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Effect of foliar application GA_3 and NAA on growth and green yield of Coriander (*Coriander sativum* L.)

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ABSTRACT

An experiment entitled "Effect of foliar application GA_3 and NAA on growth, green yield and quality of Coriander (*Coriander sativum* L.)" conducted in season during the year 2024-25 at the experimental field of Department of Horticulture, Faculty of Agriculture, Tantia University, Sri Ganganagar, Rajasthan, India. The present study aimed to evaluate the Effect of foliar application GA_3 and NAA on Growth, Yield and Quality of coriander. The plants were treated with seven different treatments having three replication of each treatment. The observations were recorded at regular interval. The results of investigation indicated a significant influence on growth, yield and quality of coriander. The maximum plant height at 60 DAS on maximum plant height of (44.21 cm) was noted in T_4 treatment (GA_3, 100ppm). The maximum no. of leaves per plant at 60 DAS on maximum no. of leaves per plant of (70.66) was noted in T_4 treatment (GA_3, 100ppm). The maximum no. of primary branches per plant at 60 DAS on maximum no. of primary branches per plant of (7.90) was noted in T_4 treatment (GA_3, 100ppm). The maximum no. of secondary branches per plant at 60 DAS on maximum no. of secondary branches per plant of (14.22) was noted in T_4 treatment (GA_3, 100ppm). The maximum fresh biomass per plant at 60 DAS on maximum fresh biomass per plant of (31.12 gm) was noted in T_4 treatment (GA_3, 100ppm). The maximum leaf yield per plant of (114.45 gm) was noted in T_4 treatment (GA_3, 100ppm). The maximum fresh leaf yield per plot of (3.11 kg) was noted in T_4 treatment (GA_3, 100ppm). The maximum green yield per hectare of (113.90 q) was noted in T_4 treatment (GA_3, 100ppm).

KEYWORDS

GA_3, NAA, Coriander, Growth, Yield, Quality

HOW TO CITE THIS ARTICLE

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The seed spices are a group which denotes all those annual whose dried fruits of seed used as spices. The seed spices mostly used in pulverized state and primarily for seasoning or garnishing food and beverages. They are characterized by pungency, strong odour, sweet or bitter taste. Spices play an important role in human dietary because of their agreeable flavor and aroma to food and add greatly to the pleasure of eating. There are about 20 seed spices grown in India and among them coriander, cumin, fennel, fenugreek, dill seed, ajawin etc. are vital rabi seed spices for arid and semi-arid regions of the country. Gujarat and Rajasthan together contribute more than 80 percent of total seed spices production in county and thus, both the state together is known as "seed spices bowl" of India (NHB, 2017). Among the seed spices, coriander popularly known as "dhania" is one of the oldest known and most widely used seed spices by mankind as a condiment throughout the world. Coriander is an important seed spices crop mainly grown in grown in winter (Rabi) season in India for its leaves as well as seed. India is a leading producer, consumer and exporter of coriander. According to official/ industry estimates for 2024-25, the total area under coriander in India was reported at approximately 627.01 thousand hectares with an estimated production of 869.44 thousand tonnes (2024-25 adv. Estimates, Source: State Agri/Hort.

Departments/ DASD Kozhikkode) earlier published estimates also report production figures close to 973.97 thousand tonnes in 2022-23, underlining the crop's large scale and economic value in India. Major producing states include Rajasthan and Madhya Pradesh, which together account for the bulk of national output. These production statistics reflect coriander's agronomic and commercial importance and motivate research into practices that can improve yield and quality. Anonymous (2024-25). Hormones usually move within plant from a site of production to site of action.

Phytohormones are physiological intercellular messengers that are needed to control the complete plant lifecycle, including germination, rooting, growth, flowering, fruit ripening, foliage and death. In addition, plant hormones are secreted in response to environmental factors such as abundance of nutrients, drought conditions, light, temperature, chemical or physical stress. Hence, levels of hormones will change over the lifespan of a plant and are dependent upon season and environment. During recent years the use of plant growth regulators (PGR's) may be one of the best possible ways to achieve spectacular progress in crop production and productivity.

Application of plant growth regulators has been reported to induce higher physiological efficiencies including photosynthetic ability of plants which resulted in better growth and yield of agronomic crops without substantial increase in cost of production. Exogenous application of PGR's has been reported to improve the growth and yield of various crops. It is well known that all the PGRs regulate the physiological functions of plant. Some workers highlighted that spraying of PGR's on crop plants improves Growth, Green Yield and Quality attributes (Deore and Bharud, 1990; Paspatis, 1995; Gott and Thomas, 1986; and Geetha *et al*., 2000). The role of plant growth regulators in various physiological and biological processes in plants is well known, which enables a rapid phenotypic change in the plant. Plant growth regulators are known to affect seed germination, vegetative growth, flowering, seed setting, seed development, seed maturity and seed yield.

Materials and Methods

The present investigation entitled "Effect of foliar application GA_3 and NAA on growth, green yield and quality of Coriander (*Coriander sativum* L.)" was carried out during the year 2024-2025. The field experiment was conducted in *Rabi* Season of 2024-2025 at Crop Research Farm, Department of Horticulture, Tantia University, Sri Ganganagar, Rajasthan, India. This located at 28.4° N latitude, 72.2° E longitude and 178 m above mean sea level.

Experimental Details

The experiment was under taken in order to find out the response of foliar application GA_3 and NAA on growth and yield of coriander. There were seven treatments and each treatment was allocated randomly in each replication during experimentation and subjected to different manurial treatment combinations given below. Details of the treatments are in table 1.

Table 1. Details of the treatments

Treatment	Treatments Details
T_1	NAA, 100ppm
T_2	NAA, 75ppm
T_3	NAA, 50ppm
T_4	GA_3, 100ppm
T_5	GA_3, 75ppm
T_6	GA_3, 50ppm
T_7	Control

The data recorded during the course of investigation was subjected to statistical analysis by "Analysis of variance technique" (Gomez and Gomez, 1976). The significant and non-significant treatment effects were judged with the help of 'F' (variance ratio) table. The significant differences between the means were tested against the critical difference at 5% probability level.

Results and Discussion

Plant Height

The data concerning the Effect of foliar application GA_3 and NAA different treatment comprising on plant height increment of coriander plant during 2024 is presented in table 2. A peep into data revealed that during maximum at 60 DAS on maximum plant height of (44.21 cm) was noted in T_4 treatment (GA_3, 100ppm) and minimum was observed in (30.44 cm) T_7 (control).

The increase in plant height seems to be due to enhanced cell division and cell enlargement. Promotion of protein synthesis by GA_3 application exogenously might have resulted in enhanced vegetative growth. Similar results were reported by (Gour *et al*., 2010, Bairva *et al*., 2012) in fenugreek, (Abbas, 2013) in dill and (Rohamare *et al*., 2013) in cumin.

Number of Leaves per Plant

The data concerning the effect of different plant growth regulators and their combination different treatment comprising on no. of leaves per plant increment of coriander plant during 2024 is presented in table 2. A peep into data revealed that during maximum no. of leaves per plant at 60 DAS on maximum no. of leaves per plant of (70.66) was noted in T_4 treatment (GA_3, 100ppm) and minimum was observed in (55.12) T_7 (control). These results were in conformation with (Kumar and Sundareswaran, 2011, Singh *et al*., 2012, Vaidehi *et al*., 2015, Haokip *et al*., 2016, Yugandhar *et al*., 2016) in coriander, (Bairva *et al*., 2012) in fenugreek.

Number of Primary Branches per Plant

The data concerning the effect of different plant growth regulators and their combination different treatment comprising on no. of primary branches per plant increment of coriander plant during 2024 is presented in table 2. A peep into data revealed that during maximum no. of primary branches per plant at 60 DAS on maximum no. of primary branches per plant of (7.90) was noted in T_4 treatment (GA_3, 100ppm) and minimum was observed in (5.44) T_7 (control).

Number of Secondary Branches per Plant

The data concerning the effect of different plant growth regulators and their combination different treatment comprising on no. of secondary branches per plant increment of coriander plant during 2024 is presented in table 2. A peep into data revealed that during maximum no. of secondary branches per plant at 60 DAS on maximum no. of secondary branches per plant of (14.22) was noted in T_4 treatment (GA_3, 100ppm) and minimum was observed in (10.89) T_7 (control).

These results were in conformation with (Kumar and Sundareswaran, 2011, Singh *et al*., 2012, Vaidehi *et al*., 2015, Haokip *et al*., 2016, Yugandhar *et al*., 2016) in coriander, (Bairva *et al*., 2012) in fenugreek.

Fresh Biomass (gm/ Plant)

The data concerning the effect of different plant growth regulators and their combination different treatment comprising on fresh biomass per plant increment of coriander plant during 2024 is presented in table 2. A peep into data revealed that during maximum fresh biomass per plant at 60 DAS on maximum fresh biomass per plant of (31.12 gm) was noted in T_4 treatment (GA_3, 100ppm) and minimum was observed in (20.32 gm) T_7 (control). These findings in the present investigation are in conformity with those reported earlier by (Singh *et al*., 2012) in coriander, (Gour *et al*., 2009) in fenugreek.

Fresh Leaf Yield per Plant (gm)

The data concerning the effect of different plant growth regulators and their combination different treatment comprising on fresh leaf yield per plant increment of coriander plant during 2024 is presented in table 3. A peep into data revealed that during maximum leaf yield per plant of (114.45 gm) was noted in T_4 treatment (GA_3, 100ppm) and minimum was observed in (76.55 gm) T_7 (control). The above results were in close conformity with the findings of (Singh *et al*., 2012, Haokip *et al*., 2016, Yugandhar *et al*., 2016) in coriander.

Fresh Leaf Yield per Plot (kg)

The data concerning the effect of different plant growth regulators and their combination different treatment comprising on fresh leaf yield per plot increment of coriander plant during 2024 is presented in table 3. A peep into data revealed that during maximum fresh leaf yield per plot of (3.11 kg) was noted in T_4 treatment (GA_3, 100ppm) and minimum was observed in (2.10 kg) T_7 (control).

Green Yield per ha (q)

The data concerning the effect of different plant growth regulators and their combination different treatment comprising on green yield per hectare increment of coriander plant during 2024 is presented in table 3.

Table 2. Effect of Foliar Application of GA_3 and NAA on Growth of Coriander

S. N.	Treatment Combination	Plant Height (cm) 60 DAS	Numbers of Leaves/ Plant 60 DAS	Number of Primary Branches per Plant 60 DAS	Number of Secondary Branches per Plant 60 DAS	Fresh Biomass (gm/Plant) 60 DAS
T_1	NAA, 100ppm	36.12	64.11	6.88	12.65	26.44
T_2	NAA, 75ppm	34.78	61.45	6.45	12.11	24.77
T_3	NAA, 50ppm	32.45	58.23	6.02	11.25	22.21
T_4	GA_3, 100ppm	44.21	70.66	7.90	14.22	31.12
T_5	GA_3, 75ppm	40.66	68.21	7.55	13.78	29.78
T_6	GA_3, 50ppm	38.45	64.89	7.10	13.12	25.55
T_7	Control	30.44	55.12	5.44	10.89	20.32
	SEm(±)	0.47	0.43	0.09	0.14	0.33
	CD (p=0.05)	1.45	1.34	0.28	0.45	1.03

Table 3. Effect of Foliar Application of GA_3 and NAA on Yield of Coriander

S. N.	Treatment Combination	Fresh Leaf Yield per Plant (gm)	Fresh Leaf Yield per Plot (kg)	Green Yield per ha (q)	Marketable Yield (%)
T_1	NAA, 100ppm	92.23	2.58	95.78	85.65
T_2	NAA, 75ppm	87.76	2.42	90.45	84.12
T_3	NAA, 50ppm	83.44	2.23	86.77	82.78
T_4	GA_3, 100ppm	114.45	3.11	113.90	91.45
T_5	GA_3, 75ppm	108.39	2.91	108.11	89.12
T_6	GA_3, 50ppm	97.11	2.68	99.77	87.34
T_7	Control	76.55	2.10	79.44	79.22
	SEm(±)	0.89	0.03	1.71	0.85
	CD (p=0.05)	2.76	0.10	5.26	2.64

A peep into data revealed that during maximum green yield per hectare of (113.90 q) was noted in T_4 treatment (GA_3, 100ppm) and minimum was observed in (79.44 q) T_7 (control). The variation in yield observed among different treatments may be attributed to the differential influence of plant growth regulators on physiological and biochemical processes of the crop. The application of GA_3 at 100 ppm (T_4) significantly enhanced leaf yield per plant, fresh leaf yield per plot, green yield per hectare, and marketable yield percentage compared to the control. The above results were in close conformity with the findings of (Singh *et al*., 2012, Haokip *et al*., 2016, Yugandhar *et al*., 2016) in coriander.

Marketable Yield (%)

The data concerning the effect of different plant growth regulators and their combination different treatment comprising on marketable yield plant increment of coriander plant during 2024 is presented in table 3.

A peep into data revealed that during maximum marketable yield plant of (91.45 %) was noted in T_4 treatment (GA_3, 100ppm) and minimum was observed in (79.22 %) T_7 (control).

Conclusion

Based on the findings of the present investigation entitled "Effect of foliar application of GA_3 and NAA on growth and green yield of Coriander (*Coriandrum sativum* L.)", a broader theoretical conclusion can be drawn by integrating plant physiological principles with the observed experimental outcomes. The study clearly demonstrated that treatment T_4 (GA_3 @ 100 ppm) was significantly superior over other treatments in enhancing growth parameters and green yield of coriander. This superiority can be theoretically explained through the fundamental role of gibberellins in plant growth regulation and metabolic activation.

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