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Genetic Variability, Heritabilty and Genetic Advance for Yield and Its Component in Indigenous Collection of Coriander (*Coriandrum sativum* L.) Germplasm

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ABSTRACT

An experiment was carried out to know the variability present among the 35 genotypes of coriander for yield and yield attributing characters during season of Rabi 2016-17. Analysis of variance revealed the significant difference for all the fourteen characters studied indicate the presence of extensive amount of variability. The high genetic coefficient of variation observed for number of seeds umbellet^{-1} at harvest, seed yield plant^{-1} and seed yield hectare^{-1} whereas, high phenotypic co-efficient of variation was observed for number of umbels per plant at harvest, number of seeds umbellet^{-1}, seed yield plant^{-1} and seed yield hectare^{-1}. Estimates of broad sense heritability was recorded high for plant height, number of primary branches, days to first flowering, days to 50 % flowering, days to harvest, number of umbels plant^{-1}, number of umbellets umbel^{-1}, number of seeds umbellet^{-1}, seed yield plant^{-1}, seed yield hectare^{-1} and harvest index. Genetic advance as percent of mean was high for number of primary branches, number of umbels plant^{-1}, number of umbellets umbel^{-1}, number of seeds umbellet^{-1}, seed yield plant^{-1}, seed yield hectare^{-1} and harvest index.

Key words: *Coriander, GCV, PCV, Genetic variability, Heritability and Genetic advance as percent of mean.*

INTRODUCTION

Coriander is one of the most important seed spice grown in India. Western Europe and Asia are considered to be the centre of origin of this crop Gal *et al*.[3]. In India, it is cultivated practically in most of the states like Rajasthan, Madhya Pradesh, Assam, Gujarat, Odisha, Andhra Pradesh, Haryana, Tamil Nadu, Uttarakhand, Uttar Pradesh, Bihar, Telangana and Karnataka Tiwari and Agarwal[15].

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Variability is the prerequisite for any crop improvement programme. Heritability is the heritable portion of phenotypic variance. It is good index of the transmission of characters from parents to offspring. The estimates of heritability help the plant breeder in selection of elite genotypes from diverse genetic populations. Genetic advance under selection, measures the role of genetic progress as the deviation between the mean genotypic value of the base population due to selection. An improvement in yield and yield attributes of coriander is normally achieved by selecting the genotypes with desirable character combination existing in nature or by hybridization. The starting point of any systematic breeding programme is the collection of large germplasm in turn assessed by the genetic variability present in the germplasm hence, the present investigation aimed at estimating the variability, heritability and genetic advance for yield and other components.

MATERIALS AND METHODS

The present field work was conducted at the College of Horticulture, Rajendranagar during *Rabi* period October 2016 to February 2017. Geographically, Hyderabad falls under semi arid tropical climate, situated at an altitude of 542.3 m above the mean sea level. Geographically, it lies at latitude of 17.19°N and longitude of 79.23°E. The monthly mean meteorological data recorded during the crop growth period (Oct-Feb) at meteorological observatory, ARI, Rajendranagar which was presented in the appendix. At all the stages of the crop growth period the weather was congenial for the growth and development of coriander. Healthy and bold seeds of 35 genotypes were sown directly in field provided with a spacing 30cm in between the rows and10 cm between plant to plant distance in last week of October 2016. Five plants were tagged randomly and the biometrics was recorded on the parameters like plant height (cm), number of leaves plnat^{-1}, number of primary branches plant^{-1}, number of secondary branches plant^{-1}, days to first flowering, days to 50% flowering, days to harvest, number of umbels plant^{-1}, number of umbellets umbel^{-1}, number of seeds umbellet^{-1}, thousand seed weight (g), seed yield plant^{-1} (g), seed yield hectare^{-1} (q) and harvest index (%). Analysis of variance for different characters was carried out using mean data in order to assess the genetic variability among genotypes as given by Cochran and Cox[2]. PCV and GCV for all characters were estimated using the formula of Burton (1952). Heritability in broad sense was given by Lush (1949)[6] and Hanson[4] and genetic advance as percent of mean was worked out according to the method given by Johnson.

RESULTS AND DISCUSSION

The mean sum of square due to replication was found non-significant for all the characters studied while, the variation due to genotypes was significant for all the characters under study both 5 and 1 per cent level of significance (Table 1). Mean performance with good range of variability represented for studied characters (Table 2). The range for plant height (30.36-42.16 cm), number of leaves (21.06-28.73), number of primary branches (4.66-7.73), number of secondary branches (10.80-16.66), days to first flowering (36.33-56.33), days to 50 % flowering (41.67-60.33), days to harvest (81.66-111.66), number of umbels plant^{-1} (12.46-31.80), number of umbellets umbel^{-1} (4.33-7.86), number of seeds umbellet^{-1} (5.73-13.33), 1000 seed weight (9.89-14.71 g), seed yield plant^{-1} (2.56-6.84 g), seed yield hectare^{-1} (8.66-26.83 q) and harvest index (30.67-53.36 %). Seed yield was in consideration with Bhandari and Gupta[1], Moniruzzaman *et al.*[8] .The magnitude of phenotypic and genotypic coefficients of variation has been assessed to know the real worth of the source material therefore the coefficients were calculated as given by Sivasubramanian and Madhavamenon[13]. High PCV and GCV was recorded for the characters *viz.*, number of umbels per plant, number of seeds per umbellet , seed yield per plant and seed yield per hectare which indicates wide range of genetic variation for this traits which were in findings with Meena *et al*[7]. Moderate PCV, Plant height at harvest, number of primary branches at harvest, days to first flowering, no. of umbellets per umbel at

harvest, 1000 seed weight and harvest index and moderate GCV was observed for traits *viz.,* days to first flowering and harvest index. Low PCV was revealed for number of leaves at harvest, days to 50% flowering and days to harvest and low GCV was recorded for plant height, number of leaves, number of primary branches, number of secondary branches, days to 50% flowering, days to harvest and 1000 seed weight represented in table-2. PCV range was higher than GCV for all the traits studied indicating the role of environmental factors on character expression.

Heritability was calculated in the present investigation. In the present investigation heritability in broad sense were high for most of the trait as grouped (Low <30%; Moderate 30-60%; High >60%) by Johnson[5].

High heritability coupled with high genetic gain as percent of mean noticed for the characters *viz.*, number of primary branches, umbels plant^{-1}, umbellets umbel^{-1}, number of seeds umbellet^{-1}, seed yield plant^{-1}, seed yield per hectare and harvest index. High heritability in conjunction with high GAM was observed for this trait indicating the preponderance of additive gene action governing the inheritance of this character and offers the best possibility of improvement through simple selection procedures. These results are in agreement with results reported by Nilkolay and Boryana[9] in coriander, Patahk *et al*.[10] in fenugreek and Patel *et al*.[11] in fennel. Moderate heritability recorded for the characters *viz.,* number of leaves at harvest, number of secondary branches at harvest and 1000 seed weight whereas moderate genetic gain as percent of mean recorded for traits *viz*., plant height, number of leaves, number of secondary branches, days to first flowering, days to 50% flowering, days to harvest and 1000 seed weight. The results obtained are in close harmony with Shrivastava *et al*.[14], Tripathi *et al*.[16] and Singh *et al*.[12]. Moderate genetic advance as per cent of mean with high or moderate heritability indicates the action of both additive and non-additive gene action for these traits hence, these traits can be further improved by suitable selection procedures.

Table 1: ANOVA for yield and yield components in Coriander

S. No	Character	Mean sum of squares		
		Replications (df =2)	**Treatments (df=34)**	**Error (df =68)**
1	Plant height @ harvest (cm)	10.15	25.13**	4.55
2	No. of leaves	8.42	11.72**	2.46
3	No. of primary branches	0.76	1.73**	1.04
4	No. of secondary branches	22.08	5.99**	2.12
5	Days to first flowering	20.06	70.59**	3.25
6	Days to 50 % flowering	4.15	65.70**	2.65
7	Days to harvest	42.20	189.15**	5.44
8	No. of umbels per plant	3.05	69.14**	1.25
9	No. of umbellets per umbel	9.00	2.43**	0.35
10	No. of seeds per umbellet	1.83	12.95**	0.85
11	1000 seed weight	1.52	4.55**	0.94
12	Seed yield per plant (g)	0.974	3.22**	0.41
13	Seed yield per hectare(q)	15.27	51.19**	1.11
14	Harvest index	8.95	69.15**	2.10

Significant at 1% level= **: Significant at 5% level= * , DAS- Days After Sowing.

Table 2: Estimates of variability, heritability, and genetic advance as percent of mean for characters in coriander genotypes

Characters	Range	Mean	GV	PV	GCV	PCV	h^2_{bs} (%)	GA	GAM
Plant height (cm)	30.36-42.16	33.46	6.85	11.41	7.82	10.09	60.12	4.18	12.50
No. of leaves	21.06-28.73	24.84	3.08	5.55	7.07	9.48	55.62	2.70	10.86
No. of primary branches	4.66-7.73	5.96	0.23	1.27	7.98	18.93	67.97	1.45	24.37
No. of secondary branches	10.80-16.66	13.94	1.29	3.42	8.14	13.25	37.79	1.44	10.91
Days to first flowering	36.33-56.33	46.42	22.47	25.70	10.21	10.92	87.34	9.12	19.65
Days to 50 % flowering	41.67-60.33	51.73	21.01	23.66	8.86	9.40	88.79	8.89	17.20
Days to harvest	81.66-111.66	100.54	61.23	66.68	7.78	8.12	91.83	15.44	15.36
No. of umbels per plant	12.46-31.80	18.62	22.63	23.88	25.54	26.24	94.74	9.53	51.21
No. of umbellets per umbel	4.33-7.86	6.18	0.69	1.05	13.47	16.54	66.33	1.39	22.60
No. of seeds per umbellet	5.73-13.33	9.54	4.03	4.88	21.03	23.14	82.58	3.76	39.38
1000 seed weight (g)	9.89-14.71	12.13	1.21	2.14	9.05	12.07	56.21	1.69	13.98
Seed yield per plant (g)	2.56-6.84	3.82	0.93	1.35	25.28	30.43	69.03	1.65	43.27
Seed yield per hectare(q ha^{-1})	8.66-26.83	15.72	16.69	17.80	25.98	26.83	94.00	8.15	51.84
Harvest index (%)	30.67-53.36	42.61	22.35	24.45	11.09	11.60	91.40	9.31	21.84

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