International Journal of Advanced Biochemistry Research

ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2025): 5.29
IJABR 2025; SP-9(12): 899-902
www.biochemjournal.com
Received: 09-10-2025
Accepted: 12-11-2025

Laxmi Prasad Bharti
M.Sc. Scholar, Department of Plantation, Spices, Medicinal and Aromatic Crops, College of Horticulture and Research Station, MGUVV, Durg, Chhattisgarh, India

Sevan Das Khunte
Assistant Professor, Department of Fruit Science, College of Horticulture and Research Station, MGUVV, Durg, Chhattisgarh, India

Namita Singh
Assistant Professor, Department of Genetics & Plant Breeding, College of Horticulture and Research Station, MGUVV, Durg, Chhattisgarh, India

Anita Kerketta
Assistant Professor, Department of Vegetable Science, College of Horticulture and Research Station, MGUVV, Durg, Chhattisgarh, India

Satyam Kumar Sahu
M.Sc. Scholar, Department of Plantation, Spices, Medicinal and Aromatic Crops, College of Horticulture and Research Station, MGUVV, Durg, Chhattisgarh, India

Prakash Kumar Sahu
M.Sc. Scholar, Department of Plantation, Spices, Medicinal and Aromatic Crops, College of Horticulture and Research Station, MGUVV, Durg, Chhattisgarh, India

Shivbrat
M.Sc. Scholar, Department of Fruit Science, College of Horticulture and Research Station, MGUVV, Durg, Chhattisgarh, India

Corresponding Author:
Laxmi Prasad Bharti
M.Sc. Scholar, Department of Plantation, Spices, Medicinal and Aromatic Crops, College of Horticulture and Research Station, MGUVV, Durg, Chhattisgarh, India

Studies on the effect of plant growth regulators on seed germination and growth behaviour of coriander (*Coriandrum sativum* L.) under Durg district of Chhattisgarh

Laxmi Prasad Bharti, Sevan Das Khunte, Namita Singh, Anita Kerketta, Satyam Kumar Sahu, Prakash Kumar Sahu and Shivbrat

DOI: https://www.doi.org/10.33545/26174693.2025.v9.i12Sk.6631

Abstract
Coriander (*Coriandrum sativum* L.) is an important annual seed spice crop belonging to the family Apiaceae, cultivated widely for its seeds and fresh foliage. Its growth and productivity are greatly influenced by environmental and physiological factors; therefore, the application of plant growth regulators (PGRs) has gained importance for enhancing crop performance.

The present investigation entitled "Studies on the effect of plant growth regulators on seed germination and growth behaviour of coriander (*Coriandrum sativum* L.) under Durg district of Chhattisgarh" was conducted during 2024-25 at the Research and Instructional Farm, College of Horticulture and Research Station, Sankara, Patan, Durg (C.G.). The experiment was carried out to evaluate the effect of different concentrations of gibberellic acid (GA_3) on germination, growth, flowering, and yield attributes of coriander.

Among all the treatments, GA_3 at 150 ppm (T_3) exhibited superior performance by recording the highest germination percentage (83.67%), plant height (33.21, 62.06, and 77.01 cm at 30 days, 60 days, and at harvest, respectively), number of primary branches (3.86 and 8.32 at 30 and 60 days), and number of secondary branches (23.91). This treatment also resulted in the maximum number of umbels per plant (68.46) and umbellates per umbel (7.03), along with minimum days to first flowering (63.67) and 50% flowering (73.00).

Yield parameters were significantly improved with GA_3 at 150 ppm, which recorded the highest number of seeds per umbellate (7.66) and seeds per umbel (44.42), seed yield per plant (7.86 g), seed yield per plot (0.91 kg), and seed yield per hectare (18.65 q). The highest test weight (12.80 g) and harvest index (44.64%) were also obtained under the same treatment.

The study concludes that application of GA_3 at 150 ppm is most effective for improving germination, vegetative growth, flowering, and seed yield of coriander and can be recommended for achieving higher productivity under the agro-climatic conditions of the Durg district of Chhattisgarh.

Keywords: Coriander, GA_3, germination, growth, flowering, yield

Introduction

Coriander (*Coriandrum sativum* L.) is an important annual spice crop belonging to the family Apiaceae, widely cultivated across the world for its leaves and seeds. Commonly known as "Dhania," it has a chromosome number of 2n = 22 and is believed to have originated in the Mediterranean and Near Eastern regions (Bhandari and Gupta, 1991) [4]. In India, coriander is primarily grown as a rabi (winter) season crop and occupies a prominent position in the spice economy. At present, it is cultivated over an area of about 631 thousand hectares with an annual seed production of 800.74 thousand metric tons (MoA and FW, 2022) [6]. Major coriander-producing states include Madhya Pradesh, Rajasthan, Gujarat, Tamil Nadu, and Uttar Pradesh, while in Chhattisgarh it is cultivated on approximately 2.95 thousand hectares with a production of 0.85 thousand metric tons (Anon, 2022) [3].

Coriander seeds are extensively used as a seasoning and flavouring agent, enhancing the taste and shelf life of food products. The seeds contain essential oil rich in bioactive compounds such as linalool, limonene, α-pinene, and geranyl acetate, which contribute to their characteristic aroma and medicinal value (Sharma and Sharma, 2012) [10].

Nutritionally, coriander seeds contain appreciable amounts of fatty oil, protein, carbohydrates, fibre, and minerals, while the leaves are rich in vitamins A and C (Parmar *et al.*, 2018) [7]. Owing to these qualities, coriander is widely used in culinary, pharmaceutical, and cosmetic industries.

Growth and productivity of coriander are highly influenced by environmental conditions, particularly temperature and sowing time. Timely sowing ensures favourable photoperiod and thermal conditions, which are essential for optimum vegetative growth, flowering, and seed development (Rasam *et al.*, 2007; Kuri *et al.*, 2015) [9, 5]. Delayed sowing exposes the crop to unfavourable temperatures during critical growth stages, resulting in reduced yield and quality (Ahmed and Haque, 1985) [1]. The thermal requirement of coriander, like other winter crops, can be explained using growing degree days (GDD), which play a vital role in determining crop phenology and productivity (Rajput *et al.*, 1987) [8].

Seed yield in coriander is a complex trait governed by several growth and yield components and influenced by both genetic and physiological factors. Poor and slow seed germination, often caused by the structural characteristics of coriander seeds, leads to uneven crop establishment. Therefore, improving seed germination and early seedling growth is crucial for achieving higher productivity.

Plant growth regulators (PGRs) such as gibberellic acid (GA_3) and naphthalene acetic acid (NAA) have been reported to play a significant role in enhancing seed germination, vegetative growth, flowering, and yield in various crops. GA_3 promotes cell elongation, enzyme activation, and mobilization of food reserves, while NAA enhances root development and overall plant growth. The judicious use of PGRs may help overcome physiological constraints and improve growth and yield performance in coriander.

In view of the economic importance of coriander and the need to enhance its productivity under varying agro-climatic conditions, the present study was undertaken to evaluate the effect of plant growth regulators on seed germination and growth behaviour of coriander.

Materials and Method Experimental Site and Season

The present investigation entitled "Studies on the effect of plant growth regulators on seed germination and growth behaviour of coriander (*Coriandrum sativum* L.) under Durg district of Chhattisgarh" was conducted during the rabi season of 2024-25 at the Research and Instructional Farm, College of Horticulture and Research Station, Sankara, Patan, Durg, Chhattisgarh, India.

The experimental site is located at 21°33′ N latitude and 81°55′ E longitude, at an altitude of 289.56 m above mean sea level.

Agro-Climatic Conditions

The region falls under a sub-humid agro-climatic zone, characterized by hot summers and mild to cool winters. The average annual rainfall ranges from 1200 to 1400 mm, with approximately 85% received during the monsoon season. During the crop period, maximum temperature ranged from 42-46 °C and minimum temperature from 6-7 °C, while relative humidity varied between 70-90%. Meteorological data during the crop growth period were recorded at the meteorological observatory of the research station.

Soil Characteristics

The experimental field consisted of silty loam soil with good drainage. Prior to the layout of the experiment, soil samples were collected from a depth of 0-15 cm at five random locations, composited, and analyzed for physico-chemical properties using standard procedures.

Experimental Design and Treatments

The experiment was laid out in a Randomized Block Design (RBD) with tens replications. Treatments consisted of different concentrations of gibberellic acid (GA_3) applied as seed treatment. The details of treatments were as follows:

T_0 Control (water soaking)
T_1 GA_3 @ 75 ppm
T_2 GA_3 @ 100 ppm
T_3 GA_3 @ 150 ppm
T_4 NAA @ 75 ppm
T_5 NAA @ 100 ppm
T_6 NAA @ 150 ppm
T_7 Triacontanol @ 75 ppm
T_8 Triacontanol @ 100 ppm
T_9 Triacontanol @ 150 ppm

Seed Treatment and Sowing

Healthy and uniform coriander seeds were soaked in the respective GA_3 solutions for 12 hours, while control seeds were soaked in distilled water. After soaking, seeds were shade-dried and sown at a spacing of 30 cm × 10 cm. All recommended agronomic practices were followed uniformly for all treatments throughout the crop growth period.

Results and Discussion

The results of the present investigation revealed a significant influence of plant growth regulators on seed germination, growth, flowering, and yield attributes of coriander (*Coriandrum sativum* L.). Among the different treatments**,** GA_3 @ 150 ppm (T_3) consistently performed better than other treatments. The highest germination percentage (83.67%) was recorded under GA_3 @ 150 ppm. Growth parameters such as plant height were significantly improved, with maximum values of 33.21 cm, 62.06 cm, and 77.01 cm at 30 DAS, 60 DAS, and at harvest, respectively.

The same treatment also produced the highest number of primary branches (3.86 and 8.32) and secondary branches (16.21 and 23.91) at 30 and 60 DAS, respectively.

Flowering behaviour was markedly influenced by GA_3 application. The minimum number of days to first flowering (63.67 days) and 50% flowering (73.00 days) was observed under GA_3 @ 150 ppm, indicating early flowering. Yield-attributing characters such as number of umbels per plant (68.46) and umbellates per umbel (7.03) were also highest in this treatment.

Yield parameters were significantly enhanced by GA_3 @ 150 ppm, recording the maximum number of seeds per umbellate (7.66) and per umbel (44.42). The highest seed yield per plant (7.86 g), seed yield per plot (0.91 kg)**,** and seed yield per hectare (18.65 q) were obtained under the same treatment. Additionally, GA_3 @ 150 ppm resulted in the highest test weight (12.80 g) and harvest index (44.64%)**,** indicating improved assimilate partitioning.

Discussion

Based on the results of the present study, it can be concluded that the application of gibberellic acid (GA_3) at 150 ppm significantly enhances seed germination, vegetative growth, flowering behaviour, and seed yield of coriander under the agro-climatic conditions of the Durg

district of Chhattisgarh. The superior performance of GA_3 @ 150 ppm may be attributed to its role in stimulating cell elongation, enzyme activity, and efficient translocation of assimilates. Therefore, GA_3 @ 150 ppm can be recommended as an effective plant growth regulator for achieving higher productivity and better crop performance in coriander.

Table 1: Mean performance of growth and yield parameters

Treatments	Germination (%)	Plant heights (cm)			Numbers of primary branches			Numbers of secondary branches			Days taken to 1st flowering	Days taken to 50% flowering	Numbers of umbels per plants	Numbers of umbellate per plants
		30 DAS	60 DAS	At Harvest	30 DAS	60 DAS	At Harvest	30 DAS	60 DAS	At Harvest				
T_0	68	21.37	58.93	65.66	1.47	4.46	5.54	2.35	10.20	12.47	36.55	45.23	15.21	4.04
T_1	80.23	32.54	61.12	76.12	3.18	7.87	7.93	2.24	11.27	13.54	37.47	49.15	23.45	6.13
T_2	83	33.02	61.86	76.67	3.45	8.1	8.87	3.21	12.01	14.24	38.20	41.02	23.73	6.24
T_3	83.67	33.21	62.06	77.01	3.86	8.32	8.65	3.42	12.35	15.35	38.42	40.12	24.46	6.33
T_4	76.13	30.26	62.13	72.15	2.54	7.07	7.34	2.04	10.20	12.40	38.15	47.34	22.24	5.07
T_5	76.36	30.54	64.08	73.28	2.92	7.33	7.54	2.27	11.13	12.74	37.74	45.63	22.76	5.56
T_6	79.67	31.97	64.97	73.56	3.02	7.06	7.45	2.66	11.72	15.14	39.22	42.33	23.24	6.04
T_7	72	27.48	53.84	62.78	2.103	6.14	6.28	2.34	10.33	12.14	37.65	49.64	22.14	4.37
T_8	75	28.64	54.45	63.45	2.2	6.32	6.62	3.8	12.08	12.54	39.76	48.56	22.54	5.15
T_9	75.67	28.05	55.67	66.74	2.3	6.54	6.87	3.39	12.14	13.24	38.55	46.41	21.45	5.57
SE (m)	2.195	0.453	2.599	4.088	0.109	0.252	0.373	0.131	0.727	0.934	2.122	2.422	2.136	0.211
C.D.	3.105	0.678	3.676	5.781	0.154	0.357	0.456	0.294	1.028	1.254	1..402	1.625	1.021	0.298
C.V.	4.94	5.146	6.16	5.878	6.963	6.268	6.394	6.199	6.242	6.432	4.622	5.623	5.372	6.465

Table 2: Mean performance of growth, yield parameters and economics of coriander

Treatment	Number of seed per umbellate	Number of seed per umbel	Seed yield per plant (g)	Seed yield per plot (kg)	Seed yield per hectare (q)	Harvest Index (%)	Test weight (g)	Net returns (Rs. ha^{-1})	B:C ratio
T_0	5.01	22.32	3.89	0.45	10.54	31.65	8.63	22.406	1.15
T_1	4.06	31.67	5.03	0.83	13.88	43.34	12.70	52.562	2.25
T_2	5.20	32.56	6.34	0.84	14.92	43.66	12.56	62.894	2.46
T3	5.66	33.42	5.86	0.91	15.65	44.64	12.80	77.194	2.67
T_4	4.05	31.54	5.00	0.73	13.12	40.78	10.85	56.456	2.24
T_5	4.42	31.56	6.33	0.75	14.46	41.36	11.39	58.842	2.56
T_6	4.86	32.00	5.65	0.76	14.92	41.68	11.89	52.323	2.12
T_7	5.18	29.00	4.43	0.53	12.85	34.69	9.35	48.245	1.84
T_8	5.34	29.97	4.06	0.55	13.24	35.35	9.56	55.156	1.36
T_9	5.67	30.02	5.04	0.57	13.33	37.45	10.92	56.145	1.59
SE (m)	0.185	1.126	0.19	0.022	0.482	1.209	0.344		
C.D.	0.242	1.321	0.222	0.031	0.682	1.709	0.487		
C.V.	5.312	5.435	5.275	5.456	5.523	5.306	5.389		

Conclusion

The following conclusion may be drawn from the results of this study. Among the effect of plant growth regulators on coriander GA_3 150 ppm gives significantly better performance for growth and yield parameters such as:

1. On the basis of the observations recorded, it may be concluded from the present investigation that of the seed treatment effect, the growth parameters like germination percentage, plant height, number of primary branches per plant, number of secondary branches per plant, days to 1st flowering, days to 50% flowering, number of umbels per plant and number of umbellate per umbel were significantly superior with the treatment T_{10} (GA_3 150 ppm) and which was at par with treatment T_2 (GA_3 100 ppm).
2. The yield parameters like number of seeds per umbellet, number of seeds per umbel, seed yield per plant (gm), seed yield per plot (kg), seed yield per hectare (q), harvest index (%) and test weight (gm) were recorded significantly superior in treatment T_3 (GA_3 150 ppm) which was at par with treatment T_2 (GA_3 100 ppm) On the basis of overall performance, the treatment T_3 (GA_3 150 ppm) was found to be best for the cultivation of coriander for seed yield.

References

1. Ahmed N, Haque ME. Effect of sowing dates on the growth and yield of coriander (*Coriandrum sativum* L.). Bangladesh J Agric Res. 1985;10(2):15-20.
2. Anonymous. Indian horticulture database. New Delhi: National Horticulture Board, Ministry of Agriculture, Government of India; 2011.
3. Anonymous. Area and production statistics of horticultural crops in Chhattisgarh. Raipur: Department of Agriculture, Government of Chhattisgarh; 2022.
4. Bhandari MM, Gupta A. Genetics and cytogenetics of coriander (*Coriandrum sativum* L.). New Delhi: Indian Council of Agricultural Research; 1991.
5. Kuri BR, Choudhary S, Meena RL. Effect of sowing dates on growth and yield of coriander (*Coriandrum sativum* L.). J Spices Aromat Crops. 2015;24(2):84-88.
6. Ministry of Agriculture and Farmers Welfare (MoA&FW). Horticulture statistics at a glance 2022. New Delhi: Government of India; 2022.

7. Parmar DJ, Vaidya HB, Rathod PJ. Nutritional composition and quality evaluation of coriander (*Coriandrum sativum* L.) seeds. Int J Chem Stud. 2018;6(4):1872-1875.
8. Rajput RP, Deshmukh MR, Paradkar VK. Accumulated heat units and phenology of wheat (*Triticum aestivum* L.) as influenced by planting dates. J Agron Crop Sci. 1987;159:345-349.
9. Rasam R, Farahani HA, Daneshian J. Effect of sowing date on yield and yield components of coriander (*Coriandrum sativum* L.). Asian J Plant Sci. 2007;6(6):1006-1011.
10. Sharma A, Sharma RK. Essential oil composition and quality evaluation of coriander (*Coriandrum sativum* L.). J Spices Aromat Crops. 2012;21(1):1-6.