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Effect of chemicals and plant growth regulator on growth and quality of capsicum under shadenet conditions

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Abstract
Capsicum (*Capsicum annuum* L.) is an important vegetable crop grown in India. Production and productivity of this crop is low because of high flower and fruit drop as well as infestation of pest and diseases. The present investigation was carried out to study the effect of different chemicals and plant growth regulator and to find out suitable chemicals and plant growth regulator. Four spray of NAA @ 60 ppm proved best for growth parameters in respect to plant height, stem diameter and number of flower whereas, NAA @ 50 ppm was found to be superior for producing maximum number of branches. In respect of quality parameters, four spray of 1% KNO_3 recorded maximum fruit length, fruit breadth, fruit volume and chlorophyll content.

Keywords: Bell pepper, chemicals, plant growth regulator, growth, quality

Introduction
Capsicum (*Capsicum annuum* L. var. *grossum*) popularly known as Shimla mirch, bell pepper, sweet pepper, green pepper. From a nutritional prospective, bell pepper is rich in vitamins; chiefly, Viatamin 'A' and 'C'. The produce is off-season to the plains and fetches a higher price to vegetable growers. However, productivity and quality of produce is low because of the fluctuating environment, deficiencies of micronutrient during its cultivation. Productivity of a crop is greatly affected by cultural and physiological factors. Auxins cause apical dominance, cell elongation by loosening of cell wall and, retard flower and fruit abscission. Micronutrients are usually required in minute quantities, nevertheless are vital to the growth of plant. Improvement in growth characters as a result of application of micronutrients might be due to enhanced photosynthetic and other metabolic activity which leads to an increase in various plant metabolites responsible for cell division and elongation. The present studies were, therefore, undertaken to study the effect of chemicals and plant growth regulator on growth and quality of capsicum under shadenet conditions.

Materials and Methods
The present studies were conducted at Instructional farm, Department of Vegetable Science, Dr. PDKV, Akola, Maharastra in a 50 per cent shadenet during October-March, 2019-20. The experiment was laid out in RBD with nine treatments and three replications *viz*., T_1 (1% KNO_3), T_2 (1.5% KNO_3), T_3 (0.5% $ZnSo_4$), T_4 (0.75% $ZnSo_4$), T_5 (50 ppm NAA), T_6 (60 ppm NAA), T_7 (1% KNO_3 + 50 ppm NAA), T_8 (1% KNO_3 + 0.5% $ZnSO_4$), T_9 (Control). Chemicals and Plant growth regulator was applied as of four sprays, applied through foliar spray at 15 days intervals on 30, 45, 60 and 75 days after transplanting. Seedlings were transplanted on 12th October, 2019-20 at a spacing of 45 x 30cm in raised beds of size 3m x 1m. Data were recorded on growth characters such as plant height (cm), stem diameter (cm), number of branches per plant, leaf area (cm^2), chlorophyll content of leaves (mg 100 g^{-1}) at 120 days after transplanting and quality characters such as fruit length (cm), fruit breadth (cm), fruit volume (cc), chlorophyll content of fruit (mg 100 g^{-1}). Standard cultural practices were followed to raise the crop as per the package of practices. Statistical analysis was done as per method suggested by Panse and Sukhatme during 1989 [4].

Table 1: Effect of chemicals and plant growth regulator on growth and quality of bell pepper

Treatments	Plant height (cm) (120 DAT)	Stem diameter (cm) (120 DAT)	Number of branches per plant (120 DAT)	Leaf area (cm^2) (120 DAT)	Chlorophyll content of leaves (mg 100 g^{-1}) (120 DAT)
T_1	113.41	1.17	7.57	165.36	2.87
T_2	113.32	1.24	7.64	164.60	3.03
T_3	111.89	1.16	7.03	161.11	2.61
T_4	112.32	1.10	6.93	162.37	2.68
T_5	113.53	1.33	8.15	167.30	2.72
T_6	114.25	1.40	8.13	166.49	2.83
T_7	113.71	1.31	8.09	166.81	2.81
T_8	112.72	1.20	6.95	164.08	2.42
T_9	112.80	1.17	6.87	164.46	2.75
'F' Test	Sig.	Sig.	Sig.	Sig.	Sig.
SE (m)±	0.25	0.02	0.05	0.77	0.03
CD at 5%	0.77	0.06	0.16	2.30	0.09

Table 2: Effect of chemicals and plant growth regulator on growth and quality of bell pepper

Treatments	Fruit length (cm)	Fruit breadth (cm)	Fruit volume (cc)	Chlorophyll content of fruit (mg 100 g^{-1})
T_1	11.60	8.51	299.95	0.78
T_2	11.38	8.43	298.72	0.76
T_3	9.48	7.71	2.93.00	0.67
T_4	9.27	7.41	291.82	0.73
T_5	7.08	6.71	212.62	0.74
T_6	6.71	6.80	210.92	0.73
T_7	7.23	6.90	210.86	0.76
T_8	10.07	7.70	282.74	0.73
T_9	9.03	7.32	281.84	0.66
'F' Test	Sig.	Sig.	Sig.	Sig.
SE (m)±	0.08	0.02	0.99	0.008
CD at 5%	0.26	0.06	2.98	0.02

Results and Discussion

Data on plant height, stem diameter, number of branches per plant, leaf area, chlorophyll content of leaves(120 DAT) in Table 1 and fruit length, fruit breadth, fruit volume and chlorophyll content of fruit is depicted in Table 2.

Significantly maximum vegetative growth in terms of plant height (114.25 cm at 120 DAT) and stem diameter (1.4 cm at 120 DAT) were recorded under treatment T_6 (60 ppm NAA), whereas maximum number of branches (8.15 at 120 DAT) were found under treatment T_5 (50 ppm NAA), maximum leaf area (167.3 cm^2 at 120 DAT) was found under treatment T_5 (50 ppm NAA) while, treatment T_2 (1.5% KNO_3) recorded maximum total chlorophyll content of leaves (3.03) at 120 DAT.

It is emanated from the data that, the growth characters *viz*., plant height, stem diameter were maximum with the application of 60 ppm NAA and number of branches was maximum where 50 ppm NAA was applied. This might be due to the fact that, plant growth regulator were applied directly in the actively growing foliage through spraying and thus absorbed more efficiently. The promoting effect of plant height by the application of NAA is might be due to its action as a group of auxins, the cell wall probably reacted favourably and high deposition of cell wall material took place due to high catalyzing activities of carbohydrates and pectiolase. This leads to better development of photosynthetic area and accelerated plant vegetative growth. These results are in consonance with the findings of Tapdiya *et al.* (2018) and Sarker *et al.* (2007) [5] in chilli and Singh *et al.* (2012) in capsicum.

The fruit quality parameters *viz*., length (11.6 cm) and breadth of fruit (8.51 cm), fruit volume (299.95 cc), Chlorophyll content of fruit (0.78 mg/100 g) were recorded significantly maximum in the treatment T_1 (1% KNO_3).

The fruit quality parameters *viz*., length and breadth of fruit, fruit volume and chlorophyll content of fruit (mg 100 g^{-1}) were recorded significantly maximum with the application of 1% KNO_3. The obtained results might be due to the role of potassium in fruit quality, where it is known as the quality nutrient because of its important effects on fruit quality parameters. These results are in line with the findings of Mardanluo *et al*. (2018) [3] in sweet pepper, Kaur *et al.* (2021) [1] and Kazemi. M. (2004) [2] in tomato.

Conclusion

It is inferred that, application of 60 ppm NAA was found beneficial for the growth characters *viz*., plant height, stem diameter whereas number of branches were maximum with application of 50 ppm NAA.

The fruit quality parameters *viz*., length and breadth of fruit, fruit volume and chlorophyll content of fruit (mg 100 g^{-1}) were recorded significantly maximum with the application of 1% KNO_3.

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