International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2018; 6(6): 1457-1460

Received: 17-09-2018
Accepted: 22-10-2018

Akshay Jain
Research Scholer, Department of Vegetable Science Narendra Deva University of Agriculture and Technology Kumarganj, Faizabad, Uttar Pradesh, India

VP Pandey
Professor, Department of Vegetable Science Narendra Deva University of Agriculture and Technology Kumarganj, Faizabad, Uttar Pradesh, India

Shubham Yadav
NNPG Collage, Dr. RMLAU Faizabad, Uttar Pradesh, India

Rajneesh Shukla
Research Scholer, Department of Vegetable Science Narendra Deva University of Agriculture and Technology Kumarganj, Faizabad, Uttar Pradesh, India

Correspondence
Akshay Jain
Research Scholer, Department of Vegetable Science Narendra Deva University of Agriculture and Technology Kumarganj, Faizabad, Uttar Pradesh, India

Assess variability, heritability and genetic advance in coriander (*Coriandrum sativum* L.) genotypes

Akshay Jain, VP Pandey, Shubham Yadav and Rajneesh Shukla

Abstract
The present study was conducted with the objective to know the extent of variation and characters inheritance in coriander. The study was comprised 73 genotypes (including three checks) in augmented design during *Rabi* seasons of 2014-15 and 2015-16. The observations were recorded on growth attributes *viz.,* days to 50% flowering, branches/plant, plant height and yield attributes *viz.,* fruiting node per plant, uumbels per plant, umbellets per umbel, fruits per umbellets, fruits per umbel, umbel diameter(cm), plant height (cm), test weight (g) and yield per plant (g). The present study revealed the wide range of variation was observed for all the traits among the genotypes during both the years. High magnitude of genotypic and phenotypic coefficients of variation was recorded in case of for branches per plant and umbels per plant during 2014-15. The high estimates of PCV as well as GCV were recorded in case of umbels per plant, fruits per umbel and yield per plant in year 2015-16. The high heritability was expressed for the high estimates of heritability (>75 %) was observed for all the characters during both years of investigation except branches per plant in Y_1 which showed moderate estimates of heritability. The highest genetic advance was expressed for umbels per plant followed by plant height, yield per plant, days to 50% flowering, while lowest genetic advance was showed for umbellets per umbel followed by branches/plant during the year, 2014-15. The highest genetic advance was expressed for umbels per plant followed by fruits per umbel, plant height, yield per plant, while lowest genetic advance was showed for umbel diameter followed by umbellets per umbel during the year 2015-16. High heritability coupled with high genetic advance was observed for umbels per plant, fruits per umbel, umbel diameter and yield per plant in 2014-15 and plant height, umbels per plant, fruits per umbellets and yield per plant in 2015-16.

Keywords: Coriander, PCV, GCV, Heritability

Introduction
Coriander *(Coriandrum sativum* L.) also called cilant or dhania is an annual herb, belong to the family Apiaceae. The genus *Coriandrum* comprised of two species. Among them, *C. sativum* is cultivated. The basic chromosome number of this genus is x=11 and *Corundum sativum* is diploid with 2n=22. The plant is a smooth, erect annual herb, 60-100 cm high, with conspicuously enlarged nodes and hollow internodes. The stems are vertically ridged. The leaves are pinnately compound and often decompound. The lower leaves are broad with serrately-lobed margins. The upper leaves are finely cut with linear lobes. The petiole is often swollen even, hollow at the base and sheathing the stem. The leaf arrangement is alternate. The plant comes to the flowering stage in about 45-60 days after sowing. The flowers are small, white or pinkish in compound terminal umbels. There are 5 seapals, 5 peatals, 5 stamens and two corpels which are free with an epigynous ovary. The fruit is a schizocarp, globular, yellow in colour with brown ribs. The size seed is about 3 mm in diameter and ripe seed are aromatic. At dehiscence, the carpels called mericarps separate, each containing a single seed with a copious endosperm and a minute embryo.

The genetic improvement of any crop depend upon its judicious exploitation through efficient breeding methods. Few high yielding varieties dominate in cultivation which often leads to genetic homogeneity. It is also well established that genetic homogeneity leads to genetic vulnerability biotic and abiotic stresses. In any crop breeding programme germplasm serves as the most valuable reservoir in providing variability for various traits. Proper screening and evaluation of germplasm lines would provide an estimate of their potential value as suitable genotypes for utilization in vertical development progamme.

Material and Methods

Experiments were conducted at the Main Experiment Station (Vegetable Research Farm), Narendra Deva University of Agriculture and Technology, (Narendra Nagar) Kumarganj, Faizabad (U.P.) India, in well leveled field having proper drainage. This farm is situated at Main Campus of the University on left side of Faizabad- Raebareli road at a distance of 42 km away from main city of Faizabad district. 73 lines including three checks of coriander germplasm maintained in All India Co-ordinated research project on spices under Department of Vegetable Science NDUAT, Kumarganj, Faizabad were taken for this investigation. These genotypes were collected from different places of India, The name of genotype and their source is given below table-1. The experiment was conducted in Augmented Block Design. The experiment consisting of 73 germplasm accessions was laid out in augmented block design.

The analysis of variance for different characters in "Augmented Design" was done according to Federer (1956). The mean squares for error was subtracted from the mean squares due to varieties and then difference was divided by number of replications for obtaining the genotypic variance, which was calculated according to the method suggested by Burton (1952) [5]. Environmental variance is the mean squares due to error. Phenotypic variance was calculated by adding genotypic variance and environmental variance, which was suggested by Burton and de Vane (1953) [6].

Results and Discussion

The analysis of variance for all the eleven traits (Table-1) showed existence of variability among the one hundred ten Germplasm. The phenotypic variability may be due to genetic constitution of the material as well as environment influences. In general the phenotypic variance and phenotypic coefficient of variance were higher than the respective genotypic variance and genotypic coefficient of variance for all the traits indicating a considerable influence of environmental on their expression. The genotypic and phenotypic coefficient of variations was computed to assess the existing variability in the genotypes (Table-2). The high magnitude of genotypic and phenotypic coefficients of variation was recorded in case of for branches per plant and umbels per plant. While, umbel diameter was showed only high phenotypic coefficient of variation in 2014-15 high estimates of PCV as well as GCV were recorded in case of umbels per plant, fruits per umbel and yield per plant in year 2015-16. According to Miller *et al*., (1957), these traits can be utilize in breeding programme to evaluate coriander accessions for seed yield by using few replicates, location and years. The high estimates of GCV and PCV for these traits were reported by several workers. The similar results has been reported by Mandal and Hazara (1989) [9], Bhandari *et al.,* (1991) [3], Bhandari*et al.,* (1993) [4], Rajput and Singh (2003) [12], Beemnet and Getinet (2010) [2], and Meena *et al.,* (2013) [10]. The GCV is less than the corresponding PCV, indicating the role of environment in the expressive of the traits under observation.

Heritability, Genetic advance and Genetic advance in per cent of mean

Heritability estimates the amount of transmissible genetic variability to the total variability and happens to most important basic factor that determines the genetic improvement or response to selection. However, the degree of improvement attained through selection is not only depending upon heritability but also on the amount of genetic variation present in breeding population and extent of the selection pressure applied by the breeder. The estimates of heritability in broad sense were higher for all the characters over the years. The high heritability was expressed for the high estimates of heritability (>75 %) was observed for all the characters during both years of investigation except branches per plant (69.17 %) In Y_1 (2014-15) which showed moderate estimates of heritability. None of the character showed moderate or low estimate of heritability in broad sense during Y_2 (2015-16), the findings of present study are in agreement with those of Reddy *et al.,* (1989) [13], Sanker and Khader (1991), Bhandari *et al.,* (1993) [3], Tripathi *et al.,* (2000) [17], Rajput and Singh (2003) [12], Singh *et al*., (2006) [15] and Singh *et al.* (2008) [16]. Burton and De vane has suggested that GCV together with heritability estimate would give best option expected for selection.

The highest genetic advance was expressed for umbels per plant followed by plant height, yield per plant, days to 50% flowering, while lowest genetic advance was showed for umbellets per umbel followed by branches/plant during the year, 2014-15. The highest genetic advance was expressed for umbels per plant followed by fruits per umbel, plant height, yield per plant, while lowest genetic advance was showed for umbel diameter followed by umbellets per umbel during the year 2015-16. The findings of present study are in agreement with those of Ali *et al.*, (1993) [1] Rajput and Singh (2003) [12], Singh *et al.,* (2008) [16] and Meena *et al.,* (2013) [10].

High heritability for the characters controlled by polygene might be useful for making effective selection. Johanson *et al., (*1955) reported that the heritability estimates along with genetic advance is more useful than the resultant effect for selecting the best genotypes as it suggest the presence of additive gene effects.

High heritability coupled with high genetic advance was observed for umbels per plant, fruits per umbel, umbel diameter and yield per plant in 2014-15, plant height, umbels per plant, fruits per umbellets and yield per plant in 2015-16. Heritability coupled with genetic advance as percent of mean for various character indicated high scope of fast genetic manipulation in the important yield contributing traits. These finding was inconformity with the finding of Singh *et al.*, (2008) [16] for seed yield per plant, test weight and umbels per plant. The findings of present study are in agreement with those of Rajput and Singh (2003) [12] and Singh *et al.,* (2008) [16].

The information on heritability alone may be misleading, when used in combination with genetic advance the utility of heritability estimate increases. In the present study, high genetic advance coupled with high heritability was observed for seed yield per plant and no of umbels per plant. It indicated that additive gene effects were more important for these traits. Therefore, improvement in these traits would be more effectively done through selection in the present materials.

Depending upon the variability, heritability and genetic advance estimates, it could be predicted that improvement by direct selection was possible in coriander for traits like branches/plant, umbel per plant and yield per plant. Therefore, these characters should be considered while making selection for yield improvement in coriander. These findings are in line with Sanker and Khader (1991) [14]

Table 1: Analysis of variance (Augmented design) for eleven characters in coriander germplasm during *Rabi* season (Y_1 = 2014-15 and Y_2 = 2015-16)

Characters	Source of Variance					
	Block		Checks		Error	
d.f.	6		2		12	
Days to 50% Flowering	Y_1	Y_2	Y_1	Y_2	Y_1	Y_2
	6.447**	14.960**	40.619**	20.571**	0.564	0.628
Branches/ Plant	1.227*	3.001**	2.096*	1.373**	0.378	0.054
Fruiting Nodes/ Plant	4.969**	6.339**	4.564**	13.406**	0.065	0.046
Umbels / Plant	743.753**	497.610**	889.870**	522.346**	0.609	0.061
Umbellets/ Umbel	0.298**	1.152**	1.532**	1.259**	0.047	0.023
Fruits/ Umbellet	1.611**	6.749**	2.629**	3.726**	0.050	0.049
Fruits/ Umbel	3.933**	3.641**	6.818**	2.059**	0.066	0.100
Umbel Diameter (cm)	5.480**	0.164**	5.481**	1.122**	0.055	0.005
Plant Height (cm)	171.256**	198.250**	80.488**	25.493**	1.442	0.945
Test Weight (g)	1.445**	6.173**	1.682**	15.225**	0.010	0.079
Yield/ Plant (g)	3.138**	8.656**	7.428**	50.600**	0.227	0.280

*,** significant at 5% and 1% probability level, respectively

Table 2: Estimate of range, general mean, genotypic and phenotypic coefficient of variation, heritability and genetics advance in per cent of mean for eleven characters in coriander during *Rabi* season (Y_1 = 2014-15 and Y_2 = 2015-16)

S No.	Characters	Year	Range		General mean	GCV	PCV	Heritability (%)	Genetic advance	Genetic advance in per cent of mean
			Min.	Max.						
1.	Days to 50% Flowering	Y_1	84.67	94.67	89.42	2.39	2.53	89.02	4.15	4.65
		Y_2	84.29	96.95	90.44	2.68	2.82	90.31	4.73	5.24
2.	Branches/ Plant	Y_1	1.73	7.29	4.47	20.74	24.94	69.17	1.58	35.53
		Y_2	3.43	9.62	6.02	19.16	19.54	96.10	2.33	38.68
3.	Fruiting Nodes/ Plant	Y_1	11.05	19.72	15.17	10.89	11.01	97.68	3.36	22.17
		Y_2	11.77	17.56	14.86	8.18	8.31	97.00	2.47	16.60
4.	Umbels/ Plant	Y_1	31.36	96.67	68.71	21.29	21.32	99.72	30.21	43.80
		Y_2	30.24	88.48	55.92	22.05	22.06	99.96	25.41	45.42
5.	Umbellets/ Umbel	Y_1	4.90	8.90	6.26	9.83	10.43	88.93	1.19	19.10
		Y_2	4.93	8.23	6.67	8.95	9.24	93.89	1.19	17.87
6.	Fruits/ Umbellets	Y_1	5.53	11.55	8.66	15.62	15.83	97.35	2.76	31.75
		Y_2	4.79	10.26	7.10	16.63	16.92	96.60	2.39	33.67
7.	Fruits/ Umbel	Y_1	32.70	40.90	37.34	3.99	4.05	97.09	3.02	8.10
		Y_2	28.99	81.65	44.60	20.98	20.99	99.89	19.26	43.19
8.	Umbel Diameter (cm)	Y_1	2.43	7.46	5.37	19.84	20.33	95.28	2.12	39.89
		Y_2	4.79	7.66	6.08	9.26	9.34	98.32	1.15	18.92
9.	Plant Height (cm)	Y_1	96.62	160.83	128.07	7.43	7.49	98.45	19.57	15.19
		Y_2	104.67	158.28	136.61	6.71	6.74	98.88	18.76	13.74
10.	Test Weight (g)	Y_1	8.25	12.41	10.14	8.21	8.26	98.61	1.70	16.79
		Y_2	8.10	14.04	10.80	11.86	12.15	95.38	2.57	23.87
11.	Yield/ Plant (g)	Y_1	8.52	17.86	13.65	16.20	16.58	95.50	4.42	32.62
		Y_2	6.27	18.99	13.31	24.31	24.63	97.38	6.56	49.41

Acknowledgement
The sole author are thankful to Dr. V. P. Pandey Associate Professor for providing facilities Department of Vegetable Science, N.D.U.A. &T. Kumarganj, Faizabad (U.P.) for providing necessary facilities.

References

1. Ali SA, Mishra RK, Yadav LN, Maurya KN. Variability and correlation studies in coriander (*Coriandrum sativum* L.) International J of Tropical Agri. 1993; 11(1):40-42.
2. Beemnet M, Getinet A. Variability in Ethiopian Coriander Accessions for Agronomic and Quality Traits. African Crop Science Journal. 2010; 18(2):43-49.
3. Bhandari MM, Gupta Adarsh. Divergence analysis in coriander. The Ind., J of G.P.B. 1993; 53(1):71-75.
4. Bhandari MM, Gupta A, Gupta A. Variation and association analysis in coriander. (*Euphytica*, 1991; 58(1):1-4.
5. Burton GW. Quantitative inheritance in grasses. Proc. 6th Int. Grassland Congress. 1952; 1:227-283.
6. Burton GW, De Vane EW. Estimation of heritability in tall fescue (Fistuea arundicea) from replicated clonal materials. Agric. J. 1953; 45:178-181.
7. Feeder WT. Augmented design, "Hawain Planters" Record. 1956; 55:191-208.
8. Johnson HW, Robinson HF, Comstock RE. Estimates of genetic and environmental variability in soyabean. Agron. J. 1955; 47:314-318.
9. Mandal AK, Hazara P. Statistical Methods forAgricultural Workers. Indian Council of Agricultural Research, New Delhi, 1989, 381.
10. Meena YK, Jadhao BJ, Kale VS. Genetic Variability, Heritability and Genetic Advance in Coriander. Agriculture for Sustainable Development. 2013; 1(1):31-33.
11. Miller PA, Williams JC, Robinson HF, Comstock RE. Estimates of genotypic and environmental variances in upland cotton and their implications in selection. Agronomy Journal. 1957; (50):126.

12. Rajput SS, Singh D. Variability in coriander (C*oriandrum sativum* L.) for yield and yield components. J. of Spices and Aromatic Crops, 2003; 12(2):162-164.
13. Reddy PV, Rao TSR, Rao SBSN, Reddy AN. Genetic variability in coriander. Indian Cocoa, Arecanut and Spices J. 1989; 12(3):90-92.
14. Sankaer KB, Khader MA. Studies of genetic variability in coriander. South Indi. Hort. 1991; 39(3):312-314.
15. Singh SP, Prasad R, Singh D. Variability and character association of grain yield and its component characters in coriander. J Applied Biosci. 2006; 32(1):64-67.
16. Singh SP, Katiyar RS, Rai SK, Yadav HK, Tripathi SM, Nigam HK, *et al*. Studies on genetic variability and character association in coriander (*Coriandrum sativum* L.) grown on sodic soil. J. Medicinal and Aromtic Plant Sci. 2008; 30(2):164-167.
17. Tripathi SM, Kamaluddin Srivastava SBL, Srivastva JP. Variability, heritability and correlation studies in coriander (*Coriandrum sativum* L.) J. Spices and Aromatic Plants. 2000, 30-34.