Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2320-7051.6077

ISSN: 2320 – 7051

Int. J. Pure App. Biosci. **6 (1):** 1308-1314 (2018)

Research Article

International Journal of Pure & Applied Bioscience

OPEN ACCESS

Flowering and Yield Characters among Coriander Genotypes

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Received: 6.12.2017 | Revised: 14.01.2018 | Accepted: 19.01.2018

ABSTRACT

The present study was conducted at HCRI Venkataramannagudem, Andhra Pradesh to evaluate thirty genotypes of coriander (Coriandrum sativum L.). The genotypes LCC-325 had maximum leaf area (83.19 cm²), genotype LCC-316 took minimum days to flower initiation (39.5 days), LCC-335 took minimum days to 50% flowering; The genotypes Shiggaon-1, AD-1, Suguna, LCC-200, LCC-331 and LCC-316 took minimum number of days (54.00) to complete flowering; The genotype Savanur-1 took minimum number of days to maturity (89.18). The genotype LCC-316 had maximum number of umbels per plant (42.43), the genotype LCC-331 had maximum number of umbellets per umbel (8.40), The maximum umbel diameter (5.74 cm) was recorded by Hirekerur-1. The genotype LCC-319 had maximum number of schizocarps per umbel; genotype LCC-317 produced more number of schizocarps per umbellets (5.90), genotype AD-1 produced less number of schizocarps per umbellets (3.90), genotype LCC-317 produced more number of schizocarps per plant (228.04) which was on par with LCC-321 (218.02). Whereas maximum yield was achieved in genotype Suguna (commercial check) (502.17 kg/ha) was significantly superior over than other genotypes evaluated.

Key words: *Coriander, Leaf area, Flowering, Fruit, Yield.*

INTRODUCTION

Coriander (*Coriandrum sativum* L.) is a native of Mediterranean region wherefrom its spread to Europe, Asia, North and South – America and Australia. It is the most important seed spice crop cultivated throughout the world both for seed and leaf purpose. The crop grows in tropics and requires a cool but comparatively dry frost-free climate, particularly at flowering and seed formation stages[7]. It is grown in almost all the states of India either for grain or leaf or dual purpose. In India the crop is cultivated mainly in Rajasthan, Madhya Pradesh, Andhra Pradesh, Orissa, Tamil Nadu and Karnataka on an area of 5.43 lakh ha with a production of 5.24 lakh metric tonnes[8]. The average crop productivity is only 965 kg ha^{-1} and is much lower in rainfed farming situation (477 kg ha^{-1}). Locally grown indigenous genotypes are low in productivity and give poor returns to the farmers.

Cite this article: Nagappa, M.K., Reddy, M.L. and Dorajeerao, A.V.D., Flowering and Yield Characters among Coriander Genotypes, *Int. J. Pure App. Biosci.* **6(1):** 1308-1314 (2018). doi: http://dx.doi.org/10.18782/2320-7051.6077

Critical evaluation of available selections of improved types with high yield potential/ traits is of great value to the breeder for crop improvement[4], Keeping this in view, the present study was undertaken to evaluate promising diverse genotypes from Godavri zone of Andhra Pradesh.

MATERIAL AND METHODS

The present was carried out during the year 2015-16 at Horticulture College and Research Institute, Dr. Y.S.R Horticultural University, Venkataramannagudem, West Godavari District. The location experiences hot humid summer and mild winter. A total of thirty genotypes were taken for evaluation study out of which fifteen genotypes were sourced from HRS Devihosur (Haveri) Karnataka (Ranibennur-1, Ranibennur-2, Ranibennur-3, Byadagi-1, Hangel-1, Hangel-2, Savanur-1, Savanur-2, Savanur-3, Hirekerur-1, Hirekerur-2, Hirekerur-3, Shiggaon-1, Shiggaon-2, Shiggaon-3) whereas, the rest of the accessions were sourced from HRS Lam Guntur, Andhra Pradesh (LCC-200, LCC-331, LCC-321, LCC-323, LCC-325, LCC-334, LCC-335, LCC-316, LCC-328, LCC-320, LCC-317, LCC-319 and LCC-322; and two checks viz., AD-1 (local check) and Suguna (commercial check). The experiment was laid out in RBD with two replications and thirty genotypes. The crop was raised at a plant spacing of 30 cm x 15 cm. The seed were sown during 2nd of November and harvested during 2nd fortnight of February.

RESULT AND DISCUSSION

Leaf area

The data of 2015-2016 year indicated that the genotypes under evaluation varied significantly with respect to qualitative and seed yield attributes studied. The data (Table 1) revealed that there were significant differences among genotypes with respect to leaf area at different stages of plant growth. The genotype LCC-325 showed maximum leaf area (83.19 cm^2) at 75 DAS which was on par with LCC-320 (82.44 cm^2), LCC-323 (81.94 cm^2), Hangel-1(81.85 cm^2), LCC-328 (80.69 cm^2), LCC-316 (80.48 cm^2), LCC-319 (80.42 cm^2) and Shiggaon-2 (80.07 cm^2) whereas, LCC-200 showed minimum leaf area (68.30 cm^2) which was on par with Ranibennur -3 (68.68 cm^2), Savanur-2 (70.01 cm^2) and Savanur-3 (71.21 cm^2). Nineteen genotypes excelled the local check AD-1 (74.44 cm^2) with respect to leaf area per plant. Leaf area is the area of assimilation of light energy into chemical energy through a process known as photosynthesis. The effectiveness of photosynthetic apparatus inside the plant is quantitatively delimited by leaf area per plant. Since the photosynthetic products contribute to the protoplasm inside the cells, tissues and organs, it is the area of assimilation that governs the gross material ingested and synthesised within the plant system. Therefore the fresh weight of whole plant is dependent on leaf area per plant and also the number of leaves per plant. Fresh weight of plant largely includes moisture in the cellular environment. The tenacity with which the moisture is held can be different in different cells or tissues or organs and also largely in genotypes. A genotype that loses moisture loosely may be left with very little dry matter and similarly when the vegetative parts are stronger and not plump in any accession, they may show slightly more dry matter disproportioning with its corresponding fresh weight. However, there is slightly similar ranking or at par ranking between fresh weight and dry weight values among the genotypes in the present study. Similar influence of these characters and their interdependence was also compiled by[3], in coriander.

Flowering duration

Significant differences were noticed among the genotypes in respect of days taken for flower initiation (Table 1). The genotype LCC-316 took minimum number of days (39.5) to flower initiation which was on par with LCC-335, LCC-328, Hirekerur-2, Hirekerur-3, LCC-200, LCC-320, Savanur-1, Savanur-3, Shiggaon-1, Shiggaon-2, AD-1, Suguna, LCC-323, LCC-334 and Shiggaon-3 (40, 40, 40.5, 40.5, 40.5, 40.5, 41, 41, 41, 41, 41, 41, 41, 41, 41.5 respectively). The genotype Hangel-1 took maximum number of days (44.50) to initiation of flowering which was on par with Ranibennur-1, Ranibennur-2, LCC-321, Ranibennur-3, Byadagi-1, Savanur-3 and HIrekerur-1 (43.50, 43.00, 43.00, 42.50, 42.50, 42.50 and 42.50 respectively). A total 12 genotypes were significantly early in flower initiation as compared to the commercial and local check variety Suguna and AD-1(41.00) respectively. The differences among the genotypes in respect of days to 50% flowering (Table 1) were found to be significant. The genotype LCC-335 took minimum number of days (47.24) to 50 per cent flowering which was on par with LCC-328, Savanur-2, Savanur-1, AD-1, Hirekerur-1 LCC-320, Hirekerur-3, Shiggaon-3, LCC-316, Shiggaon-1, LCC-331 and Hirekerur -2 (47.71, 47.71, 48.18, 48.29, 48.41, 48.53, 48.53, 48.76, 49.12, 49.12, 49.35 and 49.74 respectively). The genotype Hangel-1 and Ranibennur -1 took maximum number of days (54.60) to 50 percent flowering on par with Hangel-2, Byadagi-1, LCC-334 and Savanur-3 (53.56, 52.75, 52.50 and 52.28, respectively). A total 13 genotypes were significantly early for 50 % flowering as compared to the commercial check Suguna (50.40 days). The number of days taken to complete flowering showed significant differences among the genotypes (Table 1). The genotypes Shiggaon-1, AD-1, Suguna, LCC-200, LCC-331 and LCC-316 took minimum number of days (54.00) to complete flowering which was on par with 11 genotypes i .e. LCC-335 (54.50), Hirekerur-3 (55.00), LCC-320 (55.00), Ranibennur-2 (55.50), Byadagi-1 (55.50), Savanur-1(55.50), Hirekerur-2 (55.50), Shiggaon-3 (55.50), LCC-321 (55.50), LCC-323 (55.50), LCC-334 (55.50). The maximum number of days to complete flowering (59.50) was recorded by Ranibennur -1 on par with Savanur-3 (58.00). AD-1 and Suguna were significantly early (54 days) to complete flowering as compared to the other genotypes. The data showed that there were significant differences among the genotypes in respect of days taken to maturity (Table 1). The genotype Savanur-1 took minimum number of days to maturity (89.18) which was on par with Savanur-2 (89.32), Hirekerur-2 (89.32), Hirekerur-1 (89.61), Hirekerur-3 (90.86), Shiggaon-1 (90.92), LCC-335 (90.92), Shiggaon-3 (91.30), LCC-328 (91.30) and LCC-323 (92.18). Savanur-3 took maximum number of days to maturity (106.60) which was on par with Ranibennur-1 (105.80) and Hangel-1 (103.95). Sixteen genotypes took significantly lesser number of days to maturity as compared to the commercial check Suguna (95.55).

Flowering behaviour of accessions exhibited partial similarity but not any significant contrast among the lines. Since it is a photomorphogenetic effect genotypes may differ based on their inherent properties. Days to initiate and complete flowering indicate the transition and to complete reproductive phase of the plant. In the present study, the differences in genotypes in days to initiate flowering might be inherent and differential response to photomorphogenetic stimuli. The days taken to complete flowering in each genotype depended on the duration of flowering which in turn decided the number of productive sinks i.e. flowers and grains[6] .in fenugreek[2] ,in coriander also observed similar differences in flowering behaviour of genotypes in coriander and fenugreek.

Umbels

The data revealed that there were significant differences among the genotypes in respect of umbels per plant (Table 2). The genotype LCC-316 had maximum number of umbels per plant (42.43) which was on par with LCC-320 (40.68) and minimum number of umbels per plant (17.85) was recorded in the Hangel-1. A total of 7 genotypes had significantly more number of umbels per plant as compared to the local check AD-1 (34.62). The data revealed that there were significant differences among the genotypes in respect of umbellets per umbels (Table 2). The genotype LCC-331 had maximum number of umbellets per umbel (8.40), which was on par with LCC-200, LCC-322, Hangel-2, LCC-319 and LCC-328 (8.38, 8.28, 8.24, 8.19 and 8.12 respectively) whereas, the minimum number of umbellets per umbel (5.4) was recorded in the LCC-334 on par with Savanur-3, Hirekerur-3, LCC-320, Shiggaon-1, LCC-335 and LCC-317 (6.56, 6.61, 6.81, 6.90, 7.04 and 7.04 respectively). A total of 8 genotypes had significantly more number of umbellets per umbel as compared to the local check AD-1 (7.60). Significant differences were observed among the genotypes with respect to umbel diameter (Table 2). The maximum umbel diameter (5.74 cm) was recorded by Hirekerur-1 which was on par with LCC-331 (5.73 cm), LCC-317 (5.68 cm), LCC-321 (5.57 cm), Ranibennur-2 (5.48 cm), LCC-323 (5.47 cm), LCC-322 (5.33 cm) and Lcc-200 (5.23 cm) while LCC-320 was having the lowest umbel diameter (3.53 cm) on par with Savanur-3 (3.63 cm) and AD-1 (3.82 cm). Twenty genotypes produced significantly more umbel diameter as compared to the commercial check Suguna (4.66 cm).

Schizocarps

Significant differences were noticed among the genotypes with respect to number of schizocarps per umbel (Table 3). The genotypes LCC-319 had maximum number of schizocarps per umbel (41.58) which was on par with LCC-316 (39.08). The genotype LCC-320 had minimum number of schizocarps per umbel (23.33) which was on par with Suguna (24.36), Hirekerur -1 (25.96) and Ranibennur-2 (26.23). Three genotypes were significantly more number of schizocarps per umbel as compared to local check AD-1 (36.78). Significant differences were observed among the genotypes with respect to number of schizocarps per umbellets (Table 3). The genotype LCC-317 produced more number of schizocarps per umbellets (5.90). The genotype AD-1 produced less number of schizocarps per umbellets (3.90). Four genotypes produced more number of schizocarps per umbellets as compared to the commercial check Suguna (5.32). Significant differences were observed among the genotypes with respect to number of schizocarps per plant (Table 3). The genotype LCC-317 produced more number of schizocarps per plant (228.04) which was on par with LCC-321 (218.02). The genotype Shiggaon-3 produced less number of schizocarps per plant (144.05) on par with LCC-323 (146.37) and LCC-320 (147.28). Four genotypes produced more number of schizocarps per plant as compared to the commercial check Suguna (213.06).

During reproductive phase, coriander produces umbellets in each umbel and these umbellets bear the schizocarps. It is the effectiveness of the schizocarp bearing points on the umbellets that decides the productivity of each umbel. The number of umbellets per umbel is not showing very wide variations perhaps it may be a crop bound character and not so dynamic with genotype. The accessions having greater leaf area and long duration of flowering are naturally vested with a great amount of time in which they can divert assimilates into the reproductive parts and therefore would be able to produce a higher quantity of fruits (schizocarps) in each plant. In the present study the accessions with merit in leaf area and other vegetative parameters coupled with a long crop duration are found to show a larger quantity of grain production compared to other accessions. The association of these parameters with grain yield was also observed among different varieties of coriander by Meena *et al.*[3] in coriander.

Grain yield

The genotypes varied significantly in terms of grain yield per plant (Table 3). The highest grain yield per plant (17.33 g) was recorded by commercial check Suguna which was on par with LCC-328 (15.60 g). The genotype Savanur-1 produced the lowest grain yield per plant (4.10 g) on par with Byadagi-1 (4.75 g), Ranibennur-3 (5.67 g) and Shiggaon-1 (5.75 g). Twenty nine genotypes had significantly lower grain yield per plant as compared to the commercial check Suguna (17.33 g). The grain yield per plot exhibited significant differences among the genotypes studied (Table 3). Maximum grain yield per plot at (207.90 g) was recorded by Suguna which was on par with LCC-328 (187.20 g). The genotype Savanur-1 recorded the lowest grain yield per plot (65.80 g) on par with Byadagi-1 (74.64 g), Shiggaon-1 (79.80 g), Ranibennur-3

(82.50 g), Hangel-2 (94.15), LCC-317 (96.72) and LCC-320 (98.50 g).The commercial check Suguna genotype had significantly maximum grain yield per plot as compared to the all other genotypes (207.90 g). The grain yield per hectare exhibited significant differences among the genotypes studied (Table 3). Maximum grain yield per hectare (502.17 kg) was recorded by Suguna which was on par with LCC-328 (452.10 kg). The genotype Savanur-1 recorded the lowest grain yield per hectare (158.94 kg) on par with Byadagi-1 (180.29 kg), Shiggaon-1 (192.75 kg), Ranibennur-3 (199.28 kg), Hangel-2 (227.42 kg) and LCC-317 (233.62 kg).The commercial Suguna genotypes had significantly maximum grain yield per hectare as compared to the all other genotypes (502.17 kg). The boldness of grain and its weight and oil content are dependent on how it was able to drag the assimilates from different sources and also perhaps due to its genetic makeup. It is the speed and steady flow of the photosynthetic products that decides over time the size of the fruits and its weight. Therefore, these quality parameters are necessarily influenced by greater values of vegetative parameters as evident from the data obtained on these parameters from various genotypes. Bold grains and in higher quantities would definitely lead to greater grain yield per plant which in turn govern corresponding top rank of a genotype in grain yield per plot and per hectare. However, grain quality has no bearing on total yield or quantity produced by an accession. In the present study, it is evident that genotypes had independent ranking with regard to quality parameters as against grain yield. Yield is a complex character and is influenced by several attributing parameters. Similar trends were also noted by Meena *et al.*[3] in coriander and Anubha *et al.*[1] in fenugreek.

Table 1: Leaf area, flowering and umbel traits in coriander genotypes

Genotypes	Leaf area (cm^2)	Days taken to flower initiation	Days taken to 50% flowering	Days taken to complete flowering	Days taken to maturity
Ranibennur-1	74.53	43.50	54.60	59.50	105.80
Ranibennur-2	71.73	43.00	50.45	55.50	96.86
Ranibennur-3	68.68	42.50	50.47	56.00	94.76
Byadagi-1	76.80	42.50	52.75	55.50	101.28
Hangel-1	81.85	44.50	54.60	56.00	103.95
Hangel-2	78.35	41.00	53.56	56.00	96.82
Savanur-1	74.26	42.00	48.18	55.50	89.18
Savanur-2	70.01	41.00	47.71	56.50	89.32
Savanur-3	71.21	42.50	52.28	58.00	106.60
Hirekerur-1	73.55	42.50	48.41	56.00	89.61
Hirekerur-2	77.13	40.50	49.74	55.50	89.32
Hirekerur-3	76.03	40.50	48.53	55.00	90.86
Shiggaon-1	78.96	41.00	49.12	54.00	90.92
Shiggaon-2	80.07	41.00	51.75	57.00	96.26
Shiggaon-3	78.85	41.50	48.76	55.50	91.30
AD-1 (check)	74.44	41.00	48.29	54.00	94.53
Suguna (check)	73.55	41.00	50.40	54.00	95.55
LCC-200	68.30	40.50	51.33	54.00	96.37
LCC-331	74.27	42.00	49.35	54.00	98.70
LCC-321	76.08	43.00	51.08	55.50	93.83
LCC-323	81.94	41.00	51.33	55.50	92.18
LCC-325	83.19	42.00	51.45	56.00	94.50
LCC-334	72.62	41.00	52.50	55.50	98.70
LCC-335	78.79	40.00	47.24	54.50	90.92
LCC-316	80.48	39.50	49.12	54.00	94.60
LCC-328	80.69	40.00	47.71	57.00	91.30
LCC-320	82.44	40.50	48.53	55.00	99.51
LCC-317	78.42	42.00	50.72	57.50	93.23
LCC-319	80.42	42.00	51.45	56.00	95.55
LCC-322	76.58	42.00	51.70	56.00	99.64
Mean	**76.47**	**41.57**	**50.44**	**55.67**	**91.60**
S Em ±	1.03	0.76	0.88	0.56	1.33
CD	2.99	2.19	2.55	1.61	3.86

Table 2: Umbel parameters traits in coriander genotypes

Genotypes	Number of umbels per plant	Number of umbellets per umbel	Umbel diameter(cm)
Ranibennur-1	32.12	7.26	5.12
Ranibennur-2	26.62	7.26	5.48
Ranibennur-3	24.72	7.42	4.95
Byadagi-1	31.12	7.39	5.01
Hangel-1	17.85	7.14	4.69
Hangel-2	22.87	8.24	4.82
Savanur-1	21.32	7.59	4.53
Savanur-2	22.33	7.31	4.73
Savanur-3	27.06	6.56	3.63
Hirekerur-1	29.05	7.42	5.74
Hirekerur-2	21.52	7.51	5.05
Hirekerur-3	33.04	6.61	4.58
Shiggaon-1	36.16	6.90	4.95
Shiggaon-2	32.09	7.45	4.96
Shiggaon-3	27.18	7.47	4.66
AD-1 (check)	34.62	7.60	3.82
Suguna (check)	33.39	7.14	4.66
LCC-200	30.38	8.38	5.23
LCC-331	23.52	8.40	5.73
LCC-321	30.65	7.30	5.57
LCC-323	31.63	7.75	5.47
LCC-325	27.51	7.77	4.72
LCC-334	36.96	6.51	4.49
LCC-335	27.74	7.04	4.51
LCC-316	42.43	7.32	4.81
LCC-328	36.34	8.12	4.49
LCC-320	40.68	6.81	3.53
LCC-317	31.88	7.04	5.68
LCC-319	38.01	8.19	4.58
LCC-322	39.60	8.28	5.33
Mean	**30.35**	**7.44**	**4.85**
S Em ±	0.86	0.20	0.19
CD	2.50	0.57	0.54

Table 3: Fruiting and seed yield traits in coriander genotypes

Genotypes	Number of schizocarps per umbel	Number of schizocarps per plant	Number of schizocarps per umbellets	Grain yield per plant(g)	Grain yield per plot(g)	Grain yield per ha(kg)
Ranibennur-1	31.50	169.92	4.00	8.80	105.60	255.07
Ranibennur-2	26.23	161.73	4.38	9.59	115.03	277.84
Ranibennur-3	31.93	188.51	4.84	5.67	82.50	199.28
Byadagi-1	29.33	170.10	4.26	4.75	74.64	180.29
Hangel-1	26.67	160.27	4.55	8.93	107.10	258.70
Hangel-2	29.46	211.90	4.90	6.70	94.15	227.42
Savanur-1	30.14	193.07	5.00	4.10	65.80	158.94
Savanur-2	27.00	186.56	5.40	11.17	133.98	323.62
Savanur-3	36.49	192.78	5.10	10.25	123.00	297.10
Hirekerur-1	25.96	159.79	5.20	10.82	129.78	313.48
Hirekerur-2	28.62	194.74	4.26	11.67	140.07	338.33
Hirekerur-3	32.83	206.91	4.78	10.84	130.10	314.24
Shiggaon-1	33.96	187.27	4.85	5.75	79.80	192.75
Shiggaon-2	28.98	170.99	4.98	8.63	103.53	250.07
Shiggaon-3	32.37	212.08	5.12	10.38	124.50	300.72
AD-1 (check)	36.78	144.05	3.90	9.25	110.97	268.04
Suguna (check)	24.36	213.06	5.32	17.33	207.90	502.17
LCC-200	32.89	184.90	5.00	12.57	150.84	364.35
LCC-331	36.96	213.48	4.76	13.80	165.60	400.00
LCC-321	35.86	218.02	4.85	11.50	138.00	333.33
LCC-323	35.62	146.37	4.90	12.66	151.92	366.96
LCC-325	32.55	191.14	4.38	9.98	119.70	289.13
LCC-334	34.02	209.08	4.60	8.93	107.10	258.70
LCC-335	35.78	216.61	5.21	9.38	112.50	271.74
LCC-316	39.08	171.72	5.50	13.44	161.25	389.49
LCC-328	34.76	207.26	5.26	15.60	187.20	452.17
LCC-320	23.33	147.28	4.70	7.42	98.54	238.02
LCC-317	32.50	228.04	5.90	7.48	96.72	233.62
LCC-319	41.58	208.74	5.60	11.55	138.60	334.78
LCC-322	33.12	197.80	5.32	10.00	120.00	289.86
Mean	**32.02**	**188.81**	**4.89**	**9.96**	**119.55**	**296.01**
S Em ±	1.01	3.90	0.10	0.80	12.10	25.88
CD	2.92	11.29	0.29	2.32	34.99	74.85

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