

Effect of plant growth regulators on growth, yield and quality characters of chilli (*Capsicum annuum* L.)

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ABSTRACT

The experiment to assess the effect of plant growth regulators on growth and yield parameters of chilli was conducted during the year 2020 at the farmer's field, Venanallur, Ariyalur district. The experiment was laid out in randomized block design with seven treatments and three replications. Among all the treatments, the higher dose 60 ppm NAA resulted in increasing maximum plant height (67.82 cm), number of leaves (185.10), number of branches (25.42) and it also increased the, yield attributing characters such as fruit length (12.44 cm), fruit girth (1.15 cm), number of fruits per plant (140.77), number of seeds per plant (49.24), seed weight per fruits (0.81 g), chlorophyll content (2.56 mg/ 100g), capsicum content (0.18%), ascorbic acid content (121.54 mg/ 100g) and fruit yield per hectare (13.34 t) followed by 40 ppm NAA. There was an increase of 35 per cent in fruit yield with application of NAA 60 ppm respectively as compared to control. The minimum values of these characters were recorded under control.

Key words: Chilli, NAA, GA₃, growth, yield.

INTRODUCTION

Chilli (*Capsicum annuum*L.), belongs to the family Solanaceae. It is an important commercial spice cum vegetable crop of India. Being a crop of tropical and sub-tropical region, it requires a warm humid climate. Chilli is famous for its pleasant aromatic flavour, pungency and high colouring substance. The substances that responsible for pungency in chilli is capsaicin (C₁₈ H₃₇ NO₃) and several related chemicals, collectively called capsainoids. The green fruits are rich source of vitamin A and C. India is the world largest producer, consumer and exporter of chilli. Guntur in Andhra Pradesh produces 30% of chilli in India. The production of chilli is reduced due to flower and fruit drop, which is caused by physiological and hormonal imbalance in the plants particularly under unfavourable environments, such as extremes of temperature too low or high temperature (Shil and Nath, 2016). The growth regulators or promoters like GA₃ and NAA stimulate vegetative growth and are involved in the initiation of cell division in the cambium. Plant growth regulators are considered as new generation of agro chemicals after fertilizers, pesticides and herbicides to augment seed yield and quality. The plant growth regulators are known to

enhance the source sink relationship 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. With above consideration, keeping in view an experiment was planned to study the influence of plant growth regulators on growth and yield parameters of chilli (*Capsicum annuum*L.) var. Pusa Jwala.

MATERIALS AND METHODS

The field investigation conducted using Pusa Jwala at Venanallur, Ariyalur district during 2020. The experimental site is situated at 10 °. 53'- 11°. 26' North latitude; 78° . 56' - 79°. 31' East longitude. The area usually receives annual rainfall of 440.4 mm, average maximum temperature of 34°C, average minimum temperature of 21°C and 46 % relative humidity. Texture of soil is sandy loam having 7.1 pH and 660 µmho/cm EC. The experiment was laid in randomized block design with seven treatments each of which was replicated thrice. The treatment comprised of two PGR's (i.e) GA₃ & NAA with three different levels at 25, 40 and 60 ppm along with control. Seed sowing was done

in first week of June and one month old seedlings were transplanted at 60 cm row to row distance and 45 cm from plant to plant distance. Plot size was kept 2.6 x 2.6 m to accommodate 25 plants in each plot. The different concentration of GA₃ and NAA were imposed as foliar spray at 35 days after transplanting to flower bud initiation stage. Control plants were sprayed with distilled water in same manner. During the crop growth, required intercultural operations were given as per the recommendation to each experimental plot. The observations on different morphological and biochemical characters viz., plant height, number of leaves, number of branches, fruit length, fruit girth, number of fruits per plant, number of seeds, seed weight per fruit, chlorophyll content, capsicum content, ascorbic acid content and fruit yield per hectare, were recorded. The data based on the mean of individual characters were statistically analysed as described by Panse and Sukhatma (1967).

RESULTS AND DISCUSSION

Growth parameters

The data (Table 1) revealed that NAA had positive effect among the different treatments. Significantly maximum plant height (67.8 cm) was recorded with 60 ppm NAA. The next best treatment was 40 ppm NAA and the minimum value (53.1) was recorded in control. Kannan *et al.* (2009) reported that the greatest plant height was observed at NAA 50 ppm

spraying at vegetative, flowering and harvest stages during winter and summer seasons. Number of leaves and branches per plant were higher in the NAA treated plants as compared to control. The highest values were recorded with 60 ppm NAA. It significantly increased the numbers of leaves (185.1) and branches (25.4) per plant followed by 40 ppm NAA. This may be due to the increase in the number of primary branches due to auxins attributed to the activation of cell division and cell elongation in the auxillary buds which had promoting effect in increased more branches. Similar findings were reported by Kalshayam *et al.* (2011) in chilli.

Yield attributes and yield

Maximum fruit length and girth were recorded with 60 ppm NAA (12.4 cm and 1.15 cm) and the minimum values were recorded in control (7.8 and 0.66 cm). This increase in fruit length and girth may be attributed to increase in number of cell as well as elongation of cells which is characteristic action of any auxins group of chemicals. Similar results were reported by Surendar *et al.* (2020) in chilli. The maximum number of fruit per plant was recorded with 60 ppm NAA (140.7) followed by 40 ppm NAA (136.0) and minimum values were recorded in control (115.7). Number of fruits per plant was recorded maximum under NAA treatment as compared to other treatments. It might be due to photosynthesis activities are more in leaves and branches. Similar finding recorded by Tapdiya *et al.* (2018) in chilli.

Table 1: Effect of plant growth regulators on growth and quality characters of chilli

Treatments	Plant height	Leaves plant ⁻¹	Branches plant ⁻¹	Chlorophyll content (mg/100g)	Capsicum content (%)	Ascorbic acid content (mg/100g)
T ₁ - GA ₃ @ 25 ppm	55.2	164.2	13.3	1.23	0.15	118.3
T ₂ - GA ₃ @40ppm	60.2	174.0	17.6	1.19	0.17	104.5
T ₃ - GA ₃ @60 ppm	62.6	177.2	20.6	2.47	0.16	115.6
T ₄ - NAA@25 ppm	57.9	170.8	15.4	1.45	0.15	114.5
T ₅ - NAA@40 ppm	65.7	180.1	23.4	1.44	0.17	101.4
T ₆ - NAA @ 60 ppm	67.8	185.1	25.4	2.56	0.18	121.5
T ₇ -Control	53.1	161.4	12.1	1.15	0.15	83.44
SE.d	0.65	1.76	0.34	0.15	0.01	2.35
CD(p=005)	1.43	3.85	0.75	0.38	0.01	5.63

The difference in number of seeds per fruit and seed weight per fruit was found to be significant and maximum values were recorded by 60 ppm NAA (49.2 and 0.30). The next best

treatment (4 ppm NAA) recorded 42.65 and 0.29 and minimum values were recorded in control (29.01 and 0.15). Maximum fruit yield per hectare were recorded with 60 ppm NAA (13.3 t/

ha) and minimum values were recorded in control (5.10 t /ha). 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.

Table 2: Effect of plant growth regulators on yield contributing characters and yield of chilli

Treatments	Fruit length (cm)	Fruit girth (cm)	Fruits plant ⁻¹	Seeds fruit ⁻¹	Seed weight fruit ⁻¹ (g)	Fruit yield (t ha ⁻¹)	Net Income	B:C
T ₁ – GA ₃ @ 25 ppm	8.700	0.69	120.2	31.11	0.81	6.20	40,820	1.21
T ₂ – GA ₃ @40ppm	10.20	0.81	129.3	35.71	0.21	9.29	75,700	2.11
T ₃ - GA ₃ @60 ppm	11.00	0.84	133.2	38.98	0.23	10.10	82,490	2.13
T ₄ - NAA @25 ppm	9.70	0.72	126.1	33.07	0.20	7.50	56,160	1.65
T ₅ - NAA@40 ppm	11.40	1.03	136.0	42.65	0.29	11.62	102,920	2.82
T ₆ - NAA@ 60 ppm	12.40	1.15	140.7	49.24	0.30	13.34	120,980	3.09
T ₇ –Control	7.80	0.66	115.7	29.01	0.15	5.10	32,440	1.13
SE.d	0.13	0.03	0.51	0.40	0.005	0.13	-	-
CD (p= 0.05)	0.28	0.06	1.11	0.87	0.012	0.29	-	-

Quality parameters

The maximum chlorophyll content (2.56 mg / 100g) was observed in 60 ppm NAA and minimum values were recorded in control (1.15 mg/100g). The highest values were recorded with 60 ppm NAA; it significantly increased the

capsicum and ascorbic acid content (0.18 % and 121.54 mg / 100g). Thus might be due to increased synthesis of metabolites which can stimulate the synthesis of the ascorbic acid content. This result is in accordance with the result obtained by Arora *et al.* (2014) in chilli.

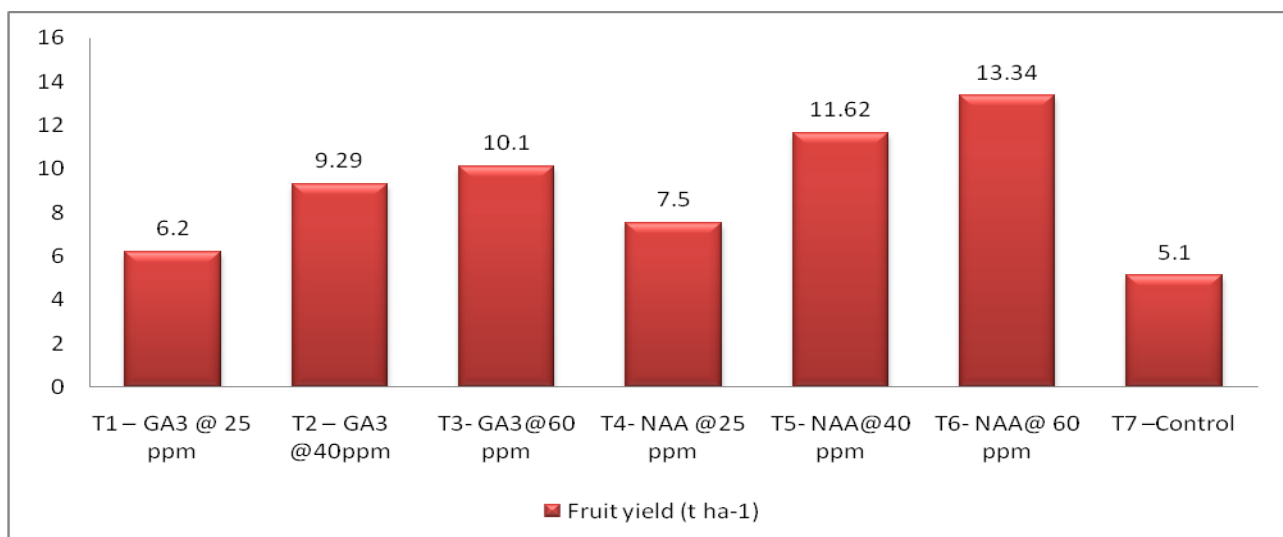


Fig. 1: Effect of plant growth regulators on fruit yield (t ha⁻¹)

Economics

The net income (Rs. 1,20,980 ha⁻¹) and BCR (3.09) was found to be maximum in treatment receiving NAA @ 60 ppm. This was followed by NAA @ 40 ppm with net income (Rs. 1,02,920 ha⁻¹) and BCR (2.82). Cost benefit

(Table 2) of farmers was considerable when plant growth regulators was used as a growth promoter and proved as the cheapest along with higher net returns. Application of NAA increased the overall growth, yield as well as the quality characters due to the presence of various active compounds.

On the basis of present experiment on response of NAA and GA₃ on growth and yield attributes of chilli cv. Pusa Jwala it can be concluded that the treatment of NAA at 60 ppm

concentration found to be the most effective for increasing growth, yield and quality parameters of chilli and also recommended to farmers for increasing their productivity.

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