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EFFECT OF PLANT GROWTH REGULATORS ON THE GROWTH AND YIELD OF CULANTRO (*ERYNGIUM FOETIDUM* L.)

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ABSTRACT

A pot trial was conducted in the polyhouse of Department of Horticulture, Sikkim University to study the effect of different growth regulators foliar spray treatment in the growth and yield of culantro. The experiment was laid out in Completely Randomized Design (CRD) with three replications and seven PGR foliar spray treatment which include control (water spray), two concentrations of BA (100 and 200 ppm), two concentrations of GA_3 (100 and 200 ppm) and combination of BA and GA_3 i.e., (BA 150 ppm + GA_3 150 ppm) and (BA 250 ppm+ GA_3 250ppm). Among the different PGR sprayed, the results indicate that the application of GA_3 100 ppm consistently outperformed other treatments significantly enhancing the plant traits like number of leaves/plant (18.66), length of flower stalk (14.30 cm), no. of inflorescence/plant (37.33) and seed yield (0.97 g) while the application of GA_3 200 ppm resulted in early emergence of inflorescence (84.33 days) and highest plant height (21.40 cm) among all other treatments. These findings provide practical insight for culantro cultivation, emphasizing GA_3 as a crucial regulator for maximizing productivity and growth.

***Key words*: Culantro, PGR, foliar spray, growth, yield.**

Introduction

Culantro commonly known as Spiny coriander is an underutilized spice belonging to the family Apiaceae. It has been acclaimed as health food because of the significant amount of calcium, iron, carotene, riboflavin, proteins and vitamins A, B, C and essential oil (Shavandi *et al*., 2012). Spiny coriander is an underutilized crop with significant economic potential. The crop is primarily grown for its leaves which are rich in vitamins, minerals, antioxidants, carotenoids and is being extensively used for flavouring, marinating, garnishing and seasoning of foods (Rai *et al*., 2023). The leaves of the plant contain 63 chemical components important for pharmaceutical industries (Singh *et al*., 2014). The plant is a source of essential oil from different parts viz., leaf, seed and root. The essential oil is of high value in the international trade for their application in perfumery and pharmaceutical industries (Igancimuthu *et al*., 1999).

Although culantro is propagated by seeds, suckers, and offshoots, its cultivation is limited by the low germination rate of seeds and the lack of sufficient seed supply. As a rare plant in the Indian subcontinent, *Eryngium foetidum* is only found in a few places, such as Tamil Nadu, Kerela, Karnataka, North East India, and the Andaman Islands (Chandrika *et al*., 2011). Therefore, there is a need to take up a firm footing step towards the conservation and sustainable development of this plant. Since the use of plant growth regulators has produced some remarkable results with regard to the growth and yield of several crops to meet the commercial demand and improve quality. Keeping in mind, the utmost importance and rising demand of culantro with increasing health concerns the present study was undertaken to cater the needs at commercial level by enhancing the growth and yield with the application of PGR through vegetative propagation method.

Materials and Methods

An investigation was undertaken in the polyhouse of Department of Horticulture, Sikkim University during May-November 2024 to assess the impact of different plant growth regulators in the growth and yield of culantro. Culantro saplings were collected from the farmer's field

Table 1: Effect of different plant growth regulators on the growth and yield attributes of culantro.

Treatment	Plant height (cm) at harvest	Leaf breadth (cm) at harvest	No. of leaves/ plant at harvest	No. of suckers/ plant at harvest	Emergence of infloresence (days)	Length of flower stalk (cm) at harvest	No. of inflorescence plant at harvest	Seed yield/ plant (g)
T_1: Control	17.36	2.76	13.33	1.00	112.66	9.90	23.00	0.51
T_2:BA 100 ppm	17.93	2.76	13.33	1.00	107.00	11.20	30.00	0.51
T_3:BA 200 ppm	16.00	2.73	14.66	1.33	97.66	11.56	27.33	0.42
T_4:GA_3 100 ppm	20.26	2.90	18.66	1.66	86.66	14.30	37.33	0.97
T_5:GA_3 200 ppm	21.40	3.06	14.00	1.33	84.33	12.76	30.66	0.67
T_6:BA 150 ppm + GA_3 150 ppm	20.70	2.96	12.66	1.00	110.00	12.56	22.66	0.46
T_7: BA 250 ppm + GA_3 250 ppm	20.06	2.86	12.00	1.00	117.00	6.53	23.00	0.50
C.D.	2.88	N/A	3.64	N/A	10.07	1.42	9.50	0.21
SE(m)	0.94	0.12	1.18	0.21	3.29	0.46	3.10	0.07

located at Barbing, East Sikkim with 2-3 leaves and 3-5 cm in length. The saplings were transplanted on 10th May, 2024 in pots with a ratio of 2:1 (soil and cocopeat) and 7 PGR foliar treatments that include control (water spray), two concentrations of BA (100 and 200 ppm), two concentrations of GA_3 (100 and 200 ppm) and combination of BA and GA_3 *i.e.*, (BA 150 ppm + GA_3 150 ppm) and (BA 250 ppm+ GA_3 250ppm). The first PGR spray treatment was given when the plant roots got acclimatized after 20 days of transplanting and thereafter PGR foliar spray was applied once in a month. Observation was recorded for different growth and yield parameters like plant height, leaf breadth, no. of leaves/plant, no. of suckers/plant, emergence of inflorescence, length of flower stalk, no. of inflorescence/ plant and seed yield. These treatments were tested in completely randomized design with 3 replications. Data were statistically analysed through OPSTAT software, an online agriculture data analysis tool developed by CCSHAU, Hissar.

Results and Discussion

The results revealed that the application of PGRs significantly improved the vegetative growth and yield parameters of culantro that is beneficial from economical aspect. Among the different growth regulator treatments, the highest plant height (21.40 cm) was observed with foliar application of T_5 (GA_3 @ 200 ppm) which was at par with T_4 (GA_3 @100 ppm), T_6 (BA 150 ppm + GA_3 150 ppm) and T_7 (BA 250 ppm + GA_3 250 ppm) but was found significant to T_2 (BA 100 ppm), T_3 (BA 200 ppm) and T_1(control) as shown in Table 1. An increase in plant height may be explained by the cell wall's increased plasticity which is followed by the hydrolysis of starch to sugars, which lowers the cell's water potential and allows water to enter the cell causing elongation. The increased photosynthetic activity, accelerated translocation, and increased efficiency of photosynthetic product utilization may have been the cause of these osmotic driven responses under gibberellin influence. These findings align with previous studies by Yugandhar *et al*., (2017), Haokip *et al*., (2016), Ravanachandar and Ilakiya (2024), Singh *et al*., (2012) in coriander, Meena *et al*., (2014) in fenugreek and Pariari *et al*., (2012) in black cumin where application of GA_3 significantly improved the plant height over other PGR treatment. The application of growth regulators did not cause any significant difference between the treatments in the leaf breadth of culantro. The highest leaf breadth (3.06 cm) was observed in T_5 (GA_3 200 ppm) while the lowest leaf breadth (2.73 cm) was recorded in T_3(BA 200 ppm).

Among all the treatments, highest number of leaves/ plant (18.66) were recorded in T_4(GA_3 100 ppm) which was comparable with T_3 (BA 200 ppm) and T_5(GA_3 200 ppm) and found significant over all other treatments. GA_3 treatment effectively promoted foliar development in culantro as evidenced by the significant increase in leaf count. GA_3 maximized the total number of leaves by promoting both vertical and lateral growth, which resulted in a denser canopy. The balanced promotion of lateral branches and vertical growth may be the cause of this increased foliar density particularly at 100 ppm which makes GA_3 application the most efficient way to maximize leaf production of culantro. The results are in conformity with the earlier findings of Ravanachandar and Ilakiya (2024) in coriander, Shah and Samiullah (2006) in black cumin. No significant differences were detected in the amount of suckers/plant between the treatments. It was found that T_4 (GA_3 100 ppm) resulted in highest number of suckers/plant (1.66) which was followed by T_3(BA 200 ppm) and T_5(GA_3 200 ppm).

It is evident from Table 1 that foliar spray of T_5 (GA_3 200 ppm) resulted in early emergence of inflorescence (84.33 days) while T_7(BA 250 ppm + GA_3 250 ppm) took the highest number of days (117.00) for the inflorescence emergence. Earlier studies by Singh *et al*., (2012), Yugandhar *et al*., (2017), Haokip *et al*., (2016) in coriander supported the present findings where the application of GA_3 took a smaller number of days for inflorescence emergence as compared to other growth regulators. The results indicate that GA_3 has a beneficial impact in the early emergence of inflorescence in culantro. In case of flower stalk the highest length (14.30 cm) was observed with the treatment T_4(GA_3 100 ppm) which was comparable with T_5(GA_3 200 ppm) and T_6(BA 150 ppm + GA_3 150 ppm) and it was significant over all other treatments.

We can infer from the results depicted in Table 1 that the highest no. of inflorescence/plant (37.33) was recorded in T_4(GA_3 100 ppm) which was at par with T_5(GA_3 200 ppm) and T_2(BA 100 ppm) and found significant over other treatments. The present results are in close accordance with the earlier reports of Singh *et al*., (2012), Verma and Sen (2006), Haokip *et al*., (2016) in coriander. In the present investigation it was found that application of PGR had a great impact on the seed yield of culantro. It is evident from Table 1 that the highest seed yield (0.97g/plant) was recorded in T_4(GA_3 100 ppm) and it was comparable with T_5(GA_3 200 ppm) and significant over rest treatments. Increased photosynthesis and increased mobilization of photosynthates towards reproductive sites, along with improved vegetative growth brought about by gibberellic acid application, may have contributed to the higher yield. Similar results were reported by Kusuma *et al*., (2019) in fennel, Shah and Samiullah (2006), Pariari *et al*., (2012), Shah *et al*., (2006) in black cumin, Panda *et al*., (2007), Haokip *et al*., (2016), Verma and Sen (2006), Singh *et al*., (2012) in coriander, Bagde *et al*., (1993), Meena *et al*., (2014), Rathod *et al*., (2023) in fenugreek who observed maximum seed yield with the application of gibberellic acid.

Conclusion

The present study indicated that the foliar spray application of GA_3 100 ppm and 200 ppm was significant over control and other treatments and resulted in significant improvement in growth and yield parameters of culantro which has practical utility in commercial cultivation for higher yield.

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