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Effect of Sowing Time on Growth and Yield Attributes of Coriander (*Coriandrum sativum* L.)

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Abstract

A field experiment was conducted during *Rabi* season of 2024-25 at Research cum Instructional Farm, Pt. Shiv Kumar Shastri College of Agriculture & Research Station, Surgi, Rajnandgaon, (C.G.) to study the Effect of time of sowing on growth and yield of Coriander (*Coriandrum sativum* L.). The experimental soil was characterized as the fine textured clayey soil in texture and with pH (7.44), EC (0.43 dS m⁻¹), OC (0.65%) and low in available nitrogen (213.46 kg ha⁻¹), phosphorus (11.08 kg ha⁻¹) and potassium (252.06 kg ha⁻¹). The experiment was laid out in a Randomized Block Design (RBD) with six treatments and four replications. Among the different sowing times treatments, sowing time 4th week of October (T₁) recorded significantly higher coriander seed yield (1660.00 kg ha⁻¹) and stover yield (3024.00 kg ha⁻¹). Similarly, higher plant height (114.30 cm), number of branches (8.23), days to 50% flowering (62.00) and days to maturity (116.00), yield attributes viz., length of umbel (8.69 cm), weight of umbel (0.49 g), number of umbel plant⁻¹ (20.50), number of umbellets umbel⁻¹ (5.50), number of seeds umbellet⁻¹ (6.93), number of seeds plant⁻¹ (795.13), seed yield plant⁻¹ (10.96 g) and test weight (13.65 g) in sowing time 4th week of October (T₁) were also reported with the same treatment which was found at par with the treatment T₂- 1st week of November.

Keywords: Coriander, time of sowing, sowing time, growth, yield

Introduction

India has been recognized as the “Land of Spices” and also known as “Home of spices” in the whole world. In 2021-22, India produced approximately 823,720 metric tons (MT) of coriander from an area of 638,620 hectares (Anonymous, 2022a) [2]. In India, coriander is mainly grown in Madhya Pradesh, Assam, Rajasthan, Uttar Pradesh and Southern states like Karnataka, Tamil Nadu and Andhra Pradesh (Thakur *et al.*, 2022) [16], Bihar, Chhattisgarh, Gujarat assam, Odisha, and Punjab (Anonymous, 2021) [1]. India is the major global producer, consumer, and exporter of seed spices, and almost 20 seed spices are cultivated in here with fennel, fenugreek, cumin, coriander, and celery. Coriander is an important crop and used both as a leafy vegetable and as a seed spice. According to the reports from the Directorate of Horticulture and Farm Forestry, Government of Chhattisgarh, coriander cultivated on 15,795 hectares, yielding a production of 75,901 metric tonnes (Anonymous, 2022b) [3]. However, it is grown for leafy purpose and for seed in all districts majorly concentrated in Rajanandgaon, Raigarh, Bilaspur, Mungeli, Gaurela-Pendra-Marwahi, Surajpur, Balrampur, Raipur and Korba.

Coriander (*Coriandrum sativum* L.) is a significant annual, aromatic spice and medicinal herb belonging to the family Apiaceae and it has a chromosome number of 2n=22 and is mainly cultivated from its seeds throughout the year (Mhemdi *et al.*, 2011) [10]. The crop is commonly known as “Dhania, Cilantro, Chinese parsley and Dhana.” Its name has come from Greek word Koris, which means shield bug or bedbug, it is because of the unpleasant fetid odour of the green herbs and unripe fruits. The plant is Andromonoecious, i.e. both staminate and perfect flowers are produced on the same plant and even in the same umbellet.

Coriander is a cool season crop and can be cultivated in *rabi* season on black cotton or other type of heavy soils which have better water retention and with a pH range of 6.0 to 8.5 is best for cultivating coriander (Joshi *et al.*, 2007) [5]. The Best season to grow coriander is June to July in *kharif* and October to November in *rabi* season. 15 to 25 kg ha⁻¹ seed rate is required when it used

as leafy green.

Coriander performs well at a temperature range of 20-30 °C (Namdev, 2017) ^[12]. Coriander is sown in winter season if the objective is seed for production (Sharangi and Roychowdhury, 2014) ^[15]. It can tolerate subtle frost and high temperature (Uikey, 2022) ^[17]. Extreme weather, particularly high temperatures, have an impact on green leaf production in coriander. It induces bolting, which results in fewer cuttings and, as a result, lower herbage yields (Moniruzzaman *et al.*, 2013) ^[11].

Time of sowing is crucial for crop for the vegetative growth and ultimate expression of yield. Time of sowing controls the crop phenological development along with efficient conversion of biomass into economic yield (Khichar and Niwas, 2006) ^[6]. The sowing period has the effect on plant height, number of branches plant⁻¹, number of umbel plant⁻¹, number of the seed's umbel⁻¹ and seeds yield (Bhadkariya *et al.*, 2007) ^[4]. A late sown crop produces shrivelled grains as compared to early sowing leading to low yield. Overcrowding, excessive water, hard seed coat and exposure to high temperatures are the other challenges associated with poor grain production. That's why an optimum sowing time should be required because it helps to fetch better return (Lal *et al.*, 2017) ^[9].

Keeping the above points in view the present investigation was initiated to study the effect of time of sowing on growth and yield of Coriander (*Coriandrum sativum* L.).

Materials and Methods

The field experiment was conducted at Research cum Instructional Farm, Pt. Shiv Kumar Shastri College of Agriculture & Research Station, Surgi, Rajnandgaon, (C.G.) during Rabi season in the year of 2024-25. The experiment was employed a in randomized block design (RBD) with four replications and six treatments viz., T₁: 4th week of October, T₂: 1st week of November, T₃: 2nd week of November, T₄: 3rd week of November, T₅: 4th week of November and T₆: 1st week of December.

The experimental soil was characterized as the fine textured clayey soil in texture and with pH (7.44), EC (0.43 dS m⁻¹), OC (0.65%) and low in available nitrogen (213.46 kg ha⁻¹), phosphorus (11.08 kg ha⁻¹) and potassium (252.06 kg ha⁻¹). Coriander variety- CG Shri Chandrahasini Dhania-02 was sown as an experimental crop with the planting distance of 30 cm × 10 cm using seed rate of 15 kg ha⁻¹. The size of gross plot is 6 m × 5 m which equals to 30 m² and while the size of net plot, where the actual experimentation occurred, was slightly smaller at 5.40 m × 4.00 m equivalent to 21.6 m². To maintain the optimum distance between replications, a gap of 1m was left between them, also a gap of 1m for each separated individual plot was maintained.

The recommended dose of fertilizers @80 kg N, 60 kg P₂O₅ and 40 kg K₂O was applied. The impact of these treatments on coriander cultivation's growth and yield characteristics was examined by collecting data on plant population (m⁻²) (At Initial and at harvest), plant height (cm) at 30, 60, 90 DAS and at harvest, number of branches at 30, 60, 90 DAS and at harvest, days to 50% flowering and days to maturity and length of umbel (cm), weight of umbel (g), number of umbel plant⁻¹, number of umbellets umbel⁻¹, number of seeds umbellet⁻¹, number of seeds plant⁻¹, seed yield plant⁻¹ (g) and test weight (g).

A total of eight irrigation was applied uniformly in all the plots. After sowing, the plots were irrigated immediately and afterward irrigation was given at 20 days interval when required in order to maintain optimum soil moisture until it showed flowering. The simultaneous thinning and weeding were done by manual labour during 20 and 30 DAS to maintain the optimum plant population and to keep the weeds under control. Recommended agronomic

practices were followed to raise the experimental crop. The data recorded were statistically analysed following standard statistical analysis of variance as outlined by Panse and Sukhatme (1967).

Results and discussions

Plant height (cm)

Data on plant height were recorded at 30, 60, 90 DAS and at harvest of coriander. The findings are presented in Table 1. Data revealed the significant effect of different times of sowing on plant height of coriander. Among all the treatments, sowing time of coriander, 4th week of October (T₁) recorded significantly the highest plant height (10.30 cm, 32.7 cm, 91.05 cm and 114.30 cm) at all crop growth stages which was found at par with sowing time 1st week of November (T₂) recorded plant height (9.73 cm, 31.25 cm, 88 cm and 112.48 cm). The shortest plants were observed when coriander was sown on 1st week of December (T₆) (6.97 cm, 22.95 cm, 74.95 cm and 84.68 cm). In optimum sowing times, better vegetative growth is due to more favourable temperature and sunshine available to crop during its growth period. Sufficient luxurious vegetative growth was due to sufficient utilization of moisture and nutrition, favourable climatic conditions, more light interception, maximum absorption of PAR and increased photosynthates synthesis and that's why growth was increased. Decrease in plant height due to delay in time of sowing can be related to higher temperature at late harvesting times and less opportunity for photosynthesis. Similar results recorded by Pan *et al.* (2003), Khoja (2005), Meena (2006), Kuri *et al.* (2015) ^[8], Lal *et al.* (2017) ^[9] and Painkara *et al.* (2024) ^[13, 14].

Number of branches plant⁻¹

Data revealed that the number of branches plant⁻¹ of coriander was influenced significantly due to different sowing times throughout crop growth stages. The findings are presented in Table 1. Among different sowing times the maximum number of branches plant⁻¹ was observed on time of sowing 4th week of October (T₁) (3.58, 5.73, 7.78 and 8.23) which was at par with sowing time 1st week of November (T₂) (3.08, 5.33, 7.60 and 8.10), whereas, minimum number of branches was observed in coriander sown on 1st week of December (T₆) (2.50, 3.95, 5.33 and 5.43). In early sowing time sufficient availability of moisture, nutrition and more light interception, maximum PAR interception, more synthesis of photosynthates is received due to that luxurious plant growth is observed and growth and yield characters were increased. The significant decrease in branches with delay in sowing can be related to higher temperature during harvesting time experienced by crops which affected their growth period of each developing structure and decreased their branches bearing capacity. These results are in agreement with the findings of Khoja (2005), Moniruzzaman *et al.* (2013) ^[11], Nadre *et al.* (2017) in fenugreek, Kuri *et al.* (2015) ^[8], Namdev (2017) ^[12], Lal *et al.* (2017) ^[9] and Painkara *et al.* (2024) ^[13, 14].

Days to 50% flowering

Data in respect to days to 50% flowering were recorded and are presented in Table 1. The number of days required for 50% flowering was significantly influenced by different time of sowing. Among all the treatments coriander sown on 4th week of October (T₁) was recorded significantly the maximum number of days (62 days) to 50% flowering in coriander which was found at par with crop sown on 1st week of November (T₂) (61 days), whereas significantly minimum number of days were recorded in 1st week of December (T₆) (54) respectively. The days to 50% flowering was found maximum might be due to occurrence of favourable temperature and luxurious crop growth *i.e.* maximum

plant height, a great number of branches, maximum plant spread and dry matter accumulation. The results were similar to Khoja (2005), Choudhari (2009), Namdev (2017) ^[12], and Painkara *et al.* (2024) ^[13, 14].

Days to maturity

Data of number of days taken to maturity as influenced by different time of sowing are presented in Table 1. The maximum number of days to maturity was recorded of coriander sown on 4th week October (T₁) (116.00 days) which was found at par with 1st week of November (T₂) (114 days), whereas minimum days taken to maturity in sowing time 1st week of December (T₆) (102 days). In early sowing times, late physiological maturity indicates a prolonged vegetative phase which have resulted in better seed yield as well. The increase in crop duration as well as overall growth and vigour of the crop by early sowing might be due to account of exposure of crops to prevalence of many climatic conditions. The results are in agreement with the Khoja (2005), Balai and Keshwa (2010), Sharangi and Roychowdhury (2014) ^[15], Namdev (2017) ^[12], Bhutia *et al.* (2017), Kiran (2018) ^[7] and Thakur *et al.* (2022) ^[16].

Length of umbel (cm)

Data pertaining to length of umbel as influenced by different times of sowing are presented in Table 2. The length of umbel was influenced significantly due to different times of sowing. Among all the treatments, sowing time 4th week of October (T₁) recorded significantly the longest umbel (8.69 cm), which was found at par with sowing time 1st week of November (T₂) (8.00 cm). The shortest umbel was recorded on sowing time 1st week of December (T₆) (4.68 cm). Due to favourable agro-climatic conditions available at the time of sowing period which promoted profuse plant growth is obtained in sowing time 4th week of October which influenced maximum length of umbel. The luxurious plant growth enhanced growth and yield attributes which produced maximum seed yield. These results are similar to Namdev (2017) ^[12], Mahor (2018) and Painkara *et al.* (2024) ^[13, 14].

Number of seeds umbellet⁻¹

Data in respect to number of seeds umbellet⁻¹ as influenced by different sowing times are presented in Table 2. A perusal of data revealed that different sowing times had significant influence on number of seeds umbellet⁻¹. Among the treatments sowing time 4th week of October (T₁) produced significantly the maximum number of seeds umbellet⁻¹ (6.93) and was found at par with sowing time 1st week of November (T₂) (6.30), whereas the lowest number of seeds umbellet⁻¹ were recorded on 1st week of December (T₆) (4.41). This might be due to sufficient availability of nutrients and moisture, maximum interception of PAR and photosynthesis during early crop growth period. The results are accordance to Kiran (2018) ^[7] in black cumin and Painkara *et al.* (2024) ^[13, 14].

Number of umbel plant⁻¹

Data pertaining to number of umbel plant⁻¹ as influenced by different times of sowing are presented in Table 2. Number of umbel plant⁻¹ significantly influenced by different sowing times. Among all the treatments crop sown on 4th week of October (T₁) reported that the maximum number of umbel plant⁻¹ (20.50) which was found at par with sowing time 1st week of November (T₂) (20.00) and minimum was on 1st week of December (T₆) (12.55). This might be due to availability of nutrients, moisture, maximum interception of PAR and photosynthesis which increases yield

attributes and yield. The results are in accordance to Khoja (2005) and Namdev (2017) ^[12].

Number of seeds plant⁻¹

Data regarding number of seeds plant⁻¹ as influenced by different treatments are presented in Table 2. The number of seeds plant⁻¹ of coriander was influenced significantly due to different sowing times. Coriander sown on 4th week of October (T₁) recorded significantly the maximum number of seeds plant⁻¹ of coriander (795.13) which was found at par with time of sowing 1st week of November (T₂) (647.87) and sowing time 1st week of December (T₆) recorded minimum number of seeds plant⁻¹ of coriander (227.58). During early sowing sufficient availability of moisture, nutrition, more light interception, maximum PAR interception and synthesis of photosynthesis is received due to that luxurious vegetative growth which increased growth and yield attributes which produced maximum seed yield. Results are accordance to Namdev (2017) ^[12].

Seed yield plant⁻¹(g)

Data pertaining to seed yield plant⁻¹ as influenced by different treatments are presented in Table 2. The seed yield plant⁻¹ of coriander was influenced significantly due to different sowing times. Among all the treatments coriander sown on 4th week of October (T₁) recorded significantly the maximum seed yield plant⁻¹ (10.96 g) which was found at par with sowing time 1st week of November (T₂) (10 g) and minimum was reported in 1st week of December (T₆) (3.57 g). During optimum sowing time, sufficient availability of moisture, nutrition, more light interception, maximum PAR interception and more synthesis of photosynthetic is received due to that luxurious vegetative growth and growth and yield attributes increased which produced maximum seed yield. Findings are similar with Khoja (2005), Anitha *et al.* (2016) in fenugreek and Painkara *et al.* (2024) ^[13, 14].

Seed yield (kg ha⁻¹)

Data pertaining seed yield have been presented in Table 2. The data has revealed that seed yield ha⁻¹ was significantly affected by different treatments. Data recorded for seed yield ha⁻¹ revealed that among all the treatments sowing time 4th week of October (T₁) produced the highest seed yield ha⁻¹ (1660.00 kg ha⁻¹) which was found at par with coriander sown on 1st week of November (T₂) (1497.00 kg ha⁻¹) while, sowing time 1st week of December (T₆) reported the lowest seed yield ha⁻¹ (995.00 kg ha⁻¹). The highest seed yield obtained might be due to sufficient availability of moisture, nutrition, more synthesis of photosynthesis, more light interception and maximum PAR interception during its initial growth, flowering and fruiting stage. In late sowing times, the possible reason for lower yield might be due to availability if insufficient time for vegetative growth as the crop entered the terminal phase at faster rate. These findings are in line with Meena *et al.* (2006), Bhadkariya *et al.* (2007) ^[4], Datta *et al.* (2008) and Painkara *et al.* (2024) ^[13, 14].

Stover yield (kg ha⁻¹)

Data pertaining to stover yield as influenced by different treatments are presented in Table 2. The stover yield of coriander was influenced significantly due to different sowing times. Among the treatments sowing time 4th week of October (T₁) recorded significantly the maximum stover yield of coriander (3024.00 kg ha⁻¹) which was found at par with sowing time 1st week of November (T₂) (2884.00 kg ha⁻¹), whereas the minimum was reported in sowing time 1st week of December (T₆) (2296.00 kg ha⁻¹). During optimum sowing time, healthy and luxurious

plant growth obtained due to availability of moisture, nutrients, sunlight, maximum PAR interception and synthesis of

photosynthesis. Similar findings were also obtained by Moniruzzaman *et al.* (2013) ^[11] and Painkara *et al.* (2024) ^[13, 14].

Table 1: Effect of time of sowing on plant height, number of branches plant⁻¹, Days to 50% flowering and Days to maturity of coriander

Treatment details	Plant height (cm)				No. of branches plant ⁻¹				Days to 50% flowering	Days to maturity
	30 DAS	60 DAS	90 DAS	At harvest	30 DAS	60 DAS	90 DAS	At harvest		
T ₁ : 4 th week of October	10.30	32.70	91.05	114.30	3.58	5.73	7.78	8.23	62.00	116.00
T ₂ : 1 st week of November	9.73	31.25	88.00	112.48	3.08	5.33	7.60	8.10	61.00	114.00
T ₃ : 2 nd week of November	8.95	28.38	85.00	108.13	2.68	4.73	6.70	7.10	57.00	108.00
T ₄ : 3 rd week of November	8.09	26.05	82.58	97.60	2.65	4.50	6.38	6.68	56.00	106.00
T ₅ : 4 th week of November	7.60	24.98	76.73	90.03	2.55	4.20	5.95	6.15	55.00	104.00
T ₆ : 1 st week of December	6.97	22.95	74.95	84.68	2.50	3.95	5.33	5.43	54.00	102.00
S.Em±	0.26	0.74	1.17	0.90	0.22	0.31	0.30	0.28	0.39	0.99
CD at 5%	0.78	2.24	3.54	2.74	0.67	0.93	0.92	0.85	1.18	2.99

Table 2: Effect of time of sowing on yield attributing characteristics and yield of coriander

Treatment details	Length of umbel (cm)	No. of umbel plant ⁻¹	No. of seeds umbellet ⁻¹	Seed yield plant ⁻¹ (g)	Seed yield (kg ha ⁻¹)	Stover yield (kg ha ⁻¹)
T ₁ : 4 th week of October	8.69	20.50	6.93	10.96	1660.00	3024.00
T ₂ : 1 st week of November	8.00	20.00	6.30	10.00	1497.00	2884.00
T ₃ : 2 nd week of November	6.65	19.08	5.41	7.71	1243.00	2660.00
T ₄ : 3 rd week of November	5.94	18.98	5.02	6.92	1225.00	2650.00
T ₅ : 4 th week of November	5.33	15.45	4.68	5.02	1213.00	2632.00
T ₆ : 1 st week of December	4.68	12.55	4.41	3.57	995.00	2296.00
S.Em±	0.24	0.46	0.32	0.33	61.00	85.00
CD at 5%	0.73	1.39	0.96	0.99	186.46	258.81

Conclusion

The study showed a significantly influential effect of time of sowing on growth and yield of coriander. On the basis of one-year experimental result, sowing time 4th week of October (T₁) produced significantly higher growth parameters, yield attributing characters and yield of coriander and it was found at par with the treatment T₂: 1st week of November. Among all the sowing times, 4th week of October (T₁) sowing time registered significantly maximum gross return, net return and B:C ratio which was followed by 1st week of November (T₂) and minimum was recorded in 1st week of December (T₆). Therefore, for the maximum yield of coriander, it should be sown in 2nd fortnight of October. The findings may recommend to the farmers and agricultural researchers to carefully consider the time of sowing which appears to be a crucial task in the different agro climatic conditions.

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