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Effect of different concentration of plant growth regulators on growth and quality of green chilli

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Abstract
A field experiment entitled "Effect of different concentration of plant growth regulators on growth and quality of green chilli" was conducted at Chilli and Vegetable Research Unit, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola during *kharif* season of 2016-2017. The experiment consists of ten treatment comprising plant growth regulators and their mode of application and was laid out in randomized block design having three replications. There were three plant growth regulators were use with different combinations and were applied by foliar application at 30 DAT, 60 DAT, 90 DAT to assess the effect on growth and quality of green chilli. The investigation revealed that, the vegetative growth observations in terms of plant height of plant was produced in the treated with NAA at 50 ppm and number of branches per plant were produced significantly the maximum due to application of CCC at 500 ppm. The plant spread was found significantly the maximum when the treated with an NAA at 50 ppm. As regards to the yield parameters which were recorded viz. fruits per plant of green chilli were produced significantly the maximum due to an application of NAA at 50 ppm concentration. As far as the fruit quality concern in terms of fruit length was observed significantly the maximum obtained an application of GA_3 at 50 ppm, significantly the maximum fruit breadth was obtained with an application of CCC at 500 ppm concentration and the other quality parameter like in respect to the chlorophyll content i.e. chlorophyll A, chlorophyll B and total chlorophyll were observed maximum when the treated with CCC at 500 ppm concentration.

Keywords: plant growth regulators; NAA, GA_3, CCC, Green chilli yield.

Introduction
Chilli (*Capsicum annuum* L.) is an important vegetable cum spice crop grown in almost all parts of tropical and subtropical regions of the world. It belongs to the family Solanaceae and originated from South and Central America where it was domesticated around 7000 BC. The genus Capsicum includes 30 species, five of which are cultivated *Capsicum annuum* L., C.*Frutescence* L., C.*Chinense*J., C.*pubescence* R. and C. *Baccatum* L. (Patel *et al.* 2016) The major chilli growing states are Maharashtra, Andhra Pradesh, Karnataka, Orissa, Tamil Nadu, Madhya Pradesh, West Bengal and Rajasthan.
There is a great potential to increase yield of chilli by reducing flower drops and by increasing fruit set. To achieve this, plant growth regulators are considered new generation of agro-chemicals after fertilizers, pesticides and herbicides. Plant growth regulators have potential ability to increase productivity of vegetables. In hot region, there is great problem of premature flower and fruit drop in chilli due to environment factors and cultivation practices. Hormonal imbalance due to sudden rise in atmospheric temperature. Poor fruit set is one of the major bottleneck in the production of chilies and it is directly affects the yield. It is by the adverse weather condition like increasing or decreasing temperature and rainfall.

Materials and methods
The field experiment was carried out at Chilli and Vegetable Research Unit, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola during *kharif* season of 2016-2017. The experiment was laid out in a Randomized Block Design (RBD). There were ten treatments and each treatment was replicated thrice with a gross and net plot sizes were 3.6m x 3.0m and 3.0m x 2.4m per treatment for that, Jayanti variety of chilli was selected for the study. Which was planted *kharif* season of 2016-2017 at 60 x 60 cm and growth regulators were sprayed at 30, 60 and 90days of transplanting. The treatments comprised of T_1 - NAA 50 ppm, T_2 - NAA 100 ppm, T_3 - NAA 150 ppm, T_4 - GA_3 10 ppm, T_5 - GA_3 25 ppm, T_6 - GA_3 50 ppm, T_7 - CCC 250 ppm, T_8 - CCC 500 ppm, T_9 - CCC 750 ppm and T_{10} – control respectively.

Treatment details

Sr. No.	Abbreviations	Treatments
1.	T_1	NAA (50ppm)
2.	T_2	NAA (100 ppm)
3.	T_3	NAA (150 ppm)
4.	T_4	GA_3 (10 ppm)
5.	T_5	GA_3 (25 ppm)
6.	T_6	GA_3 (50 ppm)
7.	T_7	CCC(250 ppm)
8.	T_8	CCC(500 ppm)
9.	T_9	CCC(750 ppm)
10.	T_{10}	Control

Results and discussion

It was observed from data pertaining to table 1 that, significantly the maximum (64.10 cm) plant height was recorded in the treatment T_1 (NAA at 50 ppm), which was at par (63.27cm) with T_5 (GA_3 at 25 ppm). Whereas, the minimum (50.27 cm) plant height was recorded in treatment T_7 (CCC at 750 ppm). The increase in plant height might be due to the fact that, Naphthalene Acetic Acid acts as growth promoter which, increases photosynthetic activities, efficient translocation and utilization of photo synthetics which might be causing rapid cell division in growth portion of the plant or stimulation of growth. The results are in conformity with the findings of Natesh *et al.* (2005) in chilli cv. Byadgi Kaddi.

With the advancement of crop growth period in chilli crop there were increase in the number of branches, in chilli significantly the maximum (24.40) number of branches were recorded in the treatment T_8 (CCC at 500 ppm), which was followed (23.37) by T_9 (CCC at 750 ppm), Whereas, the minimum (15.13) number of branches were produced at treatment T_{10} (Control). The possible reason for increase in all growth characters of chilli plants may be due to the increased osmotic uptake of water and nutrients under the influence of which cycocel would have maintained a constant swelling force against softening of cell walls. The result of this experiment are in agreement with the results of Chaudhary *et al.* (2006) in chilli. Vandana Prajapati *et al.* (2014) in chilli.

Similarly in case of plant spreads significantly the maximum (53.13 cm) plant spread was recorded in the treatment T_2 (NAA at 50 ppm), which was statistically at par (52.80 cm) with treatment T_5 (GA_3 at 25 ppm). Whereas, the minimum (42.30 cm) plant spread was recorded in treatment T_{10} (Control).

Thus might be due to the fact that, increased photosynthetic metabolic activities and dry matter content in plant was increased due to application of NAA as compaired to other plant growth regulators. The increase in the subsequent increase in plant spread. These results are in line with the finding of Chaudhary *et al.* (2006) in chilli.

The data concerning to number fruit per plant indicated that, significantly the maximum (144.17) number of fruit per plant in chilli crop was produced in the treatment T_1 (NAA at 50 ppm), which was statistically at par (143.97) with treatment T_6 (GA_3 at 50ppm). However, the minimum (110.40) number of fruits per plant was recorded with the treatment T_{10} (Control).

The data regarding to yield per plant revealed that, in green chilli crop the significantly maximum yield per plant (440.00g), were obtained from the treatment T_1 (NAA at 50 ppm) which was followed by treatment T_6 (GA_3 at 50ppm). There was increase in the yield per plant per plot and per hectare with an application of Naphthalene Acetic Acid at 50 ppm as against rest of the treatments thus might be due to the probable reason that, NAA might be responsible for increase in photosynthetic activities within the plant which might be resulted in more production of carbohydrates and related products responsible for increase in growth. Fruit size, fruit weight of chilli, ultimately responsible for increased yield of chilli. These results are in agreement with the findings of Patel, *et al*. (2016) in chilli.

The data in respect of length of fruit indicated significant differences in respect length of chilli fruit clearly depicted that, significantly the maximum (9.50cm) length of fruit was obtained in the treatment T_6 (GA_3 at 50 ppm) However, the minimum (7.70cm) length of chilli fruit was recorded with an application of treatment T_{10} Control).

Similarly in case of breadth of chilli fruit it was clearly indicated that, significantly the maximum (1.97 cm) breadth of fruit was recorded in the treatment T_8 (CCC at 500 ppm). Whereas, the minimum (1.11cm) breadth of chilli fruit was recorded when there was an application of treatment T_{10} (Control).

The data from Table 2 clearly indicated that, significantly the maximum chlorophyll content was recorded in the treatment T_8 (CCC at 500 ppm). While, the minimum (1.23 mg/100mg) chlorophyll content respectively was recorded in treatment T_{10} (Control) in chili.

Increased chlorophyll content in leaves might be due to the fact that, the more the plant spread of chilli plant more would be the chlorophyll pigmentations and finally increase in chlorophyll A,B and total was recorded. This is supported with the similar findings of by Arora *et al.* (2014), Moniruzzaman *et al*. (2014) in Brinjal,

The data presented in Table 2 indicated that capsaicin content in chilli fruit the differences among the different treatments were found statistically non-significant.

Conclusion

Treatment T_1 NAA at 50 ppm was found to be optimum as it recorded better in growth and in higher fruit yield and yield contributing characters but in case of quality parameter concern T_8 (CCC at 500 ppm) was found better.

Table 1: Effect of plant growth regulators on fruits per plant and yield per plant in green chilli

Treatments	Plant height (cm)	Number branches per plant	Plat spread (cm)	Fruits per plant	Yield per plant
T_1 - NAA (50 ppm)	64.10	19.00	53.13	144.17	440.00
T_2 - NAA (100 ppm)	60.17	17.38	48.00	131.90	423.00
T_3 – NAA (150 ppm)	62.03	19.57	51.40	139.40	390.27
T_4 - GA_3 (10 ppm)	56.13	16.07	48.90	129.80	377.23
T_5 - GA_3 (25 ppm)	63.27	18.20	52.80	134.97	410.00
T_6 - GA_3 (50 ppm)	58.17	20.07	50.13	143.97	428.73
T_7 – CCC (250 ppm)	54.23	21.23	44.50	121.20	350.03
T_8 – CCC (500 ppm)	52.67	24.40	46.30	125.67	360.07
T_9 - CCC (750 ppm)	50.27	23.37	47.10	130.97	380.37
T_{10} – Control	55.10	15.13	42.30	110.40	330.00
'F' test	Sig	Sig	Sig	Sig	Sig
SE(m)±	0.28	0.17	0.22	0.34	1.38
CD At 5 %	0.85	0.51	0.67	1.02	4.11

Table 2: Effect of different concentration of plant growth regulators on length of fruit, breadth of fruit, chlorophyll content, capsaicin content in green chilli

Treatments	Length of fruit (cm)	Breadth of fruit (cm)	Chlorophyll content (mg/100mg)	Capsaicin content (%)
T_1 - NAA (50 ppm)	8.42	1.20	1.66	0.17
T_2 - NAA (100 ppm)	8.20	1.68	1.87	0.18
T_3 – NAA (150 ppm)	8.35	1.66	2.16	0.17
T_4 - GA_3 (10 ppm)	9.43	1.36	1.73	0.17
T_5 - GA_3 (25 ppm)	7.87	1.47	2.01	0.18
T_6 - GA_3 (50 ppm)	9.50	1.61	2.40	0.18
T_7 – CCC (250 ppm)	7.83	1.23	1.42	0.17
T_8 – CCC (500 ppm)	8.33	1.97	2.68	0.18
T_9- CCC (750 ppm)	8.00	1.45	1.82	0.18
T_{10} – Control	7.70	1.11	1.23	0.17
'F' test	Sig	Sig	Sig	NS
SE(m)±	0.07	0.08	0.11	0.01
CD At 5 %	0.22	0.24	0.35	-

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