

# GENETIC VARIABILITY, HERITABILITY AND GENETIC ADVANCE IN CORIANDER (*CORIANDRUM SATIVUM L.*)

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**Abstract:** Genetic variability for various characters was studied in one hundred twenty accessions of coriander along with six check varieties. The phenotypic coefficient of variations was higher than corresponding genotypic of variations indicating environmental influence on all the characters. Genotypic and phenotypic coefficient of variations were moderate (21-50%) for umbels per plant and seeds per umbel. The estimate of heritability was moderate (21-50%) to high (>50%) for all the characters. High heritability coupled with high (>50%) genetic advance was observed only for seeds per umbel and other traits such as days to 50% flowering, plant height, umbels per plant and 1000-seed weight showed high heritability combined with moderate (21-50%) genetic advance as percentage of mean, indicating the importance of these traits in yield improvement programme.

**Keywords:** Coriander, Genetic variability, Heritability, Germplasm

## INTRODUCTION

Coriander (*Coriandrum sativum*) is an annual spice crop and a member of the Umbelliferae, or carrot family. It has an erect, branching stem growing to a height of approximately 0.6-1 m (2-3 ft.). The fresh green herb is called cilantro, or Chinese parsley. It is used in southeast and southern Asian, Chinese and Mexican cuisine, and for flavorings salads and soups. The mature, round fruit contains two fused seeds. The market requires intact fruits, as the essential oil can volatilize from split fruit or individual seeds. Mature seeds have a pleasant, spicy aroma. Coriander powder is made from ground seeds and is used to flavour many products such as curries, gin and prepared meats. Existence of adequate genetic variability for economically important characters is a prerequisite for genetic improvement and exploitation of yield. Assessment of the variability along with heritability is important in predicting genetic gain for a given selection intensity which may give us an idea of extent to which possible improvement can be made in a character under selection. Further, direct association of simple inherited characters which are less affected by environment is required to construct suitable selection indices for the improvement of complex characters. A large collection of coriander germplasm has been accumulated under the All India Coordinated Spices Improvement Project at S.K.N. College of Agriculture, Jobner. The present investigation was carried out to obtain information on genetic variability, heritability (broad sense) and genetic advance for important characters.

## MATERIAL AND METHODS

One hundred twenty accessions of coriander (*Coriandrum sativum L.*) were randomly selected

from a large collection of germplasm maintained under "All India Coordinated Research Project on Spices" at S.K.N. College of Agriculture, Jobner. These accessions along with 6 checks namely RCr-20, RCr-435, RCr-436, RCr-684 and local check were evaluated at research farm S.K.N. College of Agriculture, Jobner in an Augmented Randomized Complete Block Design (Federer 1956). This design was used in this crop because of two reasons, first the number of lines to be evaluated were more and seed supply was less. Therefore, in this design the evaluation of check is first done to get an estimate of error, which is used for deriving adjusted values of accessions. The field was divided into 5 blocks. Accessions and check varieties were sown in a plot size of 4.0 x 0.6 m accommodating two rows 4m long spaced 30 cm apart with plant to plant distance 10 cm maintained by thinning at 27<sup>th</sup> days after sowing. Recommended package of practices were followed to raise a good crop. The observations were recorded on different morphological characters i.e. day to 50% flowering. The genotypic and phenotypic coefficient of variations were estimated as suggested by Burton (1953), heritability in broad sense and expected genetic advance as percentage of mean at 5% selection intensity ( $k=2.06$ ) were calculated following Burton (1953) and Johnson et al. (1955).

## RESULT AND DISCUSSION

The result of the analysis of variance clearly indicated that the significant amount of variability was present in the check and accessions for all the characters except for branches per plant, umbellets and seed yield per plant (Table-1). Suggesting that the material has adequate potential to support the breeding programme for high yield despite the variability for seed yield being non significant.

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In the present investigation the estimates of phenotypic of variation (Table-2) were higher than genotypic coefficient of variation for all the characters. It is obvious because PCV includes variability due to genotypes, environment and genotypes x environment interaction. Genotypes coefficient of variation was moderate (21-50) for seeds per umbel and umbels per plant while low (up to 20%) for days to 50% flowering, plant height, branches per plant, umbellets per umbels and 1000-seeds weight. It indicated that the simple selection for seeds per umbel might be advantageous similar pattern of variability was earlier reported for days to 50% flowering, plant height, branches per plant by Sharma and Sharma (1989). The genotypic coefficient of variation (GCV) was moderate (21-50%) for seeds per umbel and umbels per plant which are similar to earlier reported for seeds per umbel and umbel per plant by Jain (1972). Negative estimate of genetic variance for seed yield per plant may arise due to sampling variance, because of the negative estimates further estimation for this traits were not done. Heritability (broad sense) was high (>50%) for days to 50% flowering plant height, umbels per plant, seeds per umbel and 1000-seed weight which supported earlier reports for days to 50% flowering 1000-seed weight by Bhandari and Gupta (1991) and umbel per plant by Sanker (1991).

Whereas moderate heritability (21-50%) was observed for branches per plant and umbellets per umbel were in agreement with earlier reports of Bhandari and Gupta (1991). Higher (>50%) genetic advance as percentage of mean was observed only for seeds per plant which is in agreement with reports of Jindla *et.al.* (1985). Moderate (21-50%). Moderate (21-50%) genetic advance was estimated for umbels per plant, 1000-seed weight, plant height and days to 50% flowering while low (upto 20%) genetic advance was recorded for branches per plant and umbellets per umbel.

Selection is more effective in the present material for all the characters except for branches per plant and umbellets per umbel as their heritability being higher and genetic advance being higher to moderate. However, two point must be kept in mind while interpreting the results, first that broad sense heritability is based on total genetic variance rather than additive variance, hence whole of it may not be heritability. Therefore, genetic advance estimated on the basis of broad sense heritability only represents the upper limit of response. Second, the experimental error in an augmented design is estimated only from check varieties, which may leave portion confounded with genetic. This further limits the value of heritability in predicting the response to selection.

**Table 1:** Mean square for different characters in coriander.

Source of Variation		Days to 50% flowering	Plant height (cm)	Branches per plant	Umbels per plant	Umbellets per umbel	Seeds per Umbel	1000-seed weight (g)	Seed yield per plant (g)
Blocks (ignoring accessions and checks)	4	23.3125**	52.7656	0.2296	3.5029	0.1603	51.9844**	7.4131**	0.0494
Entries (eliminating blocks)	125	85.4471**	103.0026**	1.0639**	37.1938**	0.5857	62.3433**	5.1586**	0.8137
Checks	5	36.3206**	404.1938	1.0525	73.025	1.5094	336.6097**	23.3160**	4.4300**
Accessions	119	73.7973**	85.4882**	0.8048*	23.0335**	0.5328	51.0553**	4.1984**	0.4198
Checks v/s accessions	1	67.4078**	681.2627**	31.9575**	1543.1023**	2.2615*	34.2806	28.6352**	29.6126**
Error	20	2.8527	22.4822	0.4205	8.5688	0.4096	12.3705	0.8670	0.484
Genotypic variance (Vg)		70.945	63.006	0.384	14.465	0.123	38.685	3.331	-0.065
Phenotypic variance		73.797	85.488	0.805	23.034	0.533	51.055	4.198	0.420
Error variance		2.8522	22.4822	0.4205	8.568	0.409	12.370	0.867	0.484

\*significant at p=0.05 and \*\*significant at p=0.01

**Table 2** Overall, mean values of genotypes, their range, genotypic and phenotypic coefficients of variation, heritability in broad sense and genetic advance as percentage of mean for different character in coriander.

Characters	Mean	Range	Genotypic coefficient of variation	Phenotypic coefficient of variation	Heritability (Broad sense)	Expected genetic advance % of mean
Days to 50% flowering	75.45	58.90-104.24	11.14	11.369	96.13	22.49
Plant height (cm)	55.45	34.33-82.33	14.31	16.67	73.10	25.31
Branches per plant	5.38	3.240-8.62	11.52	16.67	47.74	16.40
Umbels per plant	16.80	6.22-29.76	22.64	28.57	62.80	36.96

Umbellets per umbel	4.94	3.31-6.93	7.11	14.78	23.13	7.04
Seed per umbel	21.72	10.55-45.50	28.64	32.90	75.77	51.36
1000-seed weight (g)	10.93	5.78-16.66	16.70	18.75	79.35	30.65
Seed yield per plant (g)	1.5	0.34-3.64	*	*	*	*

The GCV, PCV, h and GA were not estimated as the genotypic variance had negative value.

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#### REFERENCES

**Bhandari, M.M. and Gupta, A.** (1991). Variation and association analysis in coriander. *Euphytica*, **58** (1): 1-4

**Burton, G.W.** (1952). Quantitative inheritance in grasses. Proc. 6<sup>th</sup> Intern.Grassland Congr. **1**: 227-83.

**Federer, W. T.** (1956). Augmented Design. Hawaiian Planters Record, **20**: 191-207.

**Jain, K.K. and Dubey, C.S.** (1972). Study of yield attributes and heritability in varieties of coriander

(*Coriandrum sativum* L.) *Madras Agric. Journal*, **59** : 193-95.

**Jindla, L. N., Singh, T.N., Allah, R. and Bansal, M.L.** (1985). Genetic variability and path coefficient analysis in coriander. *Crop Improvement*, **12** (2): 133-36.

**Johnson, H.W., Robinson, H.F. and Comstock, R.E.** (1955). Estimates of genetic and environmental variability in soyabean. *Agro. Journal*, **47**: 314-18.

**Shanker, K.B. and Khander, M.A.** (1991). Correlation studies and path analysis of yield and yield components in coriander. *South Ind. Horti.*, **39** (6): 384-86.

**Sharma, K.C. and Sharma, R.K.** (1989). Variation and character association of grain yield and its components characters in coriander. *Indian Journal of Genetics*, **19** (1): 135-39.

