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## Interactive influences of different environmental conditions *viz.*, ployhouse, shadenethouse and open field conditions and seasons of semi-arid tropics on functional performance of coriander (*Coriandrum sativum* L.) var. CO (CR)4

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**Abstract**

The experiment is about the influence of season and cultivating environment on the growth and yield of coriander var. CO (CR)4. It was conducted at Institute of Agriculture, Tamil Nadu Agricultural University located at kumulur, trichy district of Tamilnadu. The experimental design was split plot design with 2 factors and three replications. Rabi season (October) recorded significantly maximum values in parameters such as germination percentage (63.36 %), plant height (27.18 cm), number of leaves per plant (36.16), plant height (6.76 g) and yield per hectare (7.29 t/ha) on comparing with kharif crop. Likewise coriander cultivated under polyhouse recorded maximum germination percentage (62.55 %), plant height (26.52 cm), number of branches (4.50), number of leaves per plant (36.40), plant height (7.57 g) and yield per hectare (7.99 t/ha) followed by shadenet house and open field condition. The interaction effect of season and growing condition has more influence especially in polyhouse condition during rabi season. The result of the experiment showed that cultivating coriander under polyhouse during kharif and rabi as well as under shadenet during rabi season will be cost effective and profitable.

**Keywords:** coriander, kharif, rabi, polyhouse, shadenet, yield, season, protected structure

**Introduction**

*Coriandrum sativum* L., a seed spices, also utilized for its herb, being cultivated in India with more market demand throughout the year. Coriander leaves are rich in Vitamin A and C (Girenko, 1982) [1]. To meet the demand the crop has to be cultivated around the year. But the crop meets its optimum growth when cultivated during rabi season on black cotton or other type of heavy soils which have better water retention capacity (Mohanalakshmi *et al.*, 2019) [2]. It is highly sensitive to dry and warm climate which is preferably avail during summer of Indian subcontinent. Hence, the year around cultivation can be achieved by utilizing protected structures. Protected cultivation will promote the production of coriander around the year irrespective of seasons. Protected cultivation has scope to reduce stresses, exclude the modification in weather and permitting year round cultivation to ensure regular supplies in the market (Singh *et al.*, 2005) [3]. However, the profitability of protected cultivation depends upon the choice of structure, selection of crop, varieties, production technology and market price (Rajasekar *et al.*, 2013) [4]. Since the leafy coriander cultivation is a short life span crop and have good market demand, it can be cultivated in medium cost protected structures. Our current investigation is about the influence of season and cultivating environment on the growth and yield of coriander var. CO (CR)4.

**Materials and Methods**

The present experiment was conducted at Institute of Agriculture, Tamil Nadu Agricultural University located at kumulur, trichy district of Tamilnadu. The experimental design was split plot design with 2 factors and three replications. The main plot (factor 1) treatment was fixed as two seasons of sowing *viz.*, Kharif (June sowing) (S1) and Rabi (October sowing) (S2). Sub-plot (factor 2) treatment was fixed as three growing environments *viz.*, naturally ventilated polyhouse (P1), shadenet house (S2) and open field condition (S3). The seeds of Coriander CO (CR) 4 were split, water soaked for an overnight and treated with *Tricoderma viridi* before sowing. The seeds are sown in raised beds under the all the fixed environmental condition in both the seasons. The package of practices for cultivation of coriander was followed based on the Crop production guide, TNAU.

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The growth parameters such as seed number of leaves per plant (nos.), single plant weight (g) and yield per hectare (t/ha) were recorded until the herbage harvest. The data were analyzed using AGDATA and AGRES software. Experimental design was adopted based on Panse and Sukhatme (1985)<sup>[5]</sup>.

## Result and Discussion

### Influence of season

On observing the analyzed data on influence of seasons in coriander growth and yield (Table 1), rabi season (October) recorded significantly maximum values in parameters such as germination percentage (63.36 %), plant height (27.18 cm), number of leaves per plant (36.16), plant height (6.76 g) and yield per hectare (7.29 t/ha) on comparing with kharif crop. The seasons have no significant influence on promoting number of branches in this experiment. The above results proved that, the coriander is a climate sensitive crop with its higher growth during rabi season (Mohanalakshmi *et al.*, 2019)<sup>[2]</sup>.

Statement of Kichar and Niwas (2006)<sup>[6]</sup> that the time of sowing controls the crop phenological development along with efficient conversion of biomass into economic yield. It is on line with our experimental results. Sagarika *et al.*, (2014)<sup>[7]</sup> and Guha *et al.*, (2016)<sup>[9]</sup> stated that October sown plants had optimum climate which delayed the reproductive stage and plants with prolonged vegetative phase gave higher fresh green leaf yield. Ayub *et al.*, (2008)<sup>[9]</sup> reported that the maximum biological yield in October sown crop can be attributed to greater leaf area. Similar finding was reported by Anitha *et al.*, (2016)<sup>[10]</sup> on fenugreek.

### Influence of environmental condition

Coriander cultivated under polyhouse has given notable improvement in growth and yield as shown in Table 1. Coriander under polyhouse recorded maximum germination percentage (62.55 %), plant height (26.52 cm), number of branches (4.50), number of leaves per plant (36.40), plant height (7.57 g) and yield per hectare (7.99 t/ha) followed by shadenet house and open field condition. The notable increase in single plant fresh weight under polyhouse condition is proportional to increase in plant height, number of branches and number of leaves per plant. Next to polyhouse shadenet house influence more in the growth of coriander than open field. These results intimate that, the protected structure provides supportive and optimum microclimatic condition for coriander growth than open field. These findings are supported by the reports of Pan *et al.* (2003)<sup>[11]</sup>, Karetha *et al.*, (2014)<sup>[12]</sup> and Mohanalakshmi *et al.*, (2019)<sup>[2]</sup>. Dixit (2007)<sup>[13]</sup> stated that a substantial increase in yield along with

enhancement in yield attributing characters has been found in protected cultivation compared to that of open.

### Interaction of seasons and environmental condition

The interaction effect of season and growing condition has more influence especially in polyhouse condition during rabi season as shown in Table 1. Coriander grown under polyhouse during rabi season resulted in maximum yield of all time during the experiment period. Though coriander grown under shadenet condition during rabi season gives good herbage yield as like polyhouse, it is not suited for kharif season due to the deteriorating effect monsoon. But polyhouse grown coriander had maximum yield on both seasons which may be due to the standard maintenance of temperature, relative humidity and rain shelter condition throughout the year. On observing the combined influence of season and growing conditions, both polyhouse and shadenet grown corianders of rabi season given on par results in seed germination, plant height and number of leaves per plant. On observing open field grown crop of both seasons, rabi season crop have better yield even than shade net grown crop of kharif season. This denotes that the climatic condition during rabi season favours better than kharif season though there was no economically poorer yield in any treatments. The plant height was very much influenced under shade net during rabi. This shows that shade net condition promotes more vegetative growth than any other growing condition utilized in experiment. Imam and Ranjbar (2000)<sup>[14]</sup> reported that decreased light penetration into middle and lower layers of canopy which decreases the auxin decompositions there by enhances the plant height. Reports by Singh *et al.* (1994)<sup>[15]</sup> and Tehlan and Malik (2010)<sup>[16]</sup> showed that plant height increases with effect of shading. Like findings of Jeeva and Sathiyamurthy (2001)<sup>[17]</sup> in coriander supports our experimental findings. Similar experiment on coriander was done by Karetha *et al.*, (2014)<sup>[12]</sup> in which the scientist recorded the better result in naturally ventilated polyhouse and net house grown corianders, sown on june month. But that experiment was restricted for April to June and not extended for rabi season. Mohanalakshmi *et al.*, (2019)<sup>[2]</sup> proposed that October sown coriander in open field and year around production under shade net will give maximum yield on comparing. Higher temperature was found to be the main limiting factor for the germination and growth of coriander (Sarada, 2011)<sup>[18]</sup>, in kharif crop under open field. Singh *et al.*, (2007)<sup>[19]</sup> conducted as experiment in peri-urban areas of northern India and reported that protected cultivation of vegetables can provide the best option to increase the productivity and quality of vegetables as well as biotic and abiotic stress condition compared to open field.

**Table 1:** Effect of season and growing conditions in growth parameters of Coriander (*Coriandrum sativum* L.) var. CO (CR) 4

Treatments	Seed germination (%)	Plant height (cm)	No. of branches per plant	No. of leaves per plant	Single plant weight (g)	Yield per hectare (t/ha)
<b>Effect of season</b>						
S1 - Kharif	57.54	22.64	4.33	30.47	5.87	6.10
S2 – Rabi	63.36	27.18	4.33	36.16	6.76	7.29
SED	0.70	0.26	0.00	0.33	0.05	0.07
CD	3.02	1.13	0.00	1.42	0.22	0.30
C.V %	2.47	2.23	0.00	2.10	1.71	2.23
	**	**	NS	**	**	**
<b>Effect of growing conditions</b>						
P1 –Polyhouse	62.55	26.52	4.50	36.40	7.57	7.99
P2 –Shadenet	61.05	26.31	4.00	34.61	6.76	6.39
P3 – Open field	57.74	21.92	4.50	28.94	4.62	5.71

SED	0.32	0.15	0.03	0.43	0.11	0.07
CD	0.74	0.35	0.07	1.49	0.31	0.16
C.V %	0.92	1.06	1.33	1.23	2.44	1.80
	**	**	**	**	**	**
Interaction (S x P)						
S1P1	76.40	24.73	5.00	33.48	7.28	7.82
S1P2	70.50	23.80	4.00	30.54	6.28	5.62
S1P3	65.80	19.40	4.00	27.40	4.05	4.86
S2P1	80.30	28.30	4.00	39.32	7.86	8.15
S2P2	81.50	28.81	4.00	38.67	7.23	7.16
S2P3	76.50	24.43	5.00	30.48	5.19	6.56
Interaction	**	**	**	**	**	**

NS – non-significant, \*\* - significant

### Conclusion

In this experiment, the result on influence of seasons and environmental condition of Coriander CO (CR) 4 is noteworthy. Protected structure having controlled environmental condition will promote coriander crop growth irrespective of season. Particularly, cultivating coriander under polyhouse during kharif and rabi as well as under shadenet during rabi season will be cost effective and profitable.

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