

# Effect of Different Plant Growth Regulators on Fruit Yield and Quality Parameters of Cucumber (*Cucumis sativus* L.) cv. Punjab Naveen

## ABSTRACT

An experimental trial was carried out during the season from March 2018 – June 2018 at the Horticulture farm of Lovely Professional University, Phagwara (Punjab). utilising a randomised block design, the experimental trial consists three replications. The current study included eleven treatments, including a control with different PGR dosages of Maleic hydrazide (200, 250, and 300 ppm, MH), Naphthalene acetic acid (50, 100, and 150ppm, NAA), and Gibberellic acid (50,100 and 150 ppm, GA<sub>3</sub>). Based on the results of the experiment, it was concluded that the treatment T<sub>8</sub> (100 ppm GA<sub>3</sub>) significantly affected the cucumber's fruit yield parameters and treatment T<sub>7</sub> (50ppm GA<sub>3</sub>) showed the better results in quality attributes Viz., TSS and fruit texture.

**Keywords:** GA<sub>3</sub>, NAA, MH, Growth, Yield, Quality, Cucumber and Punjab Naveen

## 1. INTRODUCTION

Among the many vegetables widely grown is the cucumber (*Cucumis sativus* L.), which belongs to the Cucurbitaceae family. An annual dioecious crawling vine, it covers itself in thin, spiral tendrils as it climbs trellises or other supports. The fruit of the plant is completely surrounded by broad-sized leaves. Fruit of the cucumber plant often has a tube form and extends to the ends.

Because of its low chlorine level, cucumber may also be utilised to manufacture a vegetable in addition to being used in pickles and salads. Also used as veggies are tender leaves. Fruits aid in the treatment of dyspepsia, jaundice, and constipation. Ayurveda employs seeds for a variety of purposes. Fruit and seeds both have cooling characteristics, making them useful as astringents and medicines. According to **Mariod et al. (2017)**., the seed oil contains four major fatty acids: linoleic acid (61.6%), oleic acid (15.7%), stearic acid (11.1%), and palmitic acid (10.7%), and the seed is extremely rich in nutritional compounds, including protein (33.8%), fat (45.2%), carbohydrates (10.3%), and crude fibers (2.0%). The fruits are very nutrient-dense, contain 95% water, and have very little calories (approximately 15 calories per cup) **Mukherjee et al., (2013)**.

Both fresh and processed cucumber are extensively consumed. Based on usage, it may be divided into three categories: salad, pickling, and cooking. In India and other countries, cucumber is mostly farmed for its fruits. Cucumber may flourish in a variety of soil types, including sandy, sandy loam, clay loam, and silt loam. Sand and sandy loam soil are used when an early crop is desired. In soil with a pH between 5.5 and 6.7, it grows best. A well-drained soil is ideal. Numerous physiological processes in cucurbitaceous plants can be altered by PGR, as is well documented (**Thomps 2008**). According to **Hilli et al., (2010)**. the use of GA<sub>3</sub> in combination with NAA stimulated plant metabolic processes by promoting vegetative development Gibberellic acid and NAA, when applied exogenously at the 2-4 true leaf stages, have a direct impact on sex expression, and it may be assumed that the metabolic activities of the cucumber plant are affected by the combined administration of GA<sub>3</sub> and NAA.

The physiology of crops is impacted by plant growth regulators, which also enhance the plant's production characteristics. Maximum fruit production, maximum fruit weight (kg), and maximum yield per hectare (t) in cv. Fruit Long Green Cucumber were achieved by applying maleic hydrazide at a concentration of 100 ppm along with 100 ppm of ethephon (**Thappa et al., 2011**). In a different trial, the combination of GA<sub>3</sub> 20 ppm + NAA 100 ppm was advantageous for maximum fruit production, fruit weight (g), fruit yield per plant, and total yield per hectare (q) cv. "Pusa Uday" (**Dalai et al., 2016**). Applications of GA<sub>3</sub> with NAA have stimulated metabolic activities in plants as a result of improving vegetative development, according to **Hilli et al. (2010)**. Gibberellic acid and NAA applied exogenously at 2-4 true leaf stages have a direct impact on sex expression, and it may be assumed that the combined treatment of GA<sub>3</sub> and NAA on cucumber plants participates in metabolic activities. The NAA substance in ridge gourds slows down cell elongation and cell division in meristematic

shoots with various tissue types and regulates plant height without altering the plant's physiology or shape (Hilli *et al.* 2010).

Growth regulators accelerated the commencement of female flowers in the current study, which may be related to an increase in auxin substance metabolism in plants and also a reduction in sugar, which changed membrane permeability Baruah and Sharma (2015).

## 2. MATERIAL AND METHODS

The research experiment was carried out at the Horticulture farm of Lovely Professional University, Phagwara (Punjab). It was carried during the season from March 2018 – June 2018. The experimental trial conducted in Randomized Block Design with three replications.

Chart 1: The experiment included eleven different treatments-

Sr. No.	Treatment Notation	Treatments
1.	T <sub>1</sub>	Foliar spray 50ppm NAA
2.	T <sub>2</sub>	100ppm NAA
3.	T <sub>3</sub>	150ppm NAA
4.	T <sub>4</sub>	200ppm MH
5.	T <sub>5</sub>	250ppm MH
6.	T <sub>6</sub>	300ppm MH
7.	T <sub>7</sub>	50ppm GA <sub>3</sub>
8.	T <sub>8</sub>	100ppm GA <sub>3</sub>
9.	T <sub>9</sub>	150ppm GA <sub>3</sub>
10.	T <sub>10</sub>	100ppm NAA+ 100ppm GA <sub>3</sub> + 250ppm MH
11.	T <sub>11</sub>	Control

Each experimental unit was defined and layout was drawn as per plan. Punjab Naveen was the cultivar of cucumber which was planted at spacing of 2.5 m × 0.6 m during the experimental trial.

### 2.1 Parameters of Study

#### Fruit Yield Parameters

**2.1.1 Fruit length(cm):** Fruit length was taken by the selected fruit with the use of Vernier calliper.

**2.1.2 Fruit Diameter(cm):** Fruit diameter was taken at three different places i.e., stalk end, middle end and floral end with the use of Vernier callipers and calculate the average diameter.

**2.1.3 Number of Fruits Per Plant:** Fruit harvest from randomly selected the three plants when they are fresh and marketable purpose. Calculated the average of no. fruit / vine.

**2.1.4 Average Fruit Weight(g):** Five fruits from each of the treatments were drawn randomly at time picking and their weight was added, the average of fruit weight was calculated by dividing them with the number of fruits.

**2.1.5 Fruit Yield per Vine (Kg):** The weight of fruits from tagged plants in each treatment and each replication was reported on each picking and last picking of fruits, it was added to get the total weight of fruits from the tagged plants.

**2.1.6 Fruit yield (q/ha):** Calculate the fruit yield per ha multiply the fruit yield plants by the total no. of plants on 1 ha.

#### **Fruit Quality Parameters**

**2.1.7 TSS (Total soluble solid) °brix:** TSS was determine with use of refractometer at the time of harvesting of fruit.

**2.1.8 Texture of fruit:** Recorded the texture of fruit by physically touch the surface of fruit. Divide into two categories-

- Smooth
- Rough

### **3. Result**

A statistical analysis of the data on various yield and quality parameters revealed a substantial outcome for cucumber.

#### **Fruit Yield Parameters**

**Fruit length(cm):** The average length of fruits of different treatments was significantly influenced the fruit length compared to control. The fruit length was recorded maximum (18.84 cm) with exogenous application of T<sub>9</sub>- GA<sub>3</sub> @150ppm and minimum (11.00 cm) with control.

The treatment T<sub>9</sub>, T<sub>6</sub> and T<sub>7</sub> were found statistically at par with T<sub>9</sub>- GA<sub>3</sub> @150ppm.

**Fruit Diameter(cm):** The maximum fruit diameter (5.80 cm) was recorded under exogenous application of treatment T<sub>7</sub>-GA<sub>3</sub> @50ppm whereas, the lowest diameter of fruits (3.20cm) was recorded in the T<sub>11</sub>-control.

**Number of Fruits Per Plant:** The significantly maximum number fruits per plant (9.01) was recorded in the treatment T<sub>8</sub>-GA<sub>3</sub> @100ppm and minimum (7.16) with T<sub>11</sub>-Control. The treatments T<sub>7</sub> and T<sub>1</sub> are statistically at par with GA<sub>3</sub> @50ppm.

**Average Fruit Weight(g):** A maximum average fruit weight was 258g recorded under the treatment T<sub>8</sub> GA<sub>3</sub> @100ppm and a minimum average fruit weight was 189.6g under T<sub>4</sub> MH@200ppm.

**Fruit Yield per Vine (Kg):** The treatment shows significant increase in fruit yield per vine with foliar application of growth regulators as compared to control. The treatment T<sub>7</sub>(GA<sub>3</sub>@50ppm) recorded maximum fruit yield (2.17kg) as compared to control (1.65kg).

**Fruit yield (q/ha):** The treatment shows significant increase in fruit yield per hectare with foliar application of growth regulators. The treatment T<sub>8</sub>(GA<sub>3</sub>@100ppm) recorded maximum fruit yield (218.33q/ha) and minimum in treatment T<sub>10</sub>(NAA@100ppm+GA<sub>3</sub>@100ppm+MH @250ppm) was 103.66 q/ha.

#### **Fruit Quality Parameters**

**TSS (Total soluble solid) °brix:** The significantly maximum T.S.S. was recorded in the treatment T<sub>7</sub>-GA<sub>3</sub>@50ppm valued 4.26 °brix followed by the treatment T<sub>9</sub>- GA<sub>3</sub> @150ppm valued 4.16 °brix and T<sub>8</sub>-GA<sub>3</sub>@150ppm valued 4.15 °brix respectively. While, the minimum T.S.S. was recorded in the treatment T<sub>11</sub>-control valued 3.11 °brix.

**Texture of fruit:** Texture of fruit of different treatment of cucumber is given in Table 1. Texture of fruit was categorized into smooth and rough fruit surface.

### **DISCUSSION**

Maximum fruit length recorded in T<sub>9</sub>- GA<sub>3</sub> @150ppm while the minimum length recorded in T<sub>11</sub>-control. Due to effect of PGR reason for variation of length. According to **Akhter & Rahman (2010)** application of GA<sub>3</sub> @75ppm has been recorded that maximum fruit length (18.50cm).

Maximum fruit diameter recorded in T<sub>7</sub>- GA<sub>3</sub> @50ppm while the minimum fruit diameter recorded in T<sub>11</sub>- control. Due to effect of PGR reason for variation of diameter. The various doses of GA<sub>3</sub> @5ppm, @10ppm and @20 ppm and Maleic hydrazide @50ppm, @100ppm and @200 ppm) at various leaf stage (2,4 and 6) showed in increased diameter of fruit in cucumber of summer; whereas, Gibberellic acid was lesser to Maleic hydrazide.

Maximum no. of fruit per Vine was recorded in T<sub>8</sub>- GA<sub>3</sub> @100ppm while the minimum no. of fruit per plant recorded in T<sub>11</sub>- control. Due to effect of PGR reason for variation of no. of fruit per plant. Described that the higher no. of fruits per plant (15.8) given dose of 25ppm Gibberellic acid (**Dostogir Hossain et al. (2006)**). Geeta et al., (2014a) conducted an experiment at Department of Crop physiology University of Agricultural Sciences, Dharwad and results reported that the bitter gourd crop no. of fruits /plant was significantly greater with foliar application of @ 20ppm Gibberellic acid (11.6%).

Maximum yield was recorded in T<sub>8</sub>- GA<sub>3</sub> @100ppm while the minimum yield recorded in T<sub>11</sub>- control. Due to effect of PGR reason for variation of fruit yield. According to **Merentoshi et al. (2016)** stated that application of 50 ppm Gibberellic acid significantly increased all parameters of growth at later stages which in turn higher the yield (1.71 kg / plant).

Maximum TSS was recorded in T<sub>7</sub>- GA<sub>3</sub> @50ppm while the minimum TSS recorded in T<sub>11</sub>- control. Due to effect of PGR reason for variation of fruit yield. According to **Shafeek et al. (2016)** increased TSS with doses of GA<sub>3</sub>.

Fruit surface depend on the texture of fruit divided into smooth and rough. Treatment T<sub>4</sub> – Maleic hydrazide @ 200ppm and T<sub>5</sub>- Maleic hydrazide @250ppm given smooth surface. In remaining treatments texture was rough.

**Table 1. Effect of Different Plant Growth Regulators on Fruit Yield and Quality Parameters of Cucumber (*Cucumis sativus* L.) cv. Punjab Naveen**

Sr. No.	Treatments	Fruit Length(cm)	Fruit Diameter(cm)	Number of Fruits Per Plant	Average Fruit Weight(g)	Fruit Yield per Vine (Kg)	Fruit yield (q/ha)	Total Soluble Solids (°brix)	Texture of Fruits
1.	Foliar spray 50ppm NAA	13	4.16	8.70	213.00	1.88	188.33	3.86	Rough
2.	100ppm NAA	14.55	4.01	8.55	218.00	1.86	185.00	3.94	Rough
3.	150ppm NAA	19.04	4.05	8.12	234.33	2.00	202.00	3.28	Rough
4.	200ppm MH	11.76	3.90	7.11	189.66	1.36	137.00	3.90	Smooth
5.	250ppm MH	15.60	5.96	6.92	191.00	1.35	136.66	3.60	Smooth
6.	300ppm MH	18.17	5.02	6.99	186.00	1.32	134.00	3.64	Smooth
7.	50ppm GA <sub>3</sub>	16.76	5.80	8.81	204.00	2.00	203.66	4.26	Rough
8.	100ppm GA <sub>3</sub>	16.27	5.58	9.01	258.00	2.17	218.33	4.15	Rough
9.	150ppm GA <sub>3</sub>	18.84	5.66	8.51	206.66	1.89	190.00	4.16	Rough
10.	100ppm NAA+ 100ppm GA <sub>3</sub> + 250ppm MH	16.43	4.16	8.29	198.33	1.65	103.66	3.42	Rough
11.	Control	11	3.20	7.16	212.66	1.23	125.33	3.11	Smooth
	<b>SEm (±)</b>	<b>0.913</b>	<b>0.203</b>	<b>0.068</b>	<b>10.310</b>	<b>0.330</b>	<b>1.205</b>	<b>0.021</b>	<b>NA</b>
	<b>C.D. at 5% of Level</b>	<b>2.712</b>	<b>0.602</b>	<b>1.477</b>	<b>8.505</b>	<b>0.099</b>	<b>3.579</b>	<b>0.938</b>	<b>NA</b>

### CONCLUSION

Based on the experimental trial's recorded data, it was possible to draw the conclusion that the treatment T<sub>8</sub>(100 ppm GA<sub>3</sub>) had a substantial impact on cucumber Fruit yield parameters viz., Number of Fruits Per Plant, Average Fruit Weight(g), Fruit Yield per Vine (Kg), Fruit yield (q/ha). Treatment T<sub>7</sub> GA<sub>3</sub>(50ppm) and Treatment T<sub>9</sub> GA<sub>3</sub>(150ppm) showed the maximum fruit diameter and fruit length respectively. So, it is advised to cucumber growers to spraying GA<sub>3</sub>(100ppm) for obtaining better yield and quality of cucumber.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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