

## **Growth analysis of coriander (*Coriandrum sativum* L.) as influenced by different date of sowing and planting geometry under Chhattisgarh plains zone**

### **ABSTRACT**

An experiment was conducted to assess the effect of different sowing dates and planting geometry on coriander during the winter season of 2020-21 and 2021-22 at Instructional farm, College of Agriculture and Research Station, IGKV, Raigarh, Chhattisgarh. The experiment was laid out in split-plot design comprised four date of sowing viz., D<sub>1</sub>: 25<sup>th</sup> October, D<sub>2</sub>: 10<sup>th</sup> November, D<sub>3</sub>: 25<sup>th</sup> November and D<sub>4</sub>: 10<sup>th</sup> December as main plot and four planting geometries viz., S<sub>1</sub>: 30 x 5 cm, S<sub>2</sub>: 30 x 7.5 cm, S<sub>3</sub>: 30 x 10 cm and S<sub>4</sub>: 30 x 12.5 cm as sub-plot, and replicated thrice. The result showed that the crop sown on 25<sup>th</sup> October registered significantly higher growth parameters viz., plant height, number of branches, dry matter accumulation, crop growth rate and relative growth rate. Among planting geometry, sowing of coriander at 30 x 12.5 cm spacing produced significantly taller plants, higher number of branches plant<sup>-1</sup>, dry matter accumulation plant<sup>-1</sup>, crop growth rate and relative growth rate. Coriander sown on 25<sup>th</sup> October interacted with the 30 x 12.5 cm spacing registered significantly higher dry matter accumulation.

**Key words:** Coriander, Date of sowing, Planting geometry

### **Introduction**

Coriander (*Coriandrum sativum* L.), which belongs to the family of umbelliferae (Apiaceae) is one of the most important annual spice and medicinal herb, native to the Eastern Europe and Asia. It is grown as a field crop for its seeds commonly known as “*Dhania*” which has a fragrant odor and aromatic test. The dry seeds are said to have carminative diuretic, stomachic and aphrodisiac properties. On stem distillation, coriander seeds yield 0.2 to 1.2% essential oil. The major components of essential oil are linalool (67.7 %) followed by 1-pipen (10.5 %), 1-terpinin (9.0 %), geranyl acetate (4 %) and geraniol (1.9 %). The success of coriander production is influenced by genetic, weather and agronomic factors (Szemplinski and Nowak, 2015). The maximum fruit and essential oil yields are attained only when an appropriate combination of these factors are provided for the plant (Rangappa *et al.*, 1997;

Gill *et al.*, 2001). Date of sowing is an important management factor for almost all seed spices including coriander. Coriander exploits the environment most favorably when it is sown at optimum time (Kuri *et al.*, 2015), since sowing date significantly affects the photoperiodic response of plants and determines yields and qualities (Rassam *et al.*, 2007). Change in sowing time leads to significant change in weather microclimate and subsequently the performance of the crop. In addition, the physical environment has profound influence on growth, partitioning and ultimately the yield of coriander. Temperature, humidity, rainfall and other meteorological factors may individually or collectively limit the plant growth and production. Establishment of an appropriate spacing for maintaining the optimum plant population per unit area is the main pre-requisite to obtain maximum yields from any crop. Adequate planting geometry also render crop for a better growth and development of crop which ultimately reflects on higher production. To increase the productivity of local and improved varieties of coriander by adoption of recommended sowing date and planting geometry is very important today.

## **Material and methods**

The experiment was laid out for two consecutive *Rabi* seasons of 2020-21 and 2021-22 at Instructional farm, College of Agriculture and Research Station, IGKV, Raigarh Chhattisgarh, which is situated at 21.9° North latitude, 83.4° East longitude and at an altitude of 215 meters above mean sea level. The experimental soil was loamy sand in texture, slightly acidic in reaction, low in organic carbon and available nitrogen, phosphorus, sulphur and zinc and medium in available potassium, having low moisture retention capacity. The experiment was carried out in split plot design with sixteen treatment combinations of main and sub plots, replicated thrice. Four Dates of sowing *viz.* D<sub>1</sub>: 25<sup>th</sup> October, D<sub>2</sub>: 10<sup>th</sup> November, D<sub>3</sub>: 25<sup>th</sup> November and D<sub>4</sub>: 10<sup>th</sup> December were arranged in main plot and four planting geometris *viz.*, S<sub>1</sub>: 30 x 5 cm, S<sub>2</sub>: 30 x 7.5 cm, S<sub>3</sub>: 30 x 10 cm and S<sub>4</sub>: 30 x 12.5 cm were taken as subplot treatments. Recommended dose of fertilizer of 80:60:40 N: P<sub>2</sub>O<sub>5</sub>: K<sub>2</sub>O kg ha<sup>-1</sup> was applied. Influence of above treatments on crop was studied for growth behavior of coriander cultivation and were analyzed statistically using *F*- test, the procedure given by Gomez and Gomez (1984). Critical difference (CD) values at *P*=0.05 were used to determine the significance of mean differences of treatments.

## Results and discussion

The date of sowing, 25<sup>th</sup> October sown crop recorded significantly higher plant population in both the year which is mutually at par with 10<sup>th</sup> November and 25<sup>th</sup> November sowing crop during both the year as well as on mean basis. Sowing of coriander on 25<sup>th</sup> October produced significantly taller plants, higher number of branches plant<sup>-1</sup>, dry matter plant<sup>-1</sup>, crop growth rate (Fig. 1) and relative growth rate (Fig. 2) and minimum was observed when coriander was sown on 10<sup>th</sup> December at all the crop growth stages during both the year and pooled analysis (Table 1 and 2). In early growing season, coriander resulted in to healthy crop growth. Sufficient availability of moisture and nutrition due to that luxurious crop growth, efficient utilization of moisture and nutrients, more light interception, maximum absorption of PAR, more synthesis of photosynthates and that's why growth was increased. The significant decreases in growth with delay in sowing can be related to higher temperature at the late sowing dates experienced which limited their growth period. The plant did not have optimum opportunity for photosynthesis. The results are in agreement with Khoja (2005), Meena *et al.* (2006), Nath *et al.* (2008) in fennel and Moniruzzaaman *et al.* (2013) in coriander.

The planting geometry 30 x 5 cm recorded significantly more plant population as well as taller plants followed by 30 x 7.5 cm, 30 x 10 cm and 30 x 12.5 cm during both the year of experimentation and on mean basis. Sowing of coriander with 30 x 12.5 cm spacing, produced significantly higher number of branches plant<sup>-1</sup>, dry matter plant<sup>-1</sup>, crop growth rate (Fig. 1) and relative growth rate (Fig. 2) and minimum was observed when crop was sown at 30 x 5 cm at all the crop growth stages during both the years and on mean basis (Table 1 and 2). Tallest plants under closer spacing may be attributed due to more competition for light amongst the plants significant increase in plant height right from early stage of crop growth under closer spacing seem to be due to mutual shading because of dense population. As also recorded by Meena *et al.* (2013) and Kiran (2018) in black cumin. Increased growth under 30 x 12.5 cm spacing might be attributed to more space plant<sup>-1</sup>, available under wider spacing. The larger canopy development associated with profuse branching has increased interception, absorption and utilization of solar energy resulting in formation of higher photosynthates and finally dry matter plant<sup>-1</sup>, which has resulted in better growth and development of coriander.

The results are in line with Kiran *et al.* (2019) in Nigella, Bhapkar *et al.* (2019) and Nethravathi (2019).

Plant population and growth parameters of coriander i.e., plant height, number of branches plant<sup>-1</sup>, crop growth rate and relative growth rate were found to be differed non-significantly due to the interaction effect of date of sowing and planting geometry, however, aforesaid parameters were numerically maximum under the interactions of 25<sup>th</sup> October sowing date along with 30 x 12.5 cm spacing, except plant height which was maximum under 25<sup>th</sup> October sowing with 30 x 30 x 5 cm spacing. Dry matter accumulation of coriander was recorded significantly maximum when sowing was done on 25<sup>th</sup> October at 30 x 12.5 cm, which was at par with 25<sup>th</sup> October sowing with 30 x 10 cm spacing during both the years and on mean basis (Table 3). These results are in conformity with those reported by Meena *et al.* (2015) and Haq *et al.* (2015).

### **Conclusion**

Based on the two year experiments it has been concluded that crop sown on 25<sup>th</sup> October and 30 x 12.5 cm spacing resulted in significantly better growth and developments of coriander.

### **REFERENCES**

- Bhapkar, P.B., Sharma, H.D., Negi, S., Pundir, D., Sharma, V., Kapil, M. and Reddy S. 2019. Effect of cutting and intra row spacing on yield and phenotypical attributes of coriander (*Coriandrum sativum* L.). International Journal of Current Microbiology and Applied Sciences, 8(9): 693-698.
- Gill, B.S., Randhawa, G.S. and Saini, S.S. 2001. Effect of sowing dates and herb cutting management on growth and yield of fenugreek (*Trigonella foenum graecum*). Indian Journal of Agronomy, 46(2): 364-367.
- Gomez, K.A. and Gomez, A. A. 1984. Statistical procedure for Agricultural Reseach., edn 2, John Wiley & Sons, New York : 241-271.
- Haq, M.Z., Hossain, M.M., Haque, M.M., Das, M.R. and Huda, M.S. 2015. Blossoming Characteristics in Black Cumin Genotypes in Relation Seed Yield Influenced by Sowing Time. American Journal of Plant Sciences, 6(8): 1167-1183.

- Khoja, J.R. 2005. Effect of sowing time and sources of nitrogen on growth, thermal requirement, yield and quality of coriander (*Coriandrum sativum* L.). Ph.D. thesis. Rajashan Agricultural University, Bikaner.
- Kiran, M.R. 2018. Effect of sowing time and plant geometry on growth, yield and quality of black cumin (*Nigella sativa* L.) under Malwa plateau condition. M.Sc (Ag.) thesis.
- Kiran, M.R., Naruka, I.S., Nayma, S. and Bepari, A.R. 2019. Effect of sowing time and plant geometry on growth, yield and quality of Black Cumin (*Nigella sativa* L.). International Journal of Current Microbiology and Applied Sciences, 8 (5): 1915-1921.
- Kuri, B., Jat N., Shivran A. and Puniya M. 2015. Productivity and profitability of coriander varieties influence by sowing time and plant growth regulators. Annals of Agricultural Research, New Series, 36 (2): 204-211.
- Meena, S.S., Sen, N.L. and Malhotra, S.K. 2006. Influence of sowing date, nitrogen and plant growth regulators on growth and yield of coriander (*Coriandrum sativum* L.). Journal of Spices and Aromatic crops, 15 (2):56-64.
- Moniruzzaman, M., Rahman, M.M., Hossain, M.M., Sirajul, K.A.J.M. and Khaliq, Q.A. 2013. Effect of sowing dates on year-round production of foliage of coriander (*Coriandrum sativum* L.). Bangladesh Journal of Agricultural Research, 38(1): 29-39.
- Nath, P., Jaiswal, R.C., Verma, R.B. and Yadav, G.C. 2008. Effect of date of sowing, nitrogen levels and spacing on growth and yield of ajwain (*Trachyspermum ammi* L.) Sprague). Journal of Spices and Aromatic Crops, 17(1): 01-04.
- Nethravathi, R. 2019. Influence of planting geometry and fertilizer levels on the seed yield and quality of coriander (*Coriandrum sativum* L.). M.Sc. (Ag.) thesis.
- Rangappa, M., Bhardwaj, H.L., Showhda, M. and Hamama, A.A. 1997. Cilantro (*Coriandrum sativum* L.) response to nitrogen fertilizer rates. Journal of Herbs, Spices and Medicinal Plants, 5 (1): 63-68.
- Rassam, G.A., Naddaf, M. and Sefidkan, F. 2007. Effect of sowing dates and plant density on seed yield and yield components of *Pimpinella anisum*. Res. Sci. J. Iran. Ministry of Agriculture, 20: 127-133.

Szemplinski, W. and Nowak, J. 2015. Nitrogen fertilization versus the yield and quality of coriander fruit (*Coriander sativum* L.). *Acta Scientiarum Polonorum Hortorum Cultus*, 14(3): 37-50.

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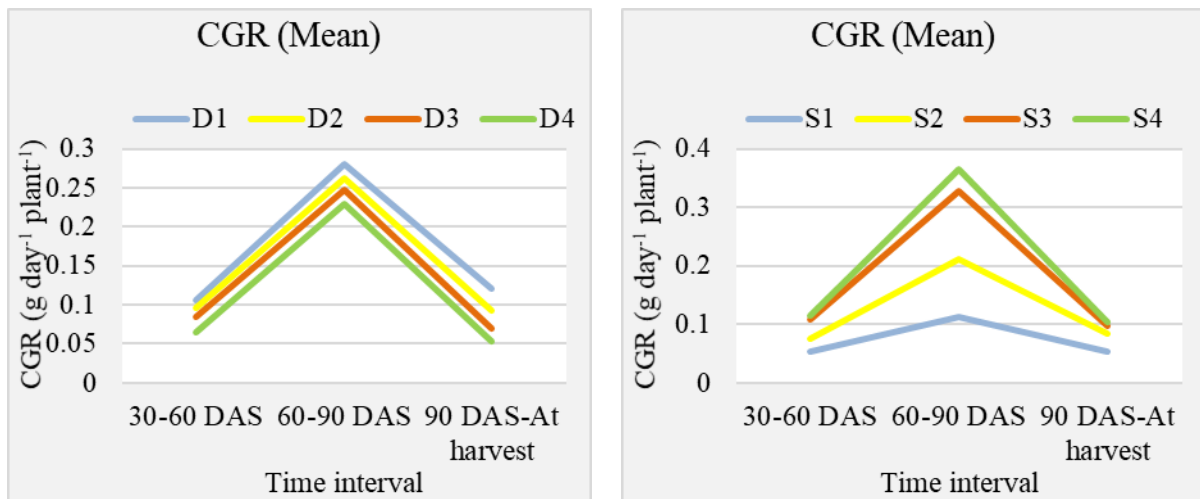




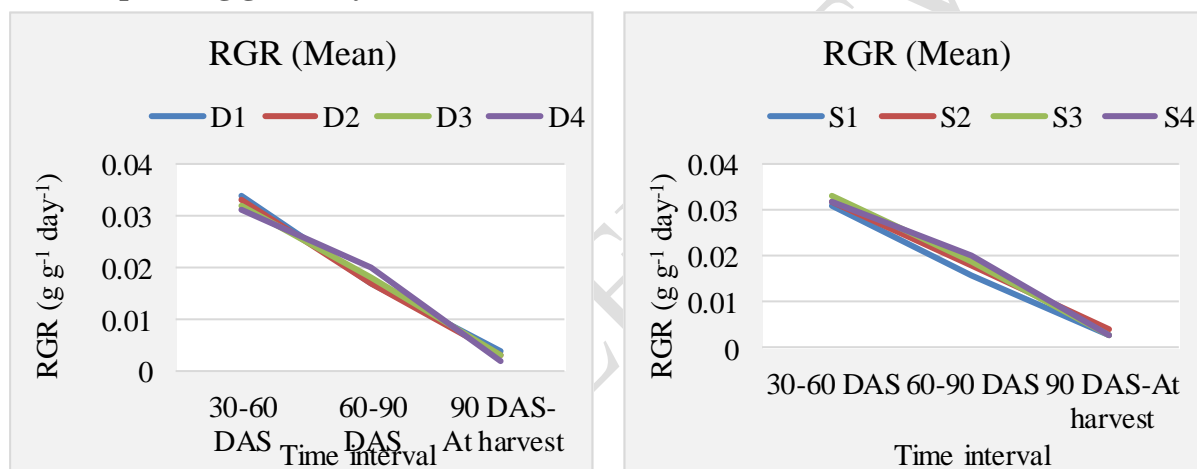
**Table 3. Interaction effects between different sowing dates and planting geometry on dry matter accumulation of coriander**

Dry matter accumulation (g plant <sup>-1</sup> ) at 60 DAS															
2020-21					2020-21					Mean					
Sowing date \ Spacing	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	Sowing date \ Spacing	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	Sowing date \ Spacing	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	
S <sub>1</sub>	2.41	1.51	0.70	0.55	S <sub>1</sub>	2.61	1.60	0.95	0.65	S <sub>1</sub>	2.51	1.56	0.83	0.60	
S <sub>2</sub>	2.92	2.44	1.68	0.86	S <sub>2</sub>	3.16	2.59	2.00	0.96	S <sub>2</sub>	3.04	2.52	1.84	0.91	
S <sub>3</sub>	4.05	3.75	3.37	1.54	S <sub>3</sub>	4.36	3.98	3.10	1.88	S <sub>3</sub>	4.21	3.87	3.24	1.71	
S <sub>4</sub>	4.20	3.91	3.57	1.71	S <sub>4</sub>	4.63	4.11	3.62	2.05	S <sub>4</sub>	4.42	4.01	3.60	1.88	
<b>SEm±</b>	<b>0.10</b>				<b>SEm±</b>	<b>0.09</b>				<b>SEm±</b>	<b>0.07</b>				
<b>CD (P=0.05)</b>	<b>0.28</b>				<b>CD (P=0.05)</b>	<b>0.25</b>				<b>CD (P=0.05)</b>	<b>0.22</b>				
Dry matter accumulation (g plant <sup>-1</sup> ) at 90 DAS															
Sowing date \ Spacing	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	Sowing date \ Spacing	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	Sowing date \ Spacing	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	
S <sub>1</sub>	6.8	4.8	2.5	2.0	S <sub>1</sub>	6.5	4.7	3.7	2.2	S <sub>1</sub>	6.6	4.7	3.1	2.1	
S <sub>2</sub>	10.6	9.1	6.8	4.6	S <sub>2</sub>	9.9	9.1	7.9	5.1	S <sub>2</sub>	10.2	9.1	7.4	4.9	
S <sub>3</sub>	16.0	14.2	12.1	7.9	S <sub>3</sub>	15.5	14.1	12.4	8.2	S <sub>3</sub>	15.7	14.1	12.2	8.1	
S <sub>4</sub>	17.4	15.3	13.5	9.2	S <sub>4</sub>	16.8	15.3	13.5	10.1	S <sub>4</sub>	17.1	15.3	13.5	9.7	
<b>SEm±</b>	<b>0.70</b>				<b>SEm±</b>	<b>0.44</b>				<b>SEm±</b>	<b>0.27</b>				
<b>CD (P=0.05)</b>	<b>2.05</b>				<b>CD (P=0.05)</b>	<b>1.29</b>				<b>CD (P=0.05)</b>	<b>0.79</b>				
Dry matter accumulation (g plant <sup>-1</sup> ) at harvest															
Sowing date \ Spacing	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	Sowing date \ Spacing	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	Sowing date \ Spacing	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	
S <sub>1</sub>	7.4	4.9	2.7	2.1	S <sub>1</sub>	8.5	5.7	4.0	2.6	S <sub>1</sub>	8.0	5.3	3.4	2.3	
S <sub>2</sub>	11.5	9.5	7.3	5.0	S <sub>2</sub>	12.8	10.2	8.6	5.7	S <sub>2</sub>	12.2	9.9	8.0	5.3	
S <sub>3</sub>	17.8	15.0	12.3	8.3	S <sub>3</sub>	19.2	16.2	13.4	8.8	S <sub>3</sub>	18.5	15.6	12.9	8.5	
S <sub>4</sub>	19.9	16.5	14.0	9.7	S <sub>4</sub>	21.4	18.5	14.5	10.5	S <sub>4</sub>	20.7	17.5	14.2	10.1	
<b>SEm±</b>	<b>0.463</b>				<b>SEm±</b>	<b>0.49</b>				<b>SEm±</b>	<b>0.33</b>				
<b>CD (P=0.05)</b>	<b>1.351</b>				<b>CD (P=0.05)</b>	<b>1.42</b>				<b>CD (P=0.05)</b>	<b>0.96</b>				

D<sub>1</sub>: 25<sup>th</sup> October, D<sub>2</sub>: 10<sup>th</sup> November, D<sub>3</sub>: 25<sup>th</sup> November, D<sub>4</sub>: 10<sup>th</sup> December,  
 S<sub>1</sub>: 30 cm x 5 cm, S<sub>2</sub>: 30 cm x 7.5 cm, S<sub>3</sub>: 30 cm x 10 cm, S<sub>4</sub>: 30 cm x 12.5 cm



**Fig. 1: Crop growth rate of coriander as influenced by different date of sowing and planting geometry**



**Fig. 2: Relative growth rate of coriander as influenced by different date of sowing and planting geometry**