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Rekha Thakur
Department of Vegetable Science, COA, Indira Gandhi Krishi Vishvavidyalaya, Raipur, Chhattisgarh, India

Bhagwat Saran Asati
Pt. KLS College of Horticulture & Research Station, Rajnandgaon, Chhattisgarh, India

Jitendra Singh
Department of Vegetable Science, COA, Indira Gandhi Krishi Vishvavidyalaya, Raipur, Chhattisgarh, India

Pooja Sahu
Pt. KLS. College of Horticulture & Research Station, Rajnandgaon, Chhattisgarh, India

Correspondence
Rekha Thakur
Department of Vegetable Science, COA, Indira Gandhi Krishi Vishvavidyalaya, Raipur, Chhattisgarh, India

Genetic variability studies for foliage yield components in coriander (*Coriandrum sativum* L.) germplasm

Rekha Thakur, Bhagwat Saran Asati, Jitendra Singh and Pooja Sahu

Abstract
The present investigation was undertaken to assess the variability, heritability and genetic advance in Coriander germplasm maintained at Pt. K.L.S. College of Horticulture and Research Station, Rajnandgaon, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.). twenty eight genotypes of coriander were evaluated for 22 qualitative and quantitative characters to study the genetic variability and association of the traints. The analysis of variance revealed considerable genetic variability in the evaluated genotypes. The GCV and PCV estimates were high for leaf stem ratio, dry stem weight, root weight, fresh stem weight and foliage yield kg plot^{-1} indicating better scope for improvement through simple selection. These characters also depicted high estimates for heritability and genetic gain indicating additive type of gene action. Foliage yield kg plot^{-1} showed positive and significant association with plant height, number of branches plant^{-1}, stem base diameter, number of leaves plant^{-1} and leaf length. Among the genotypes tested for performance studies, COR-07 and COR-10 recorded the highest foliage yield potential under Chhattisgarh.

Keywords: Coriander, genetic advance, heritability and variability

Introduction
Coriander (*Coriandrum sativum* L.), is an annual spice herb (2n=22), which belongs to the family Apiaceae and generally grown in winter season as main crop in India. It is a diploid cross pollinated crop. Western Europe and Asia are considered to be the centre of origin of this crop (Gal, *et al.*, 2010) [4]. The plant is a native to Mediterranean and near eastern region (Bhandari and Gupta 1991) and is broadly cultivated in North Africa, Europe, India, China and Thailand. The main exporters of coriander are the Ukraine, Russia, India and Morocco, and the main importers are the USA, Sri Lanka and Japan. India is world's largest producer of coriander although; the major quantity is consumed within the country (John, 1994) [6]. Rajasthan, Gujarat, Madhya Pradesh, Tamil Nadu, U.P. are the major coriander producing states in india. The domestic marketing centres of coriander are Jodhpur, Pratapgarh, Nembhaheda, Bhawanimandi, Jhalarapatan, Ramganjmandi, Kota and Jaipur. (Agasimani, 2014) [1].

It is used as spice, in perfumery, food, beverage and pharmaceutical industry, medicine such as antioxidant, treatment of nervous disorder, gut modulatory, blood pressure lowering and diuretic activities, anti-diabetic and antimicrobial agent (Qaiser *et al*., 2009; Isabelle *et al*., 2010) [9, 5]. A germplasm collection with good variability for desirable characters is a basic requirement of any crop improvement program (Singhania *et al*., 2006) [10]. Knowledge of the magnitude and direction of interrelationship between yield and its component characters is of great importance in breeding programs to select desirable types.

An estimation of variability parameters *viz.*, genotypic coefficient of variation (GCV), phenotypic coefficient of variation (PCV), heritability and genetic advance of the important yield contributing traits suggest the strategy to be adopted for its utilization in genetic improvement. Hence, the present investigation was carried out to study the nature and extent of genetic variability, heritability and genetic advance of foliage yield and its component characters in twenty eight coriander genotypes.

Material and Methods
The present investigation comprised 28 genotypes of coriander collected from various parts of

Chhattisgarh states. The genotype were sown using randomized block design (RBD) with three replication at Pt. K.L.S. College of Horticulture and Research Station, Rajnandgaon, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.) during winter season, 2016-17. Observation on five randomly selected plants from each replication were recorded for plant height (cm), number of branches plant^{-1}, stem base diameter (cm), number of leaves plant^{-1}, leaf length (cm), leaf width (cm), petiole length (cm), root length (cm), root weight (g), plant fresh weight (g), fresh leaf weight (g), leaf stem ratio, fresh stem weight (g), dry leaf weight (g), dry stem weight (g), dry plant weight (g), foliage yield kg plot^{-1}, foliage yield q ha^{-1}, fiber (%), dry matter (%), K mg 100 g^{-1} and Ca mg 100 g^{-1}.

The results were evaluated using descriptive statistics and analysis of variance (ANOVA).Data observed on 22 quantitative traits were subjected to statistical and biometrical analysis and the manifests have been demonstrated *viz.*, analysis of variance, estimation of variability, estimation of heritability and genetic advance. Analysis of variance was carried out using standard procedure prescribed by Panse & Sukhatme (1985) [8]. Variability among accessions was estimated using range, mean, least significant difference, phenotypic and genotypic variance and coefficient of variability according to Burton & Dorane (1953) [2]. Broad sense heritability, genetic advance and genetic advance as percent of the mean were analyzed according to Johnson *et al.* (1955) [7].

Results and Discussion

A wide range of phenotypic variability was observed for all the character, among genotypes studied. The analysis of variance for all the characters indicated highly significant of PCV were greater than the GCV for all the traits which is suggested the role of environmental in the expression of the characters. High magnitude of genotypic as well as phenotypic coefficient of variations were recorded for traits *viz*., leaf stem ratio (90.48 and 92.40 %), dry stem weight (43.86 and 47.11 %), root weight (41.97 and 44.12 %), fresh stem weight (41.94 and 45.81 %), foliage yield kg plot^{-1} (36.37 and 38.79 %), plant fresh weight (36.25 and 38.66 %), foliage yield q ha^{-1} (36.23 and 38.64%), dry plant weight (35.82 and 38.56 %), fresh leaf weight (35.61 and 38.33 %), K mg 100 g^{-1} (34.48 and 34.74%), dry leaf weight (34.07 and 39.65 %), stem base diameter (27.89 and 32.88%), Ca mg 100 g^{-1} (26.76 and 26.84%) and number of leaves plant^{-1} (21.82 and 27.77 %), suggested that substantial improvement on coriander through selection for these traits. Moderate GCV and PCV were recorded for fiber content (15.33 and 18.66 %), petiole length (14.95 and 20.01 %), root length (11.75 and 17.74 %) and number of branches plant^{-1} (10.50 and 17.95 %) and characters like leaf length (7.08 and 10.78 %), leaf width (5.53 and 10.56 %), dry matter % (5.21 and 13.37 %) and plant height (3.98 and 14.72 %) had low genotypic and phenotypic coefficient of variation.

The highest heritability was recorded for the characters Ca mg 100 g^{-1} (99.42 %), K mg 100 g^{-1} (98.53 %), leaf stem ratio (95.9 %), root weight (90.5 %), plant fresh weight (87.92 %), foliage yield q ha^{-1} (87.91 %), foliage yield kg plot^{-1} (87.9 %), dry stem weight (86.7 %), fresh leaf weight (86.30 %). dry plant weight (86.3 %), fresh stem weight (83.81%), dry leaf weight (73.82 %) and stem base diameter (72 %). The moderate heritability was observed for the characters fiber content (67.48 %), number of leaves plant^{-1} (61.80 %) and petiole length (55.83 %). Low heritability was observed for the characters leaf length (43.11 %), root length (43.9 %), number of branches plant $^{-1}$ (34.22 %), leaf width (27.50 %), dry matter (15.22 %) and plant height (7.30 %).

Genetic advance as percentage of mean was observed high for leaf stem ratio (182.40 %), dry stem weight (83.33 %), root weight (80.95 %), fresh stem weight (79 %), K mg 100 g^{-1} (70.51 %), foliage yield kg plot^{-1} (70.27 %), plant fresh weight (70.04 %), foliage yield q ha^{-1} (69.99%), dry plant weight (69.01 %), fresh leaf weight (68.33 %), dry leaf weight (60.97 %), Ca mg 100 g^{-1} (54.98 %), stem base diameter (49.01 %), number of leaves plant^{-1} (35.32 %), fiber content (25.95%) and petiole length (23.04%). Root length (16.04%) and number of branches plant^{-1} (12.60 %) showed moderate genetic advance as percentage of mean. Leaf length (9.59 %), leaf width (6.05 %), dry matter % (4.11%) and plant height (2.21 %) showed low genetic advance as percentage of mean.

High heritability coupled with high genetic advance were observed for characters *viz.*, leaf stem ratio, dry stem weight, root weight, fresh stem weight, K mg 100 g^{-1}, foliage yield kg plot^{-1}, plant fresh weight, foliage yield q ha^{-1}, dry plant weight, fresh leaf weight, dry leaf weight, Ca mg 100 g^{-1}, stem base diameter, number of leaves plant^{-1}, fiber content and petiole length. Hence, these characters might be improved by simple selection.

Conclusions

The analysis of variance indicated that mean sum of square due to genotypes were significant for all the characters. The phenotypic coefficient of variation was in general higher than the genotypic coefficient of variation for all the characters, which may be due to environmental effect.

On the basis of this study, it can be concluded that selection would be rewarding for leaf stem ratio, dry stem weight, root weight, fresh stem weight, foliage yield kg plot^{-1}, plant fresh weight, foliage yield q ha^{-1}, dry plant weight, fresh leaf weight, K mg 100 g^{-1}, dry leaf weight, stem base diameter, Ca mg 100 g^{-1} and number of leaves plant^{-1} in bringing out the improvement

Table: 1: Genetic parameter of variability for foliage yield and its component characters in coriander

S. No.	Parameter	Range			Coefficient of Variation (%)		Heritability	Genetic	G.A. as %
	Character	Min.	Max.	Mean	GCV	PCV	(h^2%)	Advance	of mean
1	Plant height(cm)	17.35	24.9	21.2	3.98	14.72	7.3	0.47	2.21
2	No. of Branches per plant	6.6	12.13	9.28	10.5	17.95	34.22	1.17	12.6
3	Stem base diameter(cm)	0.25	0.72	0.51	27.89	32.88	72	0.25	49.01
4	No. of leaves per plant	22.6	68.67	47.02	21.82	27.77	61.8	16.61	35.32
5	Leaf length (cm)	2.28	3.07	2.71	7.08	10.78	43.11	0.26	9.59
6	Leaf width (cm)	2.75	3.66	3.14	5.53	10.56	27.5	0.19	6.05
7	Petiole length (cm)	5.61	11.31	7.81	14.95	20.01	55.83	1.8	23.04
8	Root length (cm)	5.98	10.35	8.29	11.75	17.74	43.9	1.33	16.04
9	Root weight (g)	0.14	0.76	0.42	41.97	44.12	90.5	0.34	80.95

10	Plant fresh weight (g)	2.19	10.76	6.21	36.25	38.66	87.92	4.35	70.04
11	Fresh leaf weight (g)	0.92	4.38	2.59	35.61	38.33	86.3	1.77	68.33
12	Leaf stem ratio	0.6	5.87	1.08	90.48	92.4	95.9	1.97	182.4
13	Fresh stem weight (g)	1.03	6.37	3.19	41.94	45.81	83.81	2.52	79
14	Dry leaf weight (g)	0.15	0.64	0.41	34.07	39.65	73.82	0.25	60.97
15	Dry stem weight (g)	0.12	0.56	0.3	43.86	47.11	86.7	0.25	83.33
16	Dry plant weight (g)	0.28	1.11	0.71	35.82	38.56	86.3	0.49	69.01
17	Foliage yield (kg/plot)	0.26	1.29	0.74	36.37	38.79	87.9	0.52	70.27
18	Foliage yield (q /ha)	36.88	181.36	104.62	36.23	38.64	87.91	73.23	69.99
19	Fiber (%)	4.07	8.14	6.55	15.33	18.66	67.48	1.7	25.95
20	Dry matter (%)	9.79	14.1	11.66	5.21	13.37	15.22	0.48	4.11
21	K (mg/100g)	520	1936.6	1070.83	34.48	34.74	98.53	755.14	70.51
22	Ca (mg/100g)	1673.3	4800	2621.07	26.76	26.84	99.42	1441.11	54.98

GCV, Genotypic coefficient of variation, PCV, Phenotypic coefficient of variation

In the coriander because they appeared with high value of GCV, PCV, heritability and genetic advance as % of mean.

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