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RESEARCH PAPER

Performance of different coriander genotypes for their growth and seed yield characters under northern transitional condition of Karnataka

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Abstract : Coriander (*Coriandrum sativum* L.) is an aromatic spice crop belonging to the family Apiaceae. One of the main reasons for low yield in coriander is due to non availability of region specific genotypes. There are no systematic studies on the performance of different genotypes of coriander for different agro climatic condition. Considering the importance of the crop, the present investigation was taken upto evaluate different coriander genotypes to find out the high yielding genotype and suitable varieties for transitional region of Karnataka. The experiment was conducted at HREC, Devihosur compressing of 21 genotypes with three replications and RCBD design was followed. The varieties exhibited significant differences for all the characters including seed yield in the experiment. DCC-68 recorded the highest seed yield per plant (5.93 g), per plot (290.73 g) and per hectare (15.82 q) and the lowest yield was recorded in DCC-72 (9.60 q).

Key Words : Growth, Seed yield, Genotypes, Coriander

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INTRODUCTION

Coriander (*Coriandrum sativum* L.) is an aromatic spice crop belonging to the family Apiaceae and is native of Eastern Mediterranean region and Southern Europe. It is an important annual herb and seed spices growing in the country. Coriander is grown for seed as well as for herbage. Its used as condiment in the preparation of curry powder, pickles, sausages as seasonings. Besides condiment, coriander also has medicinal values. The dry seeds have carminative, diuretic, stomachic and aphrodisiac properties (Tiwari and Agarwal, 2004).

Coriander is a tropical crop and can be successfully cultivated in the *Rabi* season in areas free from severe frost during the flowering and seed setting stages. Dry and cool weather favours higher seed production. The season of sowing however varies with different regions of India. In Karnataka, the season of sowing is commencing from May to July during *Kharif* and from

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October to January during *Rabi* season (Farooqi *et al*., 2005).

The average yield of coriander both in India and Karnataka is low. One of the main reasons for low yield in coriander is due to non availability of region specific genotypes besides, it is grown as inter or mixed crop in cotton, onion, chilli during *Kharif* and sole crop mainly in *Rabi* season in lesser attention. Very limited scientific information is available on assessment of different coriander genotype for higher yield of transitional zone of Karnataka, though farmers are using their own genotypes for production.

There are no systematic studies on the performance of different genotypes of coriander for different agro climatic condition. Considering the importance of the crop, there is a prime need to evaluate different coriander genotypes to find out the high yielding genotype and suitable varieties for transitional region of Karnataka.

MATERIAL AND METHODS

The field experiment was conducted to evaluate the coriander (*Coriandrum sativum* L.) genotypes for growth and yield attributes under irrigated eco-system of Northern Transitional Zone of Karnataka during *Rabi* seasons 2015-2016 at Horticulture Research and Extension (UHS-HREC) Centre, Haveri (Devihosur) district Karnataka. The medium clay loam soil with the soil pH of 7.82 and Ec 0.016 ds/m at 25^0C the soil would low to medium in organic carbon 0.88 g $kg^{-1}$and medium in nitrogen 185.28 kg ha^{-1}, available phosphorus 21.86 kg ha^{-1} and available potassium 258.16 kg ha^{-1}. Design adopted was Randomized Complete Block Design (RCBD). Following 21 Genotypes as treatments, with 3 replications, comprising gross plot size: 1.12 m ×1.5 m = 1.687 m^2.

The experimental field was ploughed and brought to a fine tilth. Well decomposed farm yard manure @ 12.0 tonnes per hectare was applied and mixed well in the soil before final harrowing. The recommended dose of nutrients (35:35:35 kg NPK/ha) was applied with 50 % of N as basal dose and 50 % at 30 days after sowing.

Healthy and bold coriander seeds of different genotypes were sown on 17th October, 2015 in the experimental plot. Before sowing, the seeds were split into two halves by threshing. The seeds were directly sown in the field at specified spacing in lines of 22.5 cm x 15 cm and the plots were irrigated immediately after sowing. Regular intercultural operation was taken up and seeds were harvested at correct matured stage.

Observations on growth and yield parameters were recorded using five randomly labeled plants in each plot by avoiding border row plants.

The data recorded on various characters were subjected to Fisher's method of analysis of variance by following the formula as given by Panse and Sukhatme (1957) applied for analysis and interpretation of data. The level of significance used in "F" and "t" test was at P=0.05 and critical difference (CD) values were worked out wherever "F" test was significant.

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Growth parameters :

Plant height :

Plant height ranged from 53.80 cm to 69.00 cm (Table 1). The genotype DCC-68 recorded the highest plant height (69.00 cm) and the lowest plant height was recorded in DCC-61 (53.80 cm).

Number of primary branches ranged from 6.73 to 9.27 (Table 1). DCC-76 recorded the higher number of primary branches (9.27), while lowest number was noticed in DWD-03 (6.73).

Number of secondary branches ranged from 6.13 to 12.00. Higher number of secondary branches was registered in DCC-70 (12.00), which was at par DCC-68 (11.77). The lowest number was registered in DCC-61 (6.13).

Total biomass production :

Fresh weight at 90 DAS of the plant ranged from 10.97 to 24.52 g (Table 1). Maximum fresh weight of the plant was recorded in DCC-79 (24.52 g), which was on par with DCC-65 (20.40 g) and DCC- 67 (20.53 g). The minimum fresh weight of the plant was registered in DWD-03 (10.97 g).

Dry weight of the plant at 90 DAS ranged from 1.63 to 3.75 g. Maximum dry weight of the plant was recorded in DCC-79 (3.75 g), which was on par with DCC-73 (3.14 g), DCC-70 (3.29 g), DCC-67 (3.12 g) and DCC- 65 (3.20 g). The minimum dry weight of the plant was recorded in DCC-75 (1.63).

Plant spread in East-West :

Plant spread at 90 DAS of the genotypes ranged from 15.00 to 19.01 cm (Table 1). Maximum plant spread East-West was recorded in DCC-71 (19.01 cm). The minimum plant spread was recorded in DCC-61 (15.00 cm).

Plant spread in North-South :

Plant spread at 90 DAS of the genotypes ranged from 15.12 to 17.90 cm (Table 1). Maximum plant spread was recorded in DCC-71 (17.90 cm), whereas the minimum plant spread was found with DWD-03 (15.12 cm).

Yield parameters :

Days to 50 per cent flowering :

The varieties selected for the study exhibited significant difference with respect to days taken for 50 per cent flowering (Table 2). The earliest flowering were noticed in DCC-66 (54.33 days), DCC-74 (54.33 days) and DCC-75 (54.33 days) The number of days taken for 50 per cent flowering was maximum in DCC-63 (63 days).

Number of umbels per plant :

Number of umbels per plant differed significantly among genotype during the crop growth (Table 2).

Number of umbels per plant ranged from 14.00 to 26.33. The highest number of umbels was recorded in DCC-68 (26.33), whereas the lowest number of umbels was registered in DCC-61 (14.00).

Number of umbellets per umbel :

Number of umbellets per umbel differed significantly among the genotype during crop growth (Table 2).

Number of umbellets per umbel ranged from 5.33 to 7.67. The genotypes DCC-74 (7.67) recorded the highest number of umbellets per umbel, which was on

Table 1 : Performance of different coriander genotypes for their growth characters like plant height (cm), number of primary and secondary branches, total biomass production and plant spread(cm)

Treatments	Name of genotypes	Plant height 90 DAS	Number of primary and secondary branches		Total biomass production at 90 days		Plant spread East-West (cm)	Plant spread North-South (cm)
			90 DAS	90 DAS	Fresh (g)	Dry (g)	90 DAS	90 DAS
T_1	DCC 61	53.80	7.53	6.13	15.33	2.99	15.00	15.39
T_2	DCC 62	60.93	8.80	6.27	14.57	2.17	17.75	15.85
T_3	DCC 63	62.67	7.80	9.77	17.14	1.77	17.99	16.37
T_4	DCC 64	61.17	7.40	9.50	16.57	2.57	18.13	16.71
T_5	DCC 65	60.20	8.13	9.37	20.40	3.20	17.82	17.74
T_6	DCC 66	59.80	8.10	9.13	16.50	2.39	17.68	17.37
T_7	DCC 67	60.00	7.53	8.87	20.53	3.12	18.03	16.90
T_8	DCC 68	69.00	7.87	11.77	15.46	2.00	18.12	15.99
T_9	DCC 69	59.53	8.07	8.49	18.50	1.70	17.53	15.90
T_{10}	DCC 70	61.87	8.47	12.00	16.17	3.29	17.83	17.05
T_{11}	DCC 71	58.80	7.60	8.37	17.23	2.20	19.01	17.90
T_{12}	DCC 72	56.07	7.93	6.47	16.33	2.95	16.61	15.63
T_{13}	DCC 73	55.47	7.60	8.13	18.12	3.14	17.96	16.96
T_{14}	DCC 74	59.33	8.47	7.87	18.39	2.93	18.77	17.21
T_{15}	DCC 75	61.07	7.80	8.10	16.62	1.63	17.61	17.25
T_{16}	DCC 76	63.00	9.27	8.27	13.20	1.76	18.68	17.23
T_{17}	DCC 77	60.53	8.00	7.23	16.08	2.11	17.18	17.73
T_{18}	DCC 78	62.20	8.53	7.00	14.46	2.63	18.39	17.78
T_{19}	DCC 79	63.27	7.40	6.67	24.52	3.75	17.94	17.43
T_{20}	DCC 80	56.20	7.93	7.27	15.37	2.97	17.31	17.44
T_{21}	DWD-03	62.75	6.73	7.67	10.97	2.99	16.25	15.12
	Mean	60.36	7.95	8.30	16.66	2.49	17.69	16.81
	S.E. ±	2.27	0.25	0.19	1.58	0.25	0.49	0.54
	C.D. (P=0.05)	6.50	0.72	0.55	4.51	0.72	1.41	1.53
	CV (%)	6.52	5.46	4.03	16.28	16.97	4.83	5.53

par with DCC-72 (7.40) and DCC -71 (7.13) while the lowest number was found with DCC-65 (5.33).

Number of flowers per umbel :

There were significant differences among the genotype with respect to number of flowers per umbel at during crop growth (Table 2).

Number of flowers per umbel ranged from 7.07 to 9.07. The highest number of flowers per umbel was recorded in DCC-61 (9.07) which was at par with DCC-68 (9.00), and DCC-79 (8.87). Whereas, the lowest number of flowers per umbel was recorded in DCC-74 (7.07).

Number of seeds per umbel :

There were significant differences among the genotype with respect to number of seeds produced per umbel during crop growth stages (Table 2).

Number of seeds per umbel ranged from 31.00 to 69.60. The highest number of seeds per umbel was obtained with DCC-69 (69.60). The lowest number of seeds was obtained with DCC-70 (31.00).

Seed yield per plant (g) :

Seed yield per plant differed significantly among the different genotype (Table 2). DCC-68 gave the highest seed yield of 5.93 grams per plant, While DCC-72 noted for its lowest seed yield per plant (3.60 g).

Seed yield per plot (g) :

Seed yield per plot differed significantly differed among the different genotype (Table 2). Highest seed yield per plot was recorded in DCC-68 (290.73 g), which was at par with DCC-79 (277.67 g) and DCC-77 (275.05 g). While DCC-72 was recorded lowest seed yield per plot (176.40 g).

Seed yield per hectare (q) :

Seed yield per hectare differed significantly among the different genotypes (Table 2). The highest seed yield

Table 2 : Performance of different coriander genotypes for their yield characters

Treatments	Name of Genotypes	50 per cent flowering	Number of Umbels / Plant	Number of Umbellets / Umbel	Number of flowers / Umbel	Number of seeds/ Umbel	Seed yield / Plant (g)	Seed yield /Plot (g)	Seed yield / ha (q)
T_1	DCC 61	60.00	14.00	6.53	9.07	50.00	4.73	231.93	12.62
T_2	DCC 62	57.33	14.33	5.73	8.00	38.33	4.87	238.47	12.98
T_3	DCC 63	63.00	26.07	6.80	8.13	46.33	5.47	267.87	14.58
T_4	DCC 64	59.67	25.87	6.60	7.40	44.27	5.07	248.27	13.51
T_5	DCC 65	54.67	19.07	5.33	7.20	32.33	4.80	235.20	12.80
T_6	DCC 66	54.33	17.80	6.73	7.67	47.67	4.20	205.80	11.20
T_7	DCC 67	58.33	22.87	5.87	7.40	38.00	4.80	235.20	12.80
T_8	DCC 68	57.33	26.33	6.53	9.00	47.00	5.93	290.73	15.82
T_9	DCC 69	58.67	21.20	5.80	7.80	69.60	5.27	258.07	14.04
T_{10}	DCC 70	58.67	22.33	5.33	7.13	31.00	4.33	212.33	11.56
T_{11}	DCC 71	58.00	21.47	7.13	7.27	41.67	4.53	222.13	12.09
T_{12}	DCC 72	56.00	23.67	7.40	7.80	45.00	3.60	176.40	9.60
T_{13}	DCC 73	56.67	19.13	5.67	8.13	41.00	4.40	215.60	11.73
T_{14}	DCC 74	54.33	22.00	7.67	7.07	43.33	4.67	228.67	12.44
T_{15}	DCC 75	54.33	18.20	6.67	7.27	45.00	4.62	226.22	12.31
T_{16}	DCC 76	57.67	18.53	6.27	8.40	48.33	4.13	202.53	11.02
T_{17}	DCC 77	59.67	24.73	5.80	8.07	43.33	5.61	275.05	14.97
T_{18}	DCC 78	61.00	22.80	5.87	8.33	45.00	5.43	266.23	14.49
T_{19}	DCC 79	59.67	22.67	6.53	8.87	46.67	5.67	277.67	15.11
T_{20}	DCC 80	58.33	15.87	5.87	8.00	43.40	3.73	182.93	9.96
T_{21}	DWD-03	58.00	18.73	6.47	7.73	48.20	5.13	251.53	13.69
	Mean	57.89	20.84	6.31	7.89	44.55	4.81	235.66	12.82
	S.E. ±	1.08	2.25	0.18	0.18	3.33	0.40	19.77	1.08
	C.D. (P=0.05)	3.08	6.42	0.52	0.50	9.51	1.15	56.50	3.07
	CV (%)	3.22	18.66	5.03	3.85	12.93	14.52	14.52	14.52

per hectare was recorded in DCC-68 (15.82 q). The lowest seed yield per hectare was registered with DCC-72 (9.60 q). Six genotypes showed significantly higher seed yield per hectare than the local check DWD-03 (13.69 q).

Growth of coriander genotype in the present study varied significantly during *Rabi* season with respect to different growth and yield.

Plant height :

Among the 21 genotype evaluated during *Rabi* season, DCC-68, DCC-79, DCC-76, DCC-63 and DWD-03 produced maximum plant height (69.00, 63.27, 63.00, 62.93 and 62.75 cm, respectively) and the lowest was registered in DCC-61 (53.80 cm). This maturity of crop variations could be attributed to specific genetic makeup of the genotype and its interaction with the environmental variations in the season and better height of the genotype was also related to better biomass production in branches which helps in utilization of biomass and their elongation result in better plant growth. There are several reports indicating the variation in plant height among the varieties under different agro-climatic conditions were reported by several workers, which are in line with present findings by Shridhar *et al*. (1990) during both *Kharif* and *Rabi* from Dharwad; Rajagopalan *et al*. (1996) and Selvarajan *et al*. (2002) during *Rabi* from Coimbatore; Velayudham (2004) during both *Kharif* and *Rabi* from Arabhavi and Saxena *et al*. (2005) during *Rabi* from Kumarganj.

Number of branches :

The number of branches is the Seat for the yield as the number of branches increases number of flowers ultimately yield increases.

Number of primary branches varied from 6.73 (DWD-03) to 9.27 (DCC-76) in *Rabi* season, it was registered from the results that significantly higher primary branches were produced by genotype DCC-76 and DCC-62 (9.27 and 8.80, respectively) and least was observed in DWD-03 (6.73). Increase in the number of primary branches could be attributes to the particular

Table 3 : Performances of different genotypes for their days taken for harvesting, harvesting index (%) and seed colour in coriander

Treatments	Name of Genotypes	Days taken for harvesting	Harvesting index (%)	Seed colour
T_1	DCC 61	102.67	54.31	Golden yellow
T_2	DCC 62	97.67	55.86	Golden yellow
T_3	DCC 63	103.00	66.97	Golden yellow
T_4	DCC 64	105.67	57.98	Golden yellow
T_5	DCC 65	106.00	47.04	Golden yellow
T_6	DCC 66	113.67	51.45	Golden yellow
T_7	DCC 67	100.00	43.88	Golden yellow
T_8	DCC 68	101.00	67.78	Golden yellow
T_9	DCC 69	103.00	56.02	Golden yellow
T_{10}	DCC 70	99.00	59.90	Golden yellow
T_{11}	DCC 71	110.33	57.15	Golden yellow
T_{12}	DCC 72	115.67	72.20	Golden yellow
T_{13}	DCC 73	104.67	56.89	Golden yellow
T_{14}	DCC 74	109.67	61.30	Golden yellow
T_{15}	DCC 75	111.67	45.24	Golden yellow
T_{16}	DCC 76	116.33	47.53	Golden yellow
T_{17}	DCC 77	118.33	80.75	Golden yellow
T_{18}	DCC 78	107.33	54.17	Golden yellow
T_{19}	DCC 79	99.33	60.11	Golden yellow
T_{20}	DCC 80	115.00	39.53	Golden yellow
T_{21}	DWD-03	108.00	54.55	Golden yellow
	Mean	107.05	56.70	
	S.E. ±	2.91	5.54	
	C.D. (P=0.05)	8.31	15.84	
	CV (%)	4.70	16.92	

genotype in condition on which is grown. Similar variations among varieties with respect to primary branches were reported by several workers (Venkatareddy *et al*., 1986; Shridhar *et al.*, 1990; Selvarajan *et al*., 2002 and Velayudham, 2004) in coriander genotype grown in different agro climatic condition.

Coriander genotype showed significant variation with respect to number of secondary branches and it was ranged from 6.13 to 12.00 among the different genotype. The highest number of secondary branches produced the genotype DCC-70 (12.00) which was followed by DCC-68 (11.77) and the least number was produced with DCC-61 (6.13). The variations in production of secondary branches might be attributed to genetic characters and it's interactions with environment prevailing in *Rabi* season. Similar variation are in conformity with finding of Shridhar *et al*. (1990); Rajagopalan *et al*. (1996); Selvarajan *et al*. (2002); Velayudham (2004); Giridhar and Sarada (2005) and Moniruzzaman *et al*. (2013) in coriander genotype cultivated in different seasons.

Biomass production :

The highest fresh and dry matter was observed in DCC-79 (24.52 g and 3.75 g, respectively) and the lowest fresh and dry matter was recorded in DWD-03 and DCC-75 (10.97 g and 1.63 g, respectively). The total fresh and dry matter matter production varies significantly among the genotype. The variation the biomass production could be attributed variation the plant height, number of primary and secondary branches leaves and yield components involved in assimilation of photosynthesis material. Similar variations in fresh and dry matter among the different varieties of coriander were reported by Shridhar (1989); Hariprasadrao and Srinivasrao (2001) and Velayudham (2004).

Plant spread :

In the present study, plant spread in direction of East-West and North-South plant spread varied significantly among different coriander genotype in all the stage of crop growth at 90 DAS. East-West spread was highest in DCC-71 (19.01 cm). The minimum plant spread was observed in DCC-61 (15.00 cm).

Similarly North-South spread differed significantly among genotypes. The maximum North-South spread was recorded in DCC-71 (17.90 cm) and less plant spread was found with DWD-03 (15.12 cm) in the initial stage of the growth plant spread was minimum and as the growth advances plant spread maximum due to production of production of primary, secondary and tertiary branches and their combined effect this could be attributed to genotype showed better interaction with specific zonal condition result in better performance of growth. The present observations are in line with the reports of Banafar and Nair (1992); Yadav (1999) and Sarada and Giridhar (2005) in fenugreek.

Yield attributing parameter :

Days to 50 per cent flowering :

Coriander genotype showed marked differences in relation to days to 50 per cent flowering in the present study. The days to 50 per cent flowering was minimum in DCC-66 (54.33 days), DCC-74 (54.33 days), DCC-75 (54.33 days) followed by DCC-68 (57.33 days), DCC-62 (57.33 days), DCC- 73 (56.67 days), DCC-72 (56.00 days) and DCC-65 (54.67 days). The maximum number of days taken for 50 per cent flowering was observed in DCC-63 (63 days). This differential performance of genotype character and genotype interaction and conversion of vegetative to reproductive phase might be differed and ultimately production of flowers. Similar variations for days to flowering are also in conformity with finding of Agrawal *et al*. (1990); Selvarajan *et al*. (2002); Sarada and Giridhar (2005); Moniruzzaman *et al*. (2013) in different genotype of coriander and fenugreek.

Yield attributes :

The factors mainly responsible for the differences in the seed yield among the different genotype are due to the variations in the yield attributes like umbels per plant, umbellets per umbel, seeds per umbel and thousand seed weight. This variation in the yield components could be further attributed to the difference in the growth attributes.

In the present study, number of umbels per plant, number of umbellets per umbel, numbers of flowers per umbellet, number of seeds per umbel differed significantly among genotype. The higher number of umbels per plant was recorded in DCC-68 (26.33), number of umbellets per umbel DCC-74 (7.67), numbers of flowers per umbellet DCC-61 (9.07), number of seeds per umbel DCC-69 (69.60). This variation in the yield could be attributed to genotype character and genotypic response to environment conditions and this also related to growth

attribute of genotype.

In the present study, the thousand seed weight was differed significantly among varieties. DCC-71 (17.63 g) recorded significantly highest test weight than DCC-79 (13.27 g), which was noted as the least among the varieties tested for their test weight. This variation in seed weight related to the variation in boldness of seed and varietal character. Similar variation also reported by Yadav (1999), Raje *et al*. (2003), Sarada *et al.* (2005), Subramanian *et al*. (2005) and Singh and Kaur (2007) in coriander.

Seed yield :

The varieties exhibited significant differences for all the characters including seed yield in the experiment.

Among the 21 varieties tested in *Rabi*, DCC-68 recorded the highest seed yield per plant (5.93 g), per plot (290.73 g) and per hectare (15.82 q). The lowest yield was recorded in DCC-72 (9.60 q). The variation in the seed yield among the genotype could be attributed variation in the growth and yield attributes. Increase in the yield in DCC- 68 and related genotype might be attributed production of umbels and umblets per plant, seed set, test weight and boldness of seed contributed increase in yield components to other genotypes. Considerable variations in the seed yield among the varieties of coriander were also reported earlier by several workers (Singh and Jain, 1970; Seemanthini *et al*., 1982; Shridhar *et al*., 1990; Rajagopalan *et al.*, 1996; Selvarajan *et al*., 2002; Giridhar and Sarada, 2005; Saxena *et al*., 2005; Velayudham *et al.*, 2006 and Prabhu and Balakrishnamoorthy, 2006).

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