Lam, Guntur
11.	LCC-229	Lam, Guntur
12.	LCC-234	Lam, Guntur
13.	LCC-236	Lam, Guntur
14.	LCC-237	Lam, Guntur
15.	LCC-242	Lam, Guntur
16.	LCC-244	Lam, Guntur
17.	Acr-1	NRCSS (ICAR), Ajmer
18.	CO-4	HC&RI, TNAU, Coimbatore

Results and Discussion

Analysis of variance showed significant difference among various plant parameters studied. The mean sums of squares due to various sources for different characters are presented in Table 2. The range for eleven characters of eighteen leafy coriander genotypes is presented in Table 3. Maximum variability was recorded in plant height (23.33-16.63) while the minimum was observed in number of leaves per plant (5.97-6.80). The phenotypic and genotypic coefficients of variations, heritability and genetic advance as per cent mean for eight morphological characters of twenty four leafy coriander genotypes are presented in Table 4. Significant difference was registered among the various characters studied. PCV was higher than GCV for all the characters reflecting the influence of environment on the phenotypic expression of these characters. Highest PCV was observed in number of secondary branches (14.63) followed by number of primary branches (11.27), leaf yield per plot (10.72), days taken for germination (9.05) whereas the lowest PCV was noticed in number of leaves per plant (3.24). GCV is a better tool to understand useful variability, as it is free from the environmental components and also helps in comparison and measurement of genetic variability among different characters. The highest value was recorded for the characters viz., number of secondary branches (14.52) followed by number of primary branches (11.08), plant height (7.80). The lowest GCV was exhibited in number of primary branches (2.73). However, PCV recorded higher than GCV for all the characters of coriander genotypes reported by Gauha *et al*. 2018 [10]. Similar findings were reported by Bhandari and Gupta, (1993) [6], Singh *et al*. (2006) [21] and Nandakumar *et al*. (2018) [17] in coriander.

In the present study, most of the characters exhibited high estimates of heritability such as number of secondary

branches (98.53), number of primary branches (96.65), plant weight (86.36), plant height (84.50) and number of leaves per plant (70.96). It suggests that direct selection is most effective for these characters. Moderate heritability was observed for leaf yield per plot (49.98) and days taken for germination (45.4). This is indicating that these characters was exhibited less influenced by environment and direct selection for these yield contributing traits would be effective for future improvement in yield. Arif *et al*. (2019) [4] reported that high heritability was exhibited due to favourable influence of environment rather than genotype. Similar results were reported by Jain *et al*. (2003) [12]; Mengesha *et al*. (2010) [15]; Singh and Singh, (2013) [22] and Agasimani *et al*. (2015) [1].

Genetic advance as percentage of mean for the characters ranged from 29.69 (number of secondary branches) to 4.73 (number of leaves per plant). High magnitude of genetic advance as percentage of mean was estimated for number of secondary branches (29.69), number of primary branches (22.45) whereas the lowest for number of leaves per plant (4.73), days taken for germination (8.47). The moderate genetic advance as percentage of mean was registered for the traits such as plant height (14.78), plant weight (14.05) and leafy yield per plot (11.04). High heritability along with moderate genetic advance as per cent over mean is an important factor for predicting the resultant effect for selecting the best individuals. In the present study, genetic advance as per cent over mean recorded the highest for the characters such as number of secondary branches, number of primary branches, leaf yield per plot whereas the lowest value was noticed in which might be assigned to additive gene effect governing their inheritance and these traits are more reliable for direct selection. Thus, there is ample scope for improving these characters based on direct selection. Similar findings have been reported by Meena *et al*. (2013) [14], Anilkumar *et al*. (2018) [3] in coriander. High heritability coupled with moderate genetic advance for yield per plot strongly suggests its importance for performing selection for higher leaf yield in coriander.

Character association studies reflected strong association of dependent trait such as leaf yield per ha with important yield contributing traits (Table 5). Correlation studies were conducted to know the suitability of various characters for indirect selection (Prabhu *et al*. 2015) [19]. It also provides information on the nature and extent of association between any two metric traits and it will be possible to bring about genetic upgradation in one trait by selection against the other. Results of the present study results revealed that leaf yield per plot was significantly and positively correlated with plant weight (0.770), number of leaves per plant (0.766), plant height (0.749), number of secondary branches (0.519) and number of primary branches (0.315). Hence, it might be inferred that these traits could be considered as the most important yield contributing traits in coriander. This is in accordance with the findings of Beena *et al*. (2013) [5]; Gauhar *et al*. (2018) [10] and Nandakumar *et al*., (2018) [17] in coriander. Number of leaves per plant is one of the most important economic traits that exhibited the highest significantly positively association with plant weight (0.879), plant height (0.803), number of secondary branches (0.454) and number of primary branches (0.339). Similar findings were reported by Nandakumar *et al*. (2018) [17].

Path coefficient analysis of leaf yield per ha characters revealed that the yield per ha is the most pronounced character contributing directly to the number of leaves per plant (0.983), plant height (0.878), number of secondary branches (0.625) and number of primary branches (0.375) (Table 6). Therefore, direct selection of these traits could be useful in coriander improvement programme. Most other characters associated with leafy yield are contributing indirectly through the above characters (Sharma and Sharma, (1989) [20]; Sunilkumar *et al*., (2017) [24]; Nandakumar *et al*., (2018) [17]; Gauhar *et al*., (2018) [10] in coriander.

Table 2: Analysis of variance (mean squares) for eight agronomic traits of leafy coriander genotypes

Character	Source of variation			S.ED.	CD 5%
	Replications	Treatments (genotypes)	Error		
Degree of freedom	1	23	23		
Days taken for germination (days)	12.2818	0.5406	0.203	0.451	0.932
Number of leaves per plant	5.4133	0.0705	0.012	0.109	0.226
No. of primary branches	3.9447	0.7235	0.012	0.111	0.230
No. of secondary branches	13.6299	7.4098	0.055	0.234	0.485
Plant height (cm)	52.2552	5.1762	0.435	0.660	1.364
Plant weight (g)	15.4823	0.4770	0.035	0.187	0.387
Leaf yield per plot (Kg/plot) ($10m^2$)	5.8521	0.1794	0.060	0.245	0.506

Table 3: Phenotypic variability for difference characters in 24 leafy coriander genotypes

Characters	Mean ± S.E.	Range	CD at 5 %
Days taken for germination	6.74 ± 0.451	6.00 - 7.67	0.932
No. of leaves per plant	6.27 ± 0.109	5.97 - 6.80	0.226
No. of primary branches	5.38 ± 0.111	4.37 - 6.40	0.230
No. of secondary branches	13.21 ± 0.234	16.47 - 8.30	0.485
Plant height	19.73 ± 0.66	23.33 - 16.63	1.364
Plant weight	6.41 ± 0.187	7.50 - 5.77	0.387
Leaf yield per plot	3.23 ± 0.245	3.87 - 2.77	0.506

Table 4: Estimates of PCV, GCV, heritability and genetic advance for growth and yield parameters coriander genotypes

Characters	PCV (%)	GCV (%)	Heritability (%)	Genetic Advance as percentage of mean (%)
Days taken for germination	9.05	6.10	45.4	8.47

No of leaves per plant	3.24	2.73	70.96	4.73
No of primary branches	11.27	11.08	96.65	22.45
No of secondary branches	14.63	14.52	98.53	29.69
Plant height	8.49	7.80	84.5	14.78
Plant weight	7.90	7.34	86.36	14.05
Leaf yield per plot	10.72	7.58	49.98	11.04

Table 5: Simple correlation coefficient analysis for seven morphological and yield characters leafy coriander

	Days taken for germination	**No. of leaves per plant**	**No. of primary branches**	**No. of secondary branches**	**Plant height**	**Plant weight**	**Leaf yield per plot**
Days taken for germination	1.000	-0.427	-0.227	-0.444	-0.390	-0.400	-0.158
No. of leaves per plant		1.000	0.339	0.454	0.803	0.879	0.766
No. of primary branches			1.000	0.621	0.468	0.376	0.315
No. of secondary branches				1.000	0.471	0.497	0.519
Plant height					1.000	0.750	0.749
Plant weight						1.000	0.770
Leaf yield per plot							1.000

Table 6: Path coefficient analysis of seven characters of 24 leafy coriander genotypes

	Days taken for germination	**No. of leaves per plant**	**No. of primary branches**	**No. of secondary branches**	**Plant height**	**Plant weight**	**Leaf yield per plot**
Days taken for germination	0.624	-0.872	0.024	-0.277	0.206	0.023	-0.271
No. of leaves per plant	-0.357	1.522	-0.028	0.239	-0.348	-0.043	0.983
No. of primary branches	-0.185	0.534	-0.081	0.304	-0.179	-0.017	0.375
No. of secondary branches	-0.356	0.749	-0.050	0.486	-0.180	-0.023	0.625
Plant height	-0.348	1.436	-0.039	0.236	-0.369	-0.037	0.878
Plant weight	-0.325	1.484	-0.031	0.253	-0.314	-0.044	0.022

Residual Effect = 0.4814295

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References

1. Agasimani A. Evaluation of coriander (*Coriandrum sativum* L.) genotypes for fresh and dry biomass yield under hill zone of Karnataka. International Journal of Agricultural Sciences. 2014;10(2):747-750.
2. Al-Jibouri HH, Miller PA, Robinson HF. Genotypic and environmental variances and covariances in upland cotton crosses of interspecific origin. Agron. Journal. 1958;50:633-637.
3. Anilkumar GS, Umesha K, Shivapriya M, Halesh GK, Nithinkumar VC. Genetic Variability, Heritability and Genetic Advance Studies in Coriander (*Coriandrum sativum* L.). International Journal of Pure and Applied Bioscience. 2018;6(3):426-430.
4. Arif AA, Swamy GSK, Naik N, Jagadeesha RC, Gangadharappa PM, Thammaiah N. Genetic variability studies in tamarind (*Tamarindus indica* L.). Int. J Curr. Microbiol. App. Science. 2019;8:1929-1935.
5. Beena N, Sengupta SK, Singh KP, Naidu AK. Association and path co-efficient analysis among seed yield and its component in coriander (*Coriandrum sativum*). Asian J Horticulture. 2013 Dec;8(2):403-408.
6. Bhandari MM, Gupta A. Variation and association analysis in coriander. Euphytica. 1991 Oct;58(1):1-4.
7. Burton GW, De Vane EW. Estimating heritability in tall fescue (*Festuca arundinacea*) from replicated clonal material. Agronomy Journal. 1953 Oct;45(10):478-481.
8. Dewey DR, Lu KA. Correlation and path-coefficient analysis of components of crested wheatgrass seed production. Agronomy journal. 1959 Sep;51(9):515-518.
9. Farooqi AA, Sreeramu PV, Srinivasappa. Cultivation of Spice Crops. University Press, 2005.
10. Gauhar T, Solanki RK, Kakani RK, Choudhary M. Variability and character association studies in coriander (*Coriandrum sativum* L.). International J Seed Spices. 2018 Jan;8(1):36-40.
11. Hanson CH, Robinson, Comstock RE. Biometrical studies of yield in segregating populations of Korean Lespedeza. Agronomy journal. 1956 Jun;48(6):268-375.
12. Jain UK, Singh D, Amrita. Correlation and path analysis for certain metric traits in coriander. Progressive Agriculture. 2003;3(1and2):86-88.
13. Johnson HW, Robinson HF, Comstock RE. Estimates of genetic and environmental variability in soybean. Agronomy journal. 1955 Jul;47(7):314-318.
14. Meena YK, Jadhao BJ, Kale S. Genetic variability, heritability and genetic advance in coriander. Agric. Sustainable Development. 2013;1(1):31-33.
15. Mengesha B, Alemaw G. Variability in Ethiopian coriander accessions for agronomic and quality traits. African Crop Science Journal. 2010;18(2):43-49.
16. Menon R, Khader MA. Effect of leaf plucking on the growth and grain yield of coriander. Indian Cocoa Arecanut Spices Journal. 1997;21:74-75.
17. Nandakumar KH, Chandrappa G, Ravirajashetty P, Kumar H, Harishbabu BN. Character association and path analysis in coriander (*Coriandrum sativum* L.) genotypes. Electronic Journal of Plant Breeding. 2018;9(4):1280-1285.
18. Panse VG, Sukhatme PV. Statistical methods for agricultural workers. 2nd edition, ICAR, New Delhi, 1985.
19. Prabhu R, Manivannan N, Mothilal A, Ibrahim SM. Correlation coefficient analysis for yield and yield attributes in groundnut (*Arachis hypogaea* L.). Plant

Archives. 2015;15(2):685-689.
20. Sharma KC, Sharma RK. Variation and character association of grain yield and its component characters in coriander. Indian Journal of Genetics and Plant Breeding. 1989 Feb 25;49(01):135-139.
21. Singh D, Jain UK, Rajput SS, Khandelwal V, Shiva KN. Genetic variation for seed yield and its components and their association in coriander (*Coriandrum sativum* L.) germplasm. Journal of Spices and Aromatic Crops. 2006;15(1):25-29.
22. Singh SJ, Singh SK. Genetic variability analysis in coriander (*Coriandrum sativum* Linn.). Journal of Spices and Aromatic Crops. 2013;22(1):81-84.
23. Singh SP, Prasad R, Singh D. Variability and character association of grain yield and its component character in coriander. Journal of Applied Bioscience. 2006;32(1):64-67.
24. Sunilkumar JP, Singh D, Singh C, Mohan M, Sarkar, Sah H. Character association and path analysis in coriander (*Coriandrum sativum* L.) for yield and its attributes. Int. J Pure App. Bioscience. 2017;5(1):812-818.
25. Ullah MZ, Hassan MJ, Chowdhury AZMKA, Saki AI, Rahman AHMA. Genetic variability and correlation in exotic cucumber (*Cucumis sativus* L.) varieties. Bangladesh Journal of Plant Breeding and Genetics. 2012;25(1):17-23.