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Influence of Growth Stimulants on Growth and Yield of Bird's Eye Chilli (*Capsicum frutescens* L.)

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ABSTRACT: Bird's eye chilli (*Capsicum frutescens* L.) is considered as one of the emerging spice crop, having various health benefits and very high demand in national and international markets. So, as no much work on systemic cultivation of the crop is done the present investigation was planned to study the response of the crop to different growth stimulants. An investigation was conducted at College of Horticulture, Mudigere during the year 2022-23 to study the effect of plant growth stimulants on growth and yield of bird's eye chilli. The statistical design adopted is Randomized Complete Block Design with thirteen treatments. Among the different treatments, foliar application of GA_3 @ 75 ppm recorded significantly maximum plant height (83.59 cm) and plant spread (3014.10 cm^2). The treatment T_{12} (Humic acid @ 0.50 %) recorded maximum number of primary branches per plant (12), fruit length (1.72 cm), fruit width (5.97 mm), single fruit weight (0.67 g), fresh yield per plant (244.93 g) and dry yield per plant (93.30 g). The results revealed that foliar application of humic acid @ 0.50 per cent at 60, 90 and 120 DAT would help in improving plant growth and yield attributes of bird's eye chilli.

Keywords: Bird's eye chill, GA_3, Humic acid, Growth and Yield.

INTRODUCTION

Bird's eye chilli (*Capsicum frutescens* L.) is considered as one of the emerging spice crops. As a vegetable and spice, it plays a significant role in everyone's daily lives in tropical countries around the world. It belongs to the family Solanaceae with the chromosome number 2n = 24 and is native to Tropical America and Guatemala is the secondary centre of origin. The crop was introduced into India by Portuguese in the later part of the 16th century. Peppers are considered the first spice to have been used by human beings and there is archaeological evidence of pepper and other fossil foods from as early as 6000 years ago (Hill *et al*., 2013). Bird's eye chilli is called by many other synonyms like African pepper, chilli pepper, goat's pod, Mexican chilli, red pepper, Tabasco pepper, Zanzibar pepper and Cayenne pepper. The name bird's eye chilli because, birds love to pick the ripe fruits.

Capsicum frutescens is the hottest variety among all the pepper species in the world and comprises numerous chemicals including steam volatile oils, vitamins, capsaicinoids, carotenoids, proteins, fibre and mineral elements. Due to its greater pungency, colour and medicinal qualities, majority of bird's eye chillies are processed to extract the oleoresin for sale to the culinary and pharmaceutical industries. Traditional uses of bird's eye chilli in medicine included treating toothaches, indigestion, flatulence, as well as easing arthritis and rheumatism

There are several studies revealing the growth and yield of chilli (*Capsicum annum*). Singh and Singh (2019) observed that the application of GA_3 @ 150 ppm was found significantly superior over other treatments in terms of plant height at 30 DAT, 60 DAT and at harvest (76.82 cm, 116.14 cm, 141.58 cm), number of branches per plant at 30 DAT and at harvest (28.37 and 50.73) in chilli. Similar reports were also made by Anolisa *et al*. (2020) in chilli. Singh and Singh (2019) observed that in chilli application of GA_3 @ 150 ppm produced maximum fruit length (29.74 cm), fresh weight of 10 fruits (109.85 g), number of fruits per plant (127.91), fruit yield per plant (636.04 g) and fruit yield per ha (25.70 t/ha). Sharma and Chauhan (2019) revealed that application of triacontanol (1.5 ml/l) recorded the maximum number of fruits per cluster (5.67), number of fruits per plant (52.50), highest average fruit weight (72.2 g) and fruit yield per plant (3.79 kg) in chilli. Similar were the findings by (Verma 2020) in chilli. Jan *et al*. (2020) reported maximum number of fruits per plant (57.50), yield per plant (204.50 g) and total yield (3.93 t/ha) from humic acid (50 g/l). Whereas, fruit

weight (3.81 g), fruit diameter (13.82 mm), fruit volume (11.33 cm^3) was found in plants treated with humic acid (100 g/l) in chilli.

Bird's eye chilli being a major spice with tremendous export potential, the emphasis now lies on increasing the productivity. Due to increasing importance and demand of bird's eye chillies, its production technology needs to be developed. The average productivity of the crop is very low due to lack of research on systematic cultivation of this crop. Hence an attempt has been made to know the role of growth stimulants on growth and yield of bird's eye chilli.

MATERIAL AND METHODS

The experiment was conducted at College of Horticulture, Mudigere during *rabi* season 2022-2023 at College of Horticulture, Mudigere.The statistical design adopted was Randomized Complete Block Design (RCBD) with thirteen treatments and two replications. The aim of study was to find out the suitable growth stimulants for improved growth and yield and attributes of bird's eye chilli. The treatments included in the study were T_1 (NAA @ 50ppm), T_2 (NAA @ 75ppm), T_3 (GA_3 @ 50ppm), T_4 (GA_3 @ 75ppm), T_5 (CCC @ 500ppm), T_6 (CCC @ 750ppm), T_7 (Seaweed extract @ 0.25 per cent), T_8 (Seaweed extract @ 0.50 per cent), T_9 (Triacontanol @ 0.25 per cent), T_{10} (Triacontanol @ 0.50 per cent), T_{11} (Humic acid @ 0.25 per cent), T_{12} (Humic acid @ 0.50 per cent) and T_{13} (Control). Foliar spray was taken at 60,90 and 120 DAT (Days After Transplanting) and Observations on growth and yield attributing parameters of bird's eye chilli were recorded at 45, 75, 105 and 135 DAT (Days After Transplanting).

RESULTS AND DISCUSSION

The findings were considerably interpreted and listed in Table 1 and Plate 1 based on observation recorded in the present research.

In the present investigation, the treatment T_4 (GA_3 @ 75 ppm) recorded significantly maximum plant height (83.59 cm) at 135 DAT. However, minimum plant height was recorded in treatment T_{13} - Control (47.85 cm). This was probably due to involvement of gibberellic acid in increasing, efficient translocation and utilization of photosynthates, causing rapid cell division and cell elongation in the apical meristem of the stem leading to stimulation of growth. These results are in conformity with those reported by Singh and Singh (2019), Anolisa *et al*. (2020) in chilli.

Foliar spray with GA_3 @ 75 ppm recorded significantly maximum plant spread (3014.10 cm^2) at 135 DAT. However, minimum plant spread was recorded in treatment T_{13} - Control (1868.70 cm^2).

Table 1. Effect of growth stimulants on plant growth and yield parameters of bird's eye chilli.

Treatments	Plant height (cm)	No. of primary branches per plant	Plant spread (cm^2)	Fruit length (cm)	Fruit width (mm)	Fresh fruit yield (g/plant)	Dry fruit yield (g/plant)
T_1: NAA @ 50 ppm	63.45	9.30	2364.33	1.42	5.50	151.44	57.70
T_2: NAA @ 75 ppm	62.46	9.10	2279.77	1.35	5.54	132.45	50.46
T_3: GA_3 @ 50 ppm	73.91	9.60	2465.03	1.52	5.81	144.86	55.18
T_4: GA_3 @ 75 ppm	83.59	11.50	3014.10	1.65	4.75	159.52	60.75
T_5: CCC @ 500 ppm	67.95	10.00	2158.40	1.57	4.97	175.88	66.99
T_6: CCC @ 750 ppm	61.30	10.10	2083.70	1.55	4.94	142.94	54.44
T_7: Seaweed extract @ 0.25 %	62.35	12.00	2623.12	1.69	4.29	225.44	85.88
T_8: Seaweed extract @ 0.50 %	69.70	10.80	2394.69	1.66	5.05	193.01	73.52
T_9: Triacontanol @ 0.25 %	82.90	11.70	2605.60	1.59	4.95	179.60	68.41
T_{10}: Triacontanol @ 0.50 %	73.00	11.90	2704.05	1.44	4.49	205.59	78.32
T_{11}: Humic acid @ 0.25 %	78.41	11.50	2500.20	1.51	5.54	211.01	80.37
T_{12}: Humic acid @ 0.50 %	69.32	12.00	2737.84	1.72	5.97	244.93	93.30
T_{13}: Control	47.85	8.50	1868.70	1.31	4.01	125.91	47.97
S. Em±	**2.60**	**0.44**	**135.82**	**0.06**	**0.34**	**7.34**	**2.80**
CD @ 5%	**7.66**	**1.30**	**399.53**	**0.20**	**1.00**	**21.60**	**8.27**

Plate 1. Control vs best treatment (a. Control, b. Humic acid @ 0.5 %).

This might be due to the fact that the gibberellic acid promotes cell division and cell elongation, which leads to increased stem length and internodal length leading to greater spacing between leaves and branches, contributing to a more plant spread. The results are in conformity with the findings of Salauddin and Anupam (2013), Vandana and Varma (2014) and Singh and Singh (2019) in chilli.

Significantly maximum number of primary branches per plant was recorded in treatment T_{12} (Humic acid @ 0.50 %) and T_7 -Seaweed extract @ 0.25 per cent (12 each) at 135 DAT. Whereas, minimum number of primary branches was recorded in treatment T_{13} (Control) (8.50). This might be due to the hormone like activity of humic acid substances (like humin, fulvic acid *etc.*,), which has similar effects as that of auxins, which might have promoted the increase in number of branches. Similar findings were also reported by Yildirim (2007), Karakurt *et al*. (2009) and Manas *et al.* (2014) in chilli.

The treatment T_{12} (Humic acid @ 0.50 %), recorded significantly maximum fruit length (1.72 cm) and fruit width (5.97 mm). While T_{13} (Control) recorded minimum fruit length (1.31 cm) and fruit width (4.01mm). This might be due to the fact that foliar application of humic acid could enhance the efficiency of photosynthesis by improving number of leaves, chlorophyll content and photosynthetic rates. Due to better photosynthesis, carbohydrates might have been produced and translocated to the developing fruit, providing the necessary energy and resources for growth and development of fruits. Similar findings were also reported by Ibrahim *et al*. (2019) and El-Sayed *et al*. (2019) in sweet pepper and Verma (2020) and Jan *et al*. (2020) in chilli.

Fresh yield and dry yield of bird's eye chilli exhibited significant differences with the foliar application of growth stimulants. In the present study the fresh yield per plant (244.93 g) and dry yield per plant (93.30 g) was significantly maximum in treatment T_{12} (Humic acid @ 0.50 %). While, T_{13} (Control) recorded minimum fresh yield per plant (125.91 g) and dry yield per plant (47.97 g). This might be due to foliar application of humic acid, which was responsible for the increased number of primary branches, number of leaves, leaf area, leaf area index and also chlorophyll content in leaves, which resulted in more production of photosynthates which were responsible for the increased fruit length, fruit width, number of seeds per fruit and fruit weight, which ultimately resulted in increased the yield of bird's eye chilli. Similar findings were reported by Manas *et al.* (2014), Ibrahim *et al.* (2019), El-Sayed *et al.* (2019), Verma (2020) and Jan *et al*. (2020) in chilli.

CONCLUSIONS

The treatment T_4 (GA_3 @7 5 PPM) recorded significantly superior growth attributes over the other treatments studied. Treatment T_{12} (Humic acid @ 0.5%) recorded significantly higher yield attributes over all the treatments. Hence, it can be concluded from the study that foliar application of Humic acid @ 0.5% at 60, 90 and 120 DAT will improve plant growth and fruit yield in bird's eye chilli.

FUTURE SCOPE

Combination of growth stimulants and micronutrients on yield and quality parameters of bird's eye chilli need to be studied

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Conflict of Interest. The authors have declared that no conflict of interest exists.

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