Journal of Tropical Agriculture 55 (2): 200-204, 2017

Short communication

Effect of growing conditions on growth and herbage yield of coriander

Surya Raj* and P. Anitha

College of Horticulture, Kerala Agricultural University, Vellanikkara, Thrissur- 680656, Kerala, India.

Received 9 September 2017; received in revised form 22 December 2017; accepted 26 December 2017

Abstract

A study was conducted in the plains of Kerala to investigate the performance of coriander varieties for herbage yield and quality in the open and rain shelter conditions. The study revealed that significantly higher number of days for germination, number of leaves, herbage and biomass yield, plant height and days to leaf serration was observed in plants grown in the rain shelter compared to the open field. Among the varieties, Arka Isha recorded the highest mean values for number of leaves, herbage and biomass yield and delayed leaf serration. There was a significantly higher vitamin C content (mg $100g^{-1}$) in plants grown in open field (189.72) compared to rain shelter (124.55). The volatile oil ranging from 0.05-0.06% was recorded in both the growing conditions and were on par. Total chlorophyll content was more in the open field (1.98) than in rain shelter (1.92). Among the varieties, total chlorophyll content was more in CO (Cr-4) (2.33).

Keywords: Biomass yield, Coriander, Herbage yield, Quality, Plant height,

Coriander (*Coriandrum sativum* L.), belonging to the family Apiaceae, is an important annual spice herb, mainly cultivated for its fruits as well as for its tender green leaves (Kumar et al., 2004). India is the largest producer, consumer and exporter of coriander seeds in the world, accounting for approximately 80 per cent of total world production. Recent understanding of the nutraceutical and medicinal properties of coriander leaves elevated the status of this herb. The leaves and stem tips are rich in numerous anti-oxidant polyphenolic flavonoids such as quercetin, kaempferol, rhamnetin and epigenin. It is one of the richest herbal sources for vitamins especially Vitamin A, C and K (Girenko, 1982). Leaves are also rich in â-carotene, water, dietary fibre, fats, protein and minerals. The different plant parts possess antioxidant, diuretic, anti-diabetic, sedative, anti-microbial, anti-convulsant, hypnotic, anthelmintic and anti-mutagenic properties. Detailed and definite information on the performance of coriander varieties in terms of herbage yield and quality attributes under Kerala conditions are lacking at present. Hence, an attempt was done to evaluate the performance of coriander varieties under different growing conditions.

The present study entitled-Performance evaluation of coriander types in different growing conditions" was laid out during *rabi s*eason (October 2016-December 2016) in two different growing conditions *viz.,*rain shelter and open field by following Randomized Complete Block Design (RBD) with five treatments (genotypes/ varieties) namely CO-1, CO-2, CO-3, CO (Cr-4) and Arka Isha and four replications. Days to germination, number of leaves at 30 days after sowing and at harvest, herbage yield, biomass yield, plant height at 60 DAS and days to leaf serration were recorded from tagged plants in each replication and the biochemical analysis for estimation of volatile oil, vitamin- C and chlorophyll content of each variety

*Author for correspondence: Phone: +91- 9048443365, Email: suryavavahorti8.sr@gmail.com

was done by using standard procedures recommended by Clevenger (1982) and Sadasivam and Manickam (1996). The data was statistically analyzed by using OPSTAT Online Package software, to find out the effect of growing conditions on growth, yield and quality of the varieties.

The results of days to seed germination, number of leaves, herbage yield, biomass yield, plant height, days to leaf serration and various quality parameters are presented in the Tables 1 to 7. The mean number of days required for seed germination differed significantly in rain shelter (9.73) and open field (8.56). It was clear that seeds sown in open field required significantly less number of days for germination. The varieties exhibited a similar trend for days to germination in rain shelter and open field. In both the growing conditions, lowest number of days (6.46) was required by the variety CO (Cr-4). The varieties CO-2 and CO-3 performed on par with each other and CO-1 required 8.96 days for germination. The highest number of days (14.05) was needed for the variety Arka Isha as given in Table (1).

Table 1. Effect of growing conditions on days to seed germination in coriander

Varieties	Days to seed germination		
	Rain shelter	Open field	Mean
CO-1	9.83	8.1	8.96
CO-2	8.35	7.62	7.99
CO-3	9.45	7.07	8.26
CO(Cr-4)	6.7	6.22	6.46
Arka Isha	14.32	13.77	14.05
Mean	9.73	8.56	
CD (0.05)			
Growing conditions		0.30	
Varieties		0.48	
Growing condition×varieties		0.67	

Table 2. Effect of growing conditions on number of leaves in coriander

Varieties	Number of leaves at 30 DAS			Number of leaves at harvest		
	Rain shelter	Openfield	Mean	Rain shelter	Openfield	Mean
CO-1	8.65	7.98	8.31	14.00	13.02	13.51
CO-2	8.58	7.50	8.04	12.75	12.82	12.79
CO-3	7.30	7.15	7.22	11.82	11.88	11.85
CO(Cr-4)	10.35	9.82	10.09	15.48	14.70	15.09
Arka Isha	10.80	9.88	10.34	16.85	16.82	16.84
Mean	9.13	8.46		14.18	13.85	
CD (0.05)						
Growing conditions		0.23			0.30	
Varieties		0.36			0.48	
Growing condition×Varieties		NS			NS	

Table 3. Effect of growing conditions on herbage and biomass yield of coriander

Varieties	Herbage yield (g)			Biomass yield (g)		
	Rain shelter	Open Field	Mean	Rain shelter	Open field	Mean
CO-1	9.48	8.46	8.97	13.50	11.89	12.70
CO-2	8.56	7.82	8.19	12.03	11.09	11.56
CO-3	8.84	8.53	8.68	11.93	10.8	11.37
CO(Cr-4)	8.10	7.40	7.75	11.86	9.18	10.52
Arka Isha	11.07	9.84	10.46	14.55	13.72	14.13
Mean	9.21	8.41		12.78	11.34	
CD (0.05)						
Growing conditions		0.48			0.53	
Varieties		0.77			0.83	
Growing condition × Varieties		NS			NS	

Significantly higher number of leaves were recorded in rain shelter (9.13 and 14.18) compared to the open field (8.46 and 13.85), respectively at 30 DAS and at the time of harvest. Highest number of leaves (10.34 and 16.84) were recorded in Arka Isha compared to the other varieties at 30 DAS and at harvest, respectively. The lowest number of leaves were recorded in the variety CO-3 (7.22 and 11.85) respectively in the same period. The varieties CO-1 and CO-2 were on par, with respect to mean number of leaves produced at 30 DAS. It was also observed that the varieties CO (Cr-4) and Arka Isha performed on par at 30 DAS with respect to number of leaves. However, the same varieties performed significantly differently for the above character at the time of harvest as shown in Table (2).

Significantly higher herbage yield (g plant^{-1}) was observed from plants grown under rain shelter (9.21) compared to the open field (8.41). Among the varieties, Arka Isha recorded the highest herbage yield (10.46), followed by CO-1 (8.97) and CO-3 (8.68), and the performance of CO-2 (8.19) and CO (Cr-4) (7.75) were on par with each other. The interaction effect of growing conditions and varieties with respect to herbage yield was not significant. Similarly, biomass yield (g per plant) was significantly higher in rain shelter (12.78) than in the open field (11.34). Arka Isha was significantly superior (14.13) followed by CO-1 (12.70) with respect to biomass yield. The varieties CO-2 (11.56) and CO-3 (11.37) were on par with each other. CO (Cr-4) was significantly inferior (10.52) to all the other varieties and the interaction effect was not significant as given in Table (3).

At 60 DAS, plant height was significantly higher in rain shelter (27.04 cm) than in open field (25.88 cm). The variety Arka Isha recorded the highest plant height (27.83 cm), which was on par with CO-1 (27.25 cm). CO-2 recorded a plant height of 27.08 cm, while the lowest plant height was observed in CO-(Cr-4) (24.26) as given in Table (4).

Table 4. Effect of growing conditions on plant height in coriander

Varieties	Plant height at 60 DAS (cm)		
	Rain shelter	Open field	Mean
CO-1	27.74	26.75	27.25
CO-2	27.56	26.60	27.08
CO-3	26.71	25.08	25.89
CO(Cr-4)	24.73	23.80	24.26
Arka Isha	28.46	27.20	27.83
Mean	27.04	25.88	
CD (0.05)			
Growing conditions		0.44	
Varieties		0.70	
Growing condition ×Varieties		NS	

In the rain shelter, more number of days to appearance of serrated leaves (44.44 days) were observed compared to the open field (43.34 days). Upon comparing the varieties, it was evident that early appearance of serrated leaf was noticed in CO (Cr-4) (37.24 days). The varieties CO-1 (43.68 days) and CO-3 (44.38 days) were on par with each other. Serrated leaf appearance was most delayed in Arka Isha (49.30 days) followed by CO-2 (44.84 days) as shown in Table (5). Similar results were reported by Shoba and Rajamani (2009) and Giridhar et al. (2015).

In general, the growing conditions and the varieties did not have any effect on the volatile oil content (%). The volatile oil ranged from 0.05 -0.06

Table 5. Effect of growing conditions on days to leaf serration in coriander

Varieties	Days to serration of leaves		
	Rain shelter	Open field	Mean
CO-1	44.45	42.90	43.68
CO-2	45.52	44.15	44.84
CO-3	44.15	44.6	44.38
CO(Cr-4)	38.12	36.35	37.24
Arka Isha	49.92	48.68	49.30
Mean	44.44	43.34	
CD (0.05)			
Growing conditions		0.64	
Varieties		1.01	
Growing condition ×Varieties		NS	

Table 6. Effect of growing conditions on volatile oil and vitamin C contents in coriander

Varieties	Volatile oil (%)			Vitamin C (mg 100g^{-1})		
	Rain shelter	Open Field	Mean	Rain shelter	Open field	Mean
CO-1	0.06	0.06	0.06	124.55	209.35	166.95
CO-2	0.06	0.05	0.05	116.60	177.55	147.08
CO-3	0.06	0.06	0.06	148.40	233.20	190.80
CO(Cr-4)	0.05	0.05	0.05	127.20	103.25	115.23
Arka Isha	0.06	0.06	0.06	106.00	225.25	165.63
Mean	0.06	0.05		124.55	189.72	
CD (0.05)						
Growing conditions		NS			12.45	
Varieties		NS			19.69	
Growing condition × Varieties		NS			27.84	

Table 7. Effect of growing conditions on chlorophyll content in coriander

Varieties	Chlorophyll a (mg 100 g^{-1})			Chlorophyll b (mg 100 g^{-1})			Chlorophyll bl (mg 100 g^{-1})		
	Rain shelter	Openfield	Mean	Rain shelter	Openfield	Mean	Rain shelter	Openfield	Mean
CO-1	1.33	1.03	1.18	0.59	0.40	0.50	1.92	1.44	1.68
CO-2	1.08	1.19	1.14	0.45	0.37	0.41	1.53	1.57	1.55
CO-3	1.37	1.53	1.45	0.54	0.52	0.53	1.91	2.05	1.98
CO(Cr-4)	1.51	1.24	1.38	0.58	0.46	0.52	2.10	2.56	2.33
Arka Isha	1.56	1.67	1.62	0.86	0.60	0.73	2.16	2.28	2.22
Mean	1.37	1.33		0.6	0.47		1.92	1.98	
CD (0.05)									
Growing conditions		NS			0.02			NS	
Varieties		0.08			0.04			0.10	
Interaction		0.11			0.05			0.15	

percentage. The mean value for vitamin C in coriander leaves was observed to be significantly higher in open field (189.72 mg 100g^{-1}) compared to the rain shelter (124.55 mg 100g^{-1}). Also among the varieties, CO-3 (190.80 mg 100g^{-1}) recorded significantly higher Vitamin C followed by CO-1(166.95 mg 100 g^{-1}), Arka Isha (165.63 mg 100 g^{-1}), CO-2 (147.08 mg 100 g^{-1}) and CO (Cr-4) (115.23 mg 100 g^{-1}) as given in Table (6).

In general, growing conditions had no significant effect on total chlorophyll content of leaves. However, higher chlorophyll 'b' was recorded in rain shelter condition (0.60 mg 100 g^{-1}) compared to the open field (0.47 mg 100 g^{-1}). Total chlorophyll content was recorded more in open field (1.98 mg 100 g^{-1}) than rain shelter (1.92 mg 100 g^{-1}). Among the varieties, the total chlorophyll content ranged from 1.55 mg 100 g^{-1} in CO-2 to 2.33 mg 100 g^{-1} in CO (Cr-4) as given in Table (7). Similar results were reported by Varalakshmi et al. (2012) and Palanikumar and Rajamani (2012). The study revealed that significantly higher number of days for germination, number of leaves, herbage and biomass yield, plant height and days to leaf serration was observed in plants grown in the rain shelter compared to the open field. Among the varieties, Arka Isha recorded the highest mean values for number of leaves, herbage and biomass yield and delayed leaf serration. Thus, it can be inferred from the experiment that growing in the rain shelter improved the vegetative characters of coriander herb.

Acknowledgements

This paper forms a part of the MSc. (Hort.) thesis of the first author submitted to the Kerala Agricultural University, 2017. The authors wish to acknowledge the Kerala Agricultural University for the financial support and the College of Horticulture, Vellanikkara for the facilities provided during the course of study.

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