

Original Research Article

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Impact of Naphthalene Acetic Acid and Gibberellic Acid on Growth and Yield of Capsicum, *Capsicum annum* (L.) cv. Indra under Shade Net Conditions

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ABSTRACT

Keywords

Capsicum, NAA, GA3, Growth, Yield, Shade net condition.

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The present investigation entitled “Study on Naphthalene acetic acid and Gibberellic acid on growth and yield of Capsicum, *Capsicum annum* (L.) cv. Indra under shade net condition” was carried out at the vegetable research farm of the Department of Horticulture, Sam Higginbottom Institute of Agriculture, Technology and Sciences (Deemed to-be University), Allahabad during the *Rabi* season of 2014–2015, the experiment was laid out in Randomized Block Design having 9 treatments with 3 replications. The experiment revealed that NAA @ 60 ppm increased plant height (120.59cm), number of branches (16.05), plant spread (92.57cm), days to first flowering (32.51), number of flower per plants (11.83), fruit weight (169.66g), no of fruit per plant (9.87), no of seeds per fruit (110.78), fruit yield per plant (1.67kg), fruit yield per plot (15.07kg), fruit yield per hectare (69.76t). With the above result it can be concluded that NAA @ 60 ppm is very much beneficial for the growth and yield of capsicum.

Introduction

Vegetables play an important role in nutritional security, economic viability and fit well into the predominant intensive cropping systems prevailing in different parts of our country. More than 60 kinds of vegetables are grown in India in tropical, subtropical and temperate agro-climates. Olericulture is an important horticulture sector, occupying an area of 9.20 million ha during 2012-13 with a total production of 162.2 million tones and having average productivity of 17.6 tones/ha. In fact vegetables constitute about 61% of horticulture production. Bell pepper (*Capsicum annum* L.) belongs to the family

Solanaceae under the genus *Capsicum* (Shoemaker and Taskey, 1995). The crop is a native of Tropical South America especially Brazil which is thought to be the original home of peppers (Islam *et al.*, 2010). It is also used in salad and soup preparation. It is rich in vitamin A (180 IU) and vitamin C than that of tomatoes. From every 100 gram of edible portion of capsicum 24 k cal of energy, 1.3 g of protein, 4.3 g of carbohydrate and 0.3 g of fat is provided. It has attained a status of high value crop in India in the recent years and occupies a pride place among vegetables in Indian cuisine, because of its delicate taste

and pleasant flavor coupled with rich content of ascorbic acid and other vitamins and minerals. The mature-fruits (green, red and yellow) of sweet pepper are eaten raw or widely used in stuffing's, baking's, pizza and burger preparations.

Plant growth regulators are considered as new generation of agro-chemicals after fertilizers, pesticides and herbicides to augment yield and quality. The plant growth regulators are known to enhance and stimulate the translocation of photo assimilates thereby helping in better retention of flowers and fruits. Besides this, the growth regulators have the ability to cause accelerated growth in plants. The growth regulators or promoters like GA₃ and NAA stimulate vegetative growth and are involved in the initiation of cell division in the cambium. These plant growth regulators cause osmotic uptake of water which maintain a swelling force against the softening of cell wall (Arora *et al.*, 1985).

Materials and Methods

The present investigation was conducted from October 2014 -May 2015 at the experimental field of the Department of Horticulture, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad. The experiment was laid out in a Randomized Block Design with 9 treatments and 3 replications at a spacing of 60x40 cm at the time transplanting, The experimental site is located at a latitude of 20° and 15° North and longitude of 60° East and at an altitude of 98 meters above mean sea level (MSL) and variety selected for research was Indra (collected from I.A.R.I., New Delhi). The growth regulator (promoters) solutions were prepared as per the requirement i.e. 1ml of growth regulator (promoters) in 10 liters of water gives 100ppm. The prepared solutions were sprayed at two stages i.e., at pre bloom and fruit development stage. Five plants were taken for recording observations. The

recommended package of practices was followed for raising the successful crop. Data on plant growth and yield characters were recorded seven months after transplanting when the plants were fully grown. The treatments of the present experiment were T₀ – control, T₁ –GA₃ 30ppm, T₂ – GA₃ 60ppm, T₃ - GA₃ 80ppm, T₄ - GA₃ 100ppm, T₅ - NAA 30ppm, T₆ –NAA 40ppm, T₇ – NAA 60ppm and T₈–NAA 100ppm.

Results and Discussion

The outcome of the investigations for growth parameters like plant height (cm), plant spread (cm), no. of branches, days to first flowering, no. of flowers per plant, have been presented in table 1 and for yield parameters like fruit weight (g), no. of fruits per plant, no. of seeds per fruit, fruit yield per plant (kg), fruit yield per plot (kg) and fruit yield per hectare (t) in table 2. From the experiment, it was revealed that the maximum plant height (120.59cm), maximum plant spread (92.57cm), maximum no of branches (16.05), minimum number of days to first flowering (32.51), maximum no of flower per plant (11.83), maximum fruit weight (169.66 g), maximum no of fruits per plant (9.87), maximum no of seeds per fruit (110.78), maximum fruit yield per plant (1.67kg), maximum fruit yield per plot (15.07kg) and maximum fruit yield per hectare (69.76 t) was found in treatment T₇(NAA 60ppm).

The treatment (T₇) was followed by T₅ (NAA 30ppm) for higher plant height (109.38cm), plant spread (87.10cm), no. of branches (13.56), no of flowers per plant (10.10), fruit weight (168.26g), no. of fruits per plant (8.41), no. of seeds per fruit (105.26), fruit yield per plant(1.41kg), fruit yield per plot(12.72 kg) and fruit yield per hectare (58.96 t), while, the lowest number of days to first flowering was observed in T₁ (GA₃ 30ppm) after T₇.

Table.1 Role of different growth regulators on growth parameters of capsicum

Treatment	Treatment combinations	Growth Parameters				
		Plant height (cm) 120 DAT	Plant spread (cm) 120 DAT	Number of branches 120 DAT	Days to first flower	Number of flowers/plant
T ₀	Control	85.28	78.02	9.85	38.43	7.09
T ₁	GA ₃ 30 ppm	103.49	85.64	11.99	33.14	8.87
T ₂	GA ₃ 60 ppm	99.85	83.41	11.14	37.11	7.93
T ₃	GA ₃ 80 ppm	88.07	76.36	11.72	37.72	7.73
T ₄	GA ₃ 100 ppm	85.62	74.85	10.08	39.54	6.71
T ₅	NAA 30 ppm	109.38	87.10	13.56	34.88	10.10
T ₆	NAA 40 ppm	94.04	81.34	10.99	35.81	8.16
T ₇	NAA 60 ppm	120.59	92.57	16.05	32.51	11.83
T ₈	NAA 100 ppm	90.83	72.60	10.70	40.10	6.36
F Test		S	S	S	S	S
CD at 5%		1.13	3.25	0.26	0.46	0.27

Table.2 Role of different growth regulators on yield parameters of capsicum

Treatment	Treatment combinations	Yield Parameters					
		Fruit weight (g)	No of Fruits/plant	No of seeds/fruit	Fruit Yield/ plant (kg)	Fruit Yield/ plot (kg)	Fruit Yield/ Hectare (t)
T ₀	Control	158.63	4.51	97.73	0.71	6.44	29.79
T ₁	GA ₃ 30 ppm	167.62	7.82	104.24	1.31	11.80	54.64
T ₂	GA ₃ 60 ppm	163.23	7.10	99.97	1.15	10.42	48.25
T ₃	GA ₃ 80 ppm	155.69	6.04	97.21	0.94	8.47	39.21
T ₄	GA ₃ 100 ppm	149.84	5.51	95.58	0.82	7.43	34.38
T ₅	NAA 30 ppm	168.26	8.41	105.26	1.41	12.72	58.96
T ₆	NAA 40 ppm	159.53	6.89	98.63	1.09	9.89	45.77
T ₇	NAA 60 ppm	169.66	9.87	110.78	1.67	15.07	69.76
T ₈	NAA 100 ppm	144.65	5.09	92.36	0.73	6.63	30.69
F Test		S	S	S	S	S	S
CD at 5%		1.47	0.51	2.15	80.07	0.72	3.34

The lowest plant spread (72.60cm), no. of flowers per plant (6.36), fruit weight (144.65 g) and no. of seeds per fruit (92.36) were observed in the treatment T₈ (NAA 100ppm) while minimum plant height (85.28), number of branches per plant (9.85), no of fruits per plant(4.51), fruit yield per plant (0.70 kg), fruit yield per plot (6.44 kg) and fruit yield per hectare (29.79 t) were recorded in the treatment T₀ (Control) and maximum no. of days to first flowering was found in T₈ (NAA 100ppm). These results are similar to findings of Rana and singh (2012) for plant height in capsicum, Singh *et al.*, (2012) for no. of branches in capsicum, Kannan *et al.*, (2009) for first flowering in paprika, Shetty and Manohar (2008) for number of flowers per plant, Sridar *et al.*, (2009), Tirakannanavar *et al.*, (2009) for no. of fruits per plant in paprika chilli and Balraj *et al.*, (2002) for yield of fruit per plant in chilli.

The treatment (T₇) was followed by T₅ (NAA 30ppm) for higher plant height (109.38cm), plant spread (87.10cm), no. of branches (13.56), no of flowers per plant (10.10), fruit weight (168.26g), no. of fruits per plant (8.41), no. of seeds per fruit (105.26), fruit yield per plant(1.41kg), fruit yield per plot(12.72 kg) and fruit yield per hectare (58.96 t) while, the lowest number of days to first flowering was observed in T₁ (GA₃ 30ppm) after T₇. The lowest plant spread (72.60cm), no. of flowers per plant (6.36), fruit weight (144.65 g) and no. of seeds per fruit (92.36) were observed in the treatment T₈ (NAA 100ppm) while minimum plant height (85.28), number of branches per plant (9.85), no of fruits per plant(4.51), fruit yield per plant (0.70 kg), fruit yield per plot (6.44 kg) and fruit yield per hectare (29.79 t) were recorded in the treatment T₀ (Control) and maximum no. of days to first flowering was found in T₈ (NAA 100ppm). These results are similar to findings of Rana and singh (2012) for plant height in capsicum, Singh *et al.*,

(2012) for no. of branches in capsicum, Kannan *et al.*, (2009) for first flowering in paprika, Shetty and Manohar (2008) for number of flowers per plant, Sridar *et al.*, (2009), Tirakannanavar *et al.*, (2009) for no. of fruits per plant in paprika chilli and Balraj *et al.*, (2002) for yield of fruit per plant in chilli.

Economics

The highest gross returns, net returns and cost benefit ratio (Rs. 1255680/ha, Rs. 901439/ha and 3.54:1) was significantly observed in T₇ (NAA 60 ppm) followed by (Rs. 1061280/ha, Rs. 707850/ha and 3.00:1) T₅ (NAA 300ppm). Based on the results obtained in this experiment, it is concluded that the treatment concentration T₇ (NAA 60 ppm) was found to be superior over all other treatments in relation to growth and yield parameters in capsicum under the agro-climatic conditions of Allahabad. However, since these results are based on one year experiment, further trials may be needed to substantiate the results.

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