www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(5): 328-330

www.thepharmajournal.com
Received: 02-02-2022
Accepted: 08-04-2022

Raj Kumar Sanam
M.Sc. Scholar, Department of Horticulture and Vegetable Science, NAI, SHUATS, Prayagraj, Uttar Pradesh, India

Samir Ebson Topno
Assistant Professor, Department of Horticulture, NAI, SHUATS, Prayagraj, Uttar Pradesh, India

Corresponding Author:
Raj Kumar Sanam
M.Sc. Scholar, Department of Horticulture and Vegetable Science, NAI, SHUATS, Prayagraj, Uttar Pradesh, India

Effect of different plant growth regulators on growth and yield of chilli (*Capsicum annum*)

Raj Kumar Sanam and Samir Ebson Topno

Abstract
The experiment was laid out in Randomized Block Design with ten treatments and three replications. The plant growth regulators used as treatments were T1-Control, T2-NAA (40 ppm), T3-NAA (50ppm), T4-NAA (60ppm), T5-CCC (300ppm), T6-CCC (500pppm), T7-CCC (700ppm), T8-NAA (40ppm) + CCC (300ppm), T9-NAA (50ppm) + CCC (500ppm) and T10-NAA (60ppm) + CCC (700ppm). Results obtained in the present investigation revealed that treatment with application of NAA @ 50ppm was recorded significantly higher plant height (56.56 cm), number of days for flowering (43.63), fruit length (6.80 cm), fruit weight (2.54 g) and yield per plant (148.26 g) (56.5 quintals/hectare), whereas CCC @ 500ppm was resulted higher number of branches (24.85) and fruit length (6.29 cm).

Keywords: Plant growth hormones; Naphthalene Acetic acid (NAA), Chloro choline chloride (CCC)

Introduction

Chilli (*Capsicum annum* L.) belongs to the family Solanaceae having chromosome number 2n = 24 is an important vegetable cum spice crop grown in almost all parts of tropical and sub-tropical regions of the world. It is originated from South and Central America where it was domesticated around 7000 BC. The largest producer of chillies in the world is India accounting for 13.76 million tonnes of production annually followed by China with a production of around 3 million tonnes. The major chilli growing states are Maharashtra, Andhra Pradesh, Karnataka, Orissa, Tamil Nadu, Madhya Pradesh, Rajasthan, West Bengal. Chilli yield can be increased significantly by decreasing flower drops and improving fruit set. Plant growth regulators are a new generation of agrochemicals that follow fertilizers, insecticides, and herbicides in this regard. Plant growth regulators have the potential to boost vegetable yield. Due to environmental conditions and growing practices, there is a significant problem of early bloom and fruit drop in chilli in hot regions. Hormonal imbalance as a result of a sudden increase in ambient temperature. One of the greatest obstacles in the production of chilies is poor fruit set, which has a direct impact on yield. It is caused by poor meteorological conditions such as temperature changes and rainfall. The experiment was carried out with following objectives:

To assess the most suitable treatment of NAA and CCC for plant growth, yield, and fruit quality of chilli.

To find out the interaction effect on growth, yield, and quality of chilli.

To estimate the economics of different treatments.

Materials and Methods

The experiment was carried out during *Kharif* season 2021 at Research farm in Department of Horticulture, Naini Agriculture Institute, Sam Higginbottom University of Agriculture, Technology and sciences, Prayagraj (U.P). The experiment was laid out in Randomized Block Design (RBD) with ten treatments, those were replicated thrice. Armour (Numhems) variety of chilli was selected for the study. Which was planted during *Kharif* season in 2021 at 60cm X 45cm spacing and growth regulators were sprayed at 30, 60 and 90 Days after transplanting. The treatment comprises of T1-Control, T2-NAA@40ppm, T3-NAA@50ppm, T4-NAA@60ppm, T5-CCC@300ppm, T6-CCC@500ppm, T7-CCC@700ppm, T8-NAA@40ppm + CCC@300ppm, T9-NAA@50ppm + CCC@500ppm and T10-NAA@60ppm + CCC@700ppm respectively. Along with the recommended dosage of fertilizer is also applied during transplanting. The observations on growth parameters *i.e.* plant height (cm), Number of branches were recorded from three randomly tagged plants from each plot at various growth stages whereas yield parameters *i.e.* number of days for flowering, fruit length (cm), fruit weight (g), fruit diameter (cm), yield per plot (g) and yield per hectare were recorded. Economics were also calculated. The recorded data were analyzed statistically by ANOVA technique. Significant difference among the treatment mean was verified against the critical difference at 5% level of significance.

Table 1: Treatment details

Sr. no	Abbreviations	Treatments
1.	T1	Control
2.	T2	NAA @ 40ppm
3.	T3	NAA @ 50ppm
4.	T4	NAA @ 60ppm
5.	T5	CCC @ 300ppm
6.	T6	CCC @ 500ppm
7.	T7	CCC @ 700ppm
8.	T8	NAA@40ppm + CCC@300ppm
9.	T9	NAA@50ppm + CCC@500ppm
10.	T10	NAA@60ppm + CCC@700ppm

Results and Discussion
Growth parameters
Crop growth parameters in chilli were measured in terms of plant height (cm), number of branches/plant at 30, 60 and 90 DAT are shown in Table 2.

From the following table the results revealed that, significantly the maximum (56.56 cm) plant height was recorded in the treatment T_3 (NAA @ 50 ppm), which was at par (51.99 cm) with T_4 (NAA @ 60 ppm). Whereas, the minimum (34.33 cm) plant height was recorded in treatment T_7 (CCC @ 700 ppm). The increase in the plant height might be due to the fact that, Naphthalene Acetic Acid functions as a growth hormone that may explain the rise in plant height. Naphthalene acetic acid is a promoter that boosts photosynthetic activities and makes them more efficient for translocation and use of photo-synthetics that could be useful cause for rapid cell division in the plant's growing section or growth stimulant. The results are in conformity with the findings of Natesh *et al.* (2005) in chilli. The apical dominance effects of auxins may be responsible for the rise in plant height. Growth regulators are involved in increasing photosynthetic activity, efficient assimilation of photosynthetic products, rapid cell division and cell elongation in growth, in addition to increasing nutritional uptake.

Due to increase in the advancement of crop growth period in chilli crop there were increases in the number of branches, in chilli significantly the maximum (24.85) number of branches were recorded in the treatment T_6 (CCC @ 500 ppm), which was at par (21.89) with treatment T_4 (NAA @ 60 ppm), Whereas the minimum (18.44) number of branches were recorded in T_9 (NAA @ 50 ppm + CCC @ 500 ppm). The number of branches per plant increased continuously from 30 to 90 days after transplanting in all the treatments**.** The increased osmotic uptake of water and nutrients, under the influence of which cycocel would have maintained a steady swelling force against weakening of cell walls, could be the reason for the increase in all growth characteristics of chilli plants. The results of this experiment are in conformity with the findings of Vandana Prajapati *et al.* (2014) [7].

Table 2: Effect of different plant growth regulators on growth of chilli (*Capsicum annum* L.)

TREATMENS	PLANT HEIGHT			NO OF BRANCHES		
	30 DAT	60 DAT	90 DAT	30 DAT	60 DAT	90 DAT
1. CONTROL	13.67	26.66	37.52	4.30	7.22	19.28
2. NAA @ 40 ppm	15.79	33.55	46.64	3.56	6.44	18.96
3. NAA @ 50 ppm	18.40	38.40	56.56	3.18	7.44	20.78
4. NAA @ 60 ppm	16.42	34.33	51.99	4.44	8.34	21.89
5. CCC @ 300 ppm	14.41	31.37	41.37	3.56	7.00	19.89
6. CCC @ 500 ppm	13.84	26.88	37.88	5.52	10.33	24.85
7. CCC @ 700 ppm	13.12	23.00	34.33	4.33	6.89	19.44
8. NAA @40 ppm + CCC @ 300 ppm	11.66	29.84	39.78	3.67	6.67	18.96
9. NAA @50 ppm + CCC @ 500 ppm	12.49	26.65	36.96	4.41	6.00	18.44
10. NAA@60 ppm+ CCC @ 700ppm	11.81	25.56	34.86	4.55	6.44	19.40
CD (5 %)	0.71	2.38	1.83	0.39	0.43	0.65
CD (1 %)	0.96	3.22	2.48	0.53	0.59	0.88
CV	3.84	6.19	3.38	7.25	3.46	2.48
S.Ed (±)	0.34	1.15	0.89	0.19	0.21	0.31
F. Test	S	S	S	S	S	S
Range Lowest	11.81	23.00	34.33	3.18	6.00	18.44
Range Highest	18.40	38.40	56.56	5.52	10.33	24.85

Number of days for flowering varied among the plant growth regulator foliar application. Significantly minimum (43.63 DAS) number of days required for flowering in T3-NAA@50ppm whereas, it was recorded maximum (50.33 DAS) in T1-Control. This could be attributed to increased cytokinin and auxin synthesis in the root tissue as a result of NAA's increased action. Their simultaneous transfer to the axillary buds would have provided a more efficient sink for photo-assimilates mobilization. This has aided the transition from the vegetative to reproductive phases in the early stages. Kannan *et al.* (2009) [2] reported that early flowering observed when treated with treatment NAA 50ppm (38.80) days required for 50 percent flowering followed by NAA 25ppm (41.00) days compared to control.

Yield parameters
The observation regarding yield *viz.*, number of days for flowering, fruit length (cm), fruit weight (g), fruit diameter (cm), yield per plot and per hectare were shown in Table 3. The difference in fruit length (cm) was found significant in T3- NAA@50ppm, T6- CCC@500ppm and T1- Control. Whereas maximum fruit length was recorded in T3-NAA@50ppm (6.80 cm) which was at par with treatment T6-CCC@500ppm (6.29 cm) and minimum fruit length was recorded in treatment T1-Control (5.77 cm). This could be attributed to a rise in cell number as well as cell elongation,

which is primary effect of auxins' group of chemicals. These were reported by Sharma *et al.* (1999) [6].

Significantly more fruit weight was recorded in treatment T3-NAA@50ppm (2.54 g) which was at par with T1-Control (2.35 g) and minimum fruit weight was recorded in treatment T4-NAA@60ppm (1.74 g). The fruit weight is controlled by fruit length and fruit diameter which all were higher in T3-NAA@50ppm. Similar findings were recorded by Revanappa *et al.* (1998) [4].

Similarly, the maximum fruit diameter was recorded in the treatment T3-NAA@50ppm (2.97 cm) which was at par with T9-NAA@50ppm + CCC@500ppm (2.79 cm) whereas minimum fruit diameter was recorded by treatment T8-NAA@40ppm + CCC@300ppm (2.17 cm). The rise in fruit diameter is likely due to an increase in cell number and elongation, both of which are regulated by auxin activity. Kannan *et al.* (2009) [2] reported that fruit diameter was significantly influenced by NAA @50ppm during rabi and zaid seasons.

The foliar application of growth regulators outperformed seed treatment options in terms of fruit output per plot. T3-NAA 50ppm (148.26 kg), which was on par with T6-CCC 500ppm (138.07 kg) in foliar application, produced significantly greater fruit output per plot than control. In the control group, the minimum fruit yield per plot was reported (76.03 kg). This could have led to a faster photosynthetic rate, as well as improved shoot and root growth. Sharma *et al.* (1999) [6] reported an increase in yield due to NAA application in a bell paper.

Table 3: Effect of different plant growth regulators on yield of chilli

TREATMENTS	No of days for flowering	Fruit length (cm)	Fruit weight (g)	Fruit diameter (cm)	Yield per plot (kg)	Yield per hectare (q ha)
1. CONTROL	50.33	5.77	2.35	2.53	76.30	28.2
2. NAA @ 40 ppm	47.78	5.93	1.93	2.69	108.41	41.5
3. NAA @ 50 ppm	43.63	6.80	2.54	2.97	148.26	56.5
4. NAA @ 60 ppm	48.89	6.23	1.74	2.56	111.48	42.5
5. CCC @ 300 ppm	50.00	5.65	1.78	2.29	124.52	46.1
6. CCC @ 500 ppm	48.22	6.29	2.04	2.67	138.07	51.1
7. CCC @ 700 ppm	49.56	6.20	2.19	2.71	111.78	41.4
8. NAA @ 40 ppm + CCC @ 300 ppm	48.89	5.92	1.86	2.17	99.48	36.8
9. NAA @ 50 ppm + CCC @ 500 ppm	46.33	6.17	2.30	2.79	92.37	36.4
10. NAA @ 60 ppm + CCC @ 700 ppm	46.22	6.15	2.11	2.33	106.41	39.5
CD (5 %)	1.38	0.30	0.56	0.43	8.82	13.61
CD (1 %)	1.87	0.41	0.76	0.58	11.95	18.64
CV	2.22	3.79	18.94	9.64	6.09	19.54
S. Ed (±)	0.67	0.15	0.27	0.20	4.27	6.48
F. Test	S	S	S	S	S	S
Range Lowest	43.63	5.77	1.74	2.17	76.30	28.2
Range Highest	50.33	6.80	2.54	2.97	148.26	56.5

Conclusion

From the above results, it is concluded that foliar application of treatment T3 with NAA@50ppm has performed better in growth and yield parameters and was economically viable.

Acknowledgement

The work was supported by Advisor Dr. Samir Ebson Topno and all faculty members, Department of Horticulture, Naini Agricultural institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, (U.P.) India for providing field and assistance in conducting the research trail.

References

1. Tapdiya GH, Gawande PP, Ulemale PH, Patil RK, Naware MS. Effect of growth regulators on quantitative characters of chilli (*Capsicum annum*). International Journal of Current Microbiology and Applied Sciences 2018; ISSN: 2319-7692. 2018;(6):2151-2157.
2. Kannan K, Jawaharlal M, Prabhu M. Effect of plant growth regulators on growth and yield parameters of Paparika cv. Ktpl-19. Agric. Sci. Digest. 2009;29(3):157-162.
3. Mahindre PB, Jawarkar AK, Ghawade SM, Tayade VD. Effect of different concentration of plant growth regulators on growth and quality of green chilli. Journal of pharmacognosy and Phytochemistry. 2018;SPI:3040-3042.
4. Revanappa. Influence of growth regulators on fruit parameter, yield and parameter in green chilli cultivars. Karnataka J Agric. Sci. 1998;12(1):122 126.
5. Shankhwar B, Nigam AK, Vasure N, Vishvakarma D. Effect of different plant growth regulators on growth of chilli (*Capsicum annum*), 2017, Agriculture update. 2017;(12):1187-1189.
6. Sharma AK, Ratian RS, Pathania NK. Effect of plant growth regulators on yield and morphological traits in brinjal (*Solanum melongena* L.). Agric. Sci. Dig. 1999;12:219-222.
7. Vandana P, Varma LR. Effect of spray treatment of pant growth substances at different stages on growth and yield of sweet pepper (*Capsicum annum* L.) cv. Indra. International Journal of Agricultural Research. 2014;2:235-240.