

Original Research Article

<https://doi.org/10.20546/ijcmas.2019.804.085>

Morphological Character and Seed Yield Potential of Coriander Genotypes under Gangetic Alluvial Region of West Bengal

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ABSTRACT

Keywords

Coriander
Genotypes,
*Coriandrum
sativum*

Article Info

Accepted:

07 March 2019

Available Online:

10 April 2019

The present investigation was carried out during the year 2014-15 and 2015-16 for studying the yield and quality parameters in 12 germplasms at HRS, Mandouri, Bidhan Chandra Krishi Viswavidyalaya, Nadia, West Bengal. The experimental design was RBD and evaluation studies were carried out on the basis of morphology and yield parameters. The germplasm NRCS A.Cr-1 showed the maximum days to flower. Days to harvest were minimum in genotype Manipur collection-1. Plant height, length of longest basal leaves, Number of umbels per plant, number of umbellets per umbel, test weight, seed yield per plant, yield per plot, and projected yield per hectare were recorded maximum in the variety Pant Haritma. Number of basal leaves was recorded highest in Arka Isha with 9.50 per plant. Number of primary branches, number of secondary branches and number of seed per umbel were highest in NRCS A.Cr-1

Introduction

Spices are low volume high value crops which play vital role in our national economy and international market. The association of spices and mankind is prehistoric. They are used as flavouring, food additives, colouring agents, body toners, preservatives, contraceptives, cosmetics and in various ailments. India has been the leading spice producing and exporting country of the world since the recorded history. It constitutes an important group of agricultural commodities, since antiquity and has been considered virtually indispensable in culinary art.

Coriander (*Coriandrum sativum* L.) is an important annual spice herb that belongs to the family Umbelliferae/Apiaceae (Hedburg and Hedburg, 2003). It is a diploid cross pollinated crop. The plant, indigenous to Southern Europe and the Mediterranean region, is one of oldest consumed spices in India. The green unripened fruits have unpleasant fetid bug like odour. However, when ripe, the seeds have a distinctive sweet citrus/mint/musty aroma that has been valued over the centuries.

It is commercially grown in India, Egypt, Morocco, USSR, USA, Hungary, Poland, Rumania, Mexico, Czechoslovakia and

Guatemala. Coriander is exported to other countries like Malaysia, Singapore, Australia and Central European countries. By exporting 35,185 tonnes, it fetched Rs /-272, 74 crore (Spice Board, 2019). India has prime position in cultivation and production of coriander. The production in India during the year 2013-14 is 496240 t (Spice Board, 2019). The main coriander growing states in India are Andhra Pradesh, Rajasthan, Madhya Pradesh, Karnataka, Tamil Nadu and Uttar Pradesh. Rajasthan emerges as the largest producer with 63 % of domestic production. In 1993-1994 India exported 13552 t of coriander seeds and imported 73 t of coriander seed oil. Like other spices, the productivity of coriander is 1011 kg per hectare.

The essential oil coriander has antibacterial property. In India, the decoctions of coriander seeds along with cumin are traditionally used as diuretic. It is pharmacologically proven to have chemopreventive (Lakhera *et al.*, 2015), antidiabetic (Mazhar and Mazumder, 2013), anti-inflammatory (Mohan *et al.*, 2013) and anti-diarrheal (Nithya, 2015) the seeds form a main component in the preparation of curry powder and in preparation of various pickles. They are used for flavouring pastry, cookies-cakes, tobacco, bakery product, meat fish, soda, syrups, candy, preserve and liquor (Thamburaj and Singh, 2004). It is used as a spice in culinary (Diederichsen, 1996), medicine (Kubo *et al.*, 2004; Delaquis *et al.*, 2002). The main flavour compound are d-linalool, α , β -pinene and p-cymene. The seed contains significant quantities of vitamins (Holland *et al.*, 1991); minerals and dietary fiber (Ensminger and Esminger, 1986).

The average seed yield of coriander is rather low in spite of its wide cultivation in India, because of lack of attention given to this crop. In order to exploit the yield potential of coriander, the factors affecting yield and yield component should be thoroughly investigated.

These factors include environment and cultural practices which directly affect the yield. The productivity of coriander has increased substantially due to rapid development of varieties. However, fewer attempts have been made to standardize them for various locations. Since several germplasms are available for cultivation, it is necessary to identify the potential genotype for the prevailing agro-climatic conditions.

Coriander is grown in almost all the districts of West Bengal. Mostly local cultivars/landraces are predominant in the state. Characterization of local and promising genetic resources for identification of important traits for further utilization is important in the present day breeding programme.

Materials and Methods

The present investigation was carried out at Horticultural Research Station, Mandouri, Faculty of Horticulture, Bidhan Chandra Krishi Viswavidyalaya, Nadia, West Bengal during the year 2014-15 and 2015-16. The research station is located at 23.5° North latitude, 89° East longitude having an average altitude of 9.75m above mean sea level.

The design of the experiment was randomized block design (RBD) with 12 number of treatments, 3 replications. The plot size was 1.8m×1m and the spacing adopted was 25cm×15cm. There were 48 numbers of plants per plot. Time of planting was 10th Nov 2014 and 10th Nov, 2015 (Table 1).

One deep ploughing with tractor followed by two ploughings with power tiller was done in order to make soil friable and pulverized. Levelling was done properly as far as practicable with the help of ladder to avoid water stagnation. Well rotten Farm Yard Manure (FYM) @ 20t/ha and N, P and K

were applied at the rate of 30:40:20 kg. Half dose of N and full dose of P and K were applied as basal and remaining half dose of N was applied 30 days after sowing. The sources of N, P₂O₅ and K₂O were Urea, single super phosphate and muriate of potash respectively. Seed of coriander were soaked overnight for better and quick germination and dried under shade and were. The seeds were sown in line with spacing of 25cm (row to row) ×15 cm (plant to plant). Thinning and hoeing was done 30 days after sowing along with first weeding. Irrigation was given once in a week after sowing to enhance uniform seed germination. The crop was harvested when 60 per cent of seeds in main umbels turn yellowish brown in colour.

Results and Discussion

Days to flowering differs significantly in all the genotypes ranging from 44.83-77.17days (Table 2). The germplasm NRCS A.Cr-1 showed the maximum days followed by Five - X, Pant Haritma. West Bengal collection 1 was found to take minimum days to flowering. Phurailatpam *et al.*, (2016) stated that days to flowering ranges from 42.67-

68.67. In case of days to harvesting the germplasm Manipur collection-1 was the earliest to harvest (94.17 days) followed by Assam collection whereas NRCS A.Cr1 took maximum days (130.33) to harvest. Arif *et al.*, (2014) recorded 176-200 days to harvesting and Singh *et al.*, (2011) recorded 139.33-142.33 days. Pant Haritma was found tallest (114.98cm) whereas Tripura collection was the shortest (64.76cm). The result of Moniruzzaman *et al.*, (2013) showed the plant height ranging from 60.40-100.40 cm. Number of basal leaves was found highest in Arka Isha (9.50) followed by Pant Haritma. West Bengal collection1 showed the least number of basal leaves. The results are in line with Arif *et al.*, (2014), ranging from 3 - 23.2. Length of longest basal leaves was found maximum Pant Haritma (19.90) followed by Suvashini (14.40), West Bengal Collection-3. While West Bengal collection-1 showed the minimum. The highest number of primary branch was found in NRCS A. Cr1 (10.50) whereas Manipur collection-2 was recorded the least (3.83). Similar result were observed by Meena *et al.*, (2014) and Bhandhari and Gupta (1993).

Table.1 Collection of different genotypes of coriander

Treatments	Germplasms	Collected from
1.	Arka Isha	IIHR, Bangalore
2.	Manipur collection-1	Imphal, Manipur
3.	Suvashini	Gayespur, West Bengal
4.	West Bengal collection-1	Mohanpur, West Bengal
5.	West Bengal collection-2	Mohanpur, West Bengal
6.	Assam collection	Jorhat, Assam
7.	Five -X	Gayespur, West Bengal
8.	Manipur collection-2	Imphal, Manipur
9.	NRCS A.Cr-1	NRCS, Ajmer
10.	Tripura collection	Tripura
11.	Pant Haritma	GBPUAT, Pantnagar
12.	West Bengal collection-3	Cooch Behar, West Bengal

Table.2 Performance of coriander genotypes in two years for growth

Genotypes	Days to flowering			Days to maturity			Plant height(cm)			No. basal leaves			Length of longest basal leaves			No.Primary branches		
	1 st year	2 nd year	Pool	1 st year	2 nd year	Pool	1 st year	2 nd year	Pool	1 st year	2 nd year	Pool	1 st year	2 nd year	Pool	1 st year	2 nd year	Pool
Arka Isha	67.67	70.67	69.17	105.67	106.67	106.17	115.33	114.52	114.93	9.33	9.67	9.50	12.90	13.23	13.07	5.67	5.33	5.50
Manipur collection-1	50.00	51.33	50.67	93.67	94.67	94.17	74.67	69.89	72.28	3.67	3.33	3.50	12.73	12.83	12.78	5.33	5.67	5.50
Suvashini	59.33	58.33	58.83	102.33	103.67	103.00	106.02	106.41	106.21	5.67	6.67	6.17	14.30	14.50	14.40	6.67	6.33	6.50
West Bengal collection-1	43.33	46.33	44.83	99.00	100.67	99.83	76.83	75.85	76.34	3.33	3.00	3.17	9.30	9.27	9.28	4.33	4.67	4.50
West Bengal collection-2	53.00	57.67	55.33	119.00	118.67	118.83	108.11	102.91	105.51	7.67	7.33	7.50	11.97	12.30	12.13	7.33	7.00	7.17
Assam collection	42.33	47.33	44.83	96.67	98.67	97.67	78.33	76.26	77.30	4.33	3.67	4.00	12.50	12.10	12.30	4.00	4.33	4.17
Five -X	73.33	71.00	72.17	117.33	118.00	117.67	108.67	102.86	105.76	6.67	6.33	6.50	9.60	9.73	9.67	7.33	7.67	7.50
Manipur collection-2	57.67	57.33	57.50	109.67	110.67	110.17	70.95	72.99	71.97	3.33	3.67	3.50	12.33	12.17	12.25	4.00	3.67	3.83
NRCSS A.Cr-1	77.00	77.33	77.17	129.33	131.33	130.33	113.28	111.71	112.49	6.33	6.33	6.33	12.90	12.83	12.87	10.33	10.67	10.50
Tripura collection	48.67	50.00	49.33	100.33	98.00	99.17	64.33	65.19	64.76	4.33	4.67	4.50	11.00	10.53	10.77	4.67	5.00	4.83
Pant Haritma	70.33	70.33	70.33	125.00	125.67	125.33	111.55	118.41	114.98	8.67	8.00	8.33	20.03	19.77	19.90	9.67	10.00	9.83
West Bengal collection-3	64.67	65.33	65.00	107.67	108.67	108.17	83.67	83.00	83.33	6.33	6.67	6.50	13.70	13.93	13.82	3.67	4.33	4.00
SE(m)	1.84	1.59	1.27	0.74	0.97	0.61	3.84	3.34	3.37	0.33	0.42	0.30	0.34	0.45	0.34	0.36	0.37	0.30
CD at 5%	5.38	4.66	3.73	2.16	2.85	1.80	11.25	9.79	9.88	0.97	1.23	0.87	0.98	1.33	0.99	1.05	1.08	0.87

Table.3 Growth and seed character of coriander genotypes under Gangetic alluvial soils

Genotypes	No. Secondary branches			No. umbels/plant			No. umbellets/umbel			No. seeds/umbel			Test Weight		
	1 st year	2nd year	Pool	1 st year	2nd year	Pool	1 st year	2nd year	Pool	1 st year	2nd year	Pool	1 st year	2nd year	Pool
Arka Isha	12.33	12.00	12.17	22.31	22.28	22.30	4.25	4.24	4.25	36.76	36.31	36.54	8.20	8.07	8.13
Manipur collection-1	11.00	12.33	11.67	21.14	21.24	21.19	4.00	4.03	4.02	22.22	21.67	21.94	7.32	7.40	7.36
Suvashini	11.67	12.67	12.17	23.33	23.00	23.17	5.59	5.48	5.53	34.33	35.24	34.78	7.72	7.80	7.76
West Bengal collection-1	8.00	9.67	8.83	17.61	17.34	17.48	3.88	3.82	3.85	30.55	31.20	30.88	6.94	6.80	6.87
West Bengal collection-2	12.67	13.33	13.00	27.77	27.67	27.72	5.69	5.43	5.56	46.22	45.99	46.11	7.58	7.70	7.64
Assam collection	7.67	8.33	8.00	19.78	19.63	19.70	4.38	4.18	4.28	29.14	30.68	29.91	7.34	7.41	7.37
Five- X	15.00	15.33	15.17	26.00	26.00	26.00	4.90	4.64	4.77	40.03	39.95	39.99	7.14	7.14	7.14
Manipur collection-2	8.33	7.67	8.00	16.66	16.17	16.42	4.39	4.33	4.36	32.75	31.84	32.30	6.82	6.90	6.86
NRCSS A.Cr-1	17.00	18.00	17.50	24.02	24.23	24.12	6.08	6.16	6.12	51.83	50.77	51.30	6.94	7.20	7.07
Tripura collection	10.00	10.00	10.00	20.30	20.11	20.21	3.64	3.86	3.75	29.94	29.88	29.91	7.66	7.78	7.72
Pant Haritma	15.67	16.00	15.83	29.81	29.98	29.89	6.91	7.13	7.02	45.05	45.38	45.21	9.98	9.49	9.74
West Bengal collection-3	12.33	12.00	12.17	20.59	19.76	20.18	5.79	5.87	5.83	23.75	24.23	23.99	9.30	9.41	9.36
SE(m)	0.64	0.96	0.60	0.87	0.85	0.67	0.19	0.19	0.17	1.31	1.29	0.93	0.14	0.11	0.12
CD at 5%	1.89	2.82	1.76	2.57	2.49	1.96	0.56	0.56	0.50	3.84	3.78	2.72	0.42	0.32	0.35

Table.4 Yield and yield contributing character of coriander under Gangetic alluvial soils

Genotypes	Seed yield/plant(g)			Yield/plot(g)			Projected yield/ha(q)		
	1 st year	2 nd year	Pool	1 st year	2 nd year	Pool	1 st year	2 nd year	Pool
Arka Isha	2.44	2.72	2.58	300.75	303.25	302.00	15.04	15.16	15.10
Manipur collection-1	1.21	1.27	1.24	150.70	159.37	155.04	7.54	7.97	7.75
Suvashini	2.66	2.51	2.59	292.44	282.36	287.40	14.62	14.12	14.37
West Bengal collection-1	3.29	3.25	3.27	278.09	266.99	272.54	13.90	13.35	13.63
West Bengal collection-2	5.73	5.76	5.75	336.33	343.16	339.75	16.82	17.16	16.99
Assam collection	1.63	1.87	1.75	172.81	180.14	176.48	8.64	9.01	8.82
Five- X	3.78	3.66	3.72	327.08	320.82	323.95	16.35	16.04	16.20
Manipur collection-2	1.12	1.18	1.15	181.13	190.79	185.96	9.06	9.54	9.30
NRCSS A.Cr-1	5.52	5.67	5.60	382.67	386.00	384.33	19.13	19.30	19.22
Tripura collection	3.50	3.38	3.44	218.92	235.26	227.09	10.95	11.76	11.35
Pant Haritma	6.03	6.31	6.17	442.04	448.71	445.37	22.10	22.44	22.27
West Bengal collection-3	2.14	2.18	2.16	295.58	294.87	295.23	14.78	14.74	14.76
SE(m)	0.16	0.14	0.13	3.66	5.42	3.88	0.18	0.27	0.19
CD at 5%	0.48	0.42	0.37	10.73	15.90	11.39	0.54	0.79	0.57

In case of secondary branch NRCS A.Cr-1 was recorded the highest number (17.77) followed by Pant Haritma (15.83), Assam collection (8.00) showed the least. According to Datta and Choudhari (2006) number of secondary branches ranges from 10.10-16.75. So far as the umbels per plant in concerned the germplasm Pant Haritma produced the maximum number of umbels per plant (29.89) followed by West Bengal collection-2, Five-X. Whereas the germplasm Manipur collection-2 produced the minimum (16.42) number of umbels per plant. The range of umbellets per umbel in all the germplasm under study varied from 7.02 in Pant Haritma to 3.75 in Tripura collection (Table 3). The results are in line with Malik and Tehlan (2013). In case of number of seeds per umbel the maximum value was observed in NRCS A.Cr-1 (51.30) followed by west Bengal collection-2, Pant Haritma. On the other hand the minimum seeds/umbel was found with the germplasm Manipur collection-1 (21.94).

Similar results have been obtained by Meena *et al.*, (2010). Test weight in different germplasms ranged from 9.74 in Pant Haritma to 6.86 in Manipur collection-2 (Table 3). The results are in line with Jain *et al.*, (2017).

Seed yield/plant in different coriander germplasms ranged from 6.17 g in Pant Haritma to 1.15 g in Manipur collection-2 as shown in table 4. The results are in line with Kurubetta *et al.*, (2017). Yield per plot was found highest in highest in Pant Haritma (445.37) followed by NRCS A.Cr-1 (384.33) whereas Manipur collection-1(155.04) recorded the least. The result is in agreement with the observations of Moniruzzaman *et al.*, 2013 and Meena *et al.*, 2010. So far as projected yield per ha is concerned highest yield was obtained in Pant Haritma (22.27) whereas Manipur collection-1 recorded the least of (7.75). Similar results have been obtained by Phurailatpam *et al.*, (2016), Singh *et al.*, (2012) and Giridhar *et al.*, (2014).

Based on growth and seed yield of coriander genotypes, it can be concluded that the genotypes Pant Haritma followed by NRCSS, A.Cr-1 and Arka Isha are suitable for Gangetic alluvial region of West Bengal.

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How to cite this article:

Akoijam Ranjita Devi and Sharangi, A.B. 2019. Morphological Character and Seed Yield Potential of Coriander Genotypes under Gangetic Alluvial Region of West Bengal. *Int.J.Curr.Microbiol.App.Sci.* 8(04): 775-782. doi: <https://doi.org/10.20546/ijcmas.2019.804.085>