

## EFFECT OF PLANT GROWTH REGULATORS ON MELON UNDER PLASTIC GREENHOUSE

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### ABSTRACT

Field experiments were carried out during successive early summer seasons 1997/1998 and 1998/1999 season at Kaha Research Station, Vegetable Research Unit to study the effect of growth regulator on cantaloupe to produced good seed yield and fruit quality. Foliar application of GA, IAA or NAA at 50, 100, 150ppm had no affect on the plant growth parameters such as number of branches per plant, plant fresh and dry weight, number of days from flowering, fruit yield and fruit quality. These growth regulators had a favorable effect on pollen grain viability, which led to increase the number of seeds per fruit and induced significant effect on the seed germination.

### INTRODUCTION

Gibberellin (GA<sub>3</sub>), Indol Acetic Acid (IAA) and Naphthalene Acetic Acid (NAA) were known as the plant growth regulators which used to promotion, inhibition or modifying the physiological processes of plant.

Foliar application of the growth regulators had no effect in some vegetative characters on many cucurbitace plants as reported by Brantley & Warren (1960). Who found that spraying of NAA did not induce any increase in the plant fresh weigh of muskmelon. Also, Singh & Randhawa (1969) reported that foliar application of GA on bottle gourd at 75ppm had no effect on the production of lateral shoots. Mohamedien (1972) detected that sprying of GA or IAA had no significant effect in plant fresh weight of squash.

Khademi & Khoshkhui (1977) found that IAA had no effect on the number of lateral branches in pepper. Morsy (1992) reported that the spraying with GA, IAA or NAA at 50, 100 and 150ppm did not induce any increase in the plant fresh and dry weight of cantaloupe. On the other hand, he found that using GA<sub>3</sub> and IAA at 100 and 150ppm increased the number of branches of plant. Foliar application of IAA at 100 and 150ppm and NAA at 100 ppm increased the pollen viability on cantaloupe.

Regarding the effect of foliar application with growth regulated on the flowering date, it was noticed by EL-Kholy & Hafez (1982) that application of IAA at 100ppm suppressed the formation of male flowers in snake cucumber. Das *et al* (1995) reported that foliar application of cucumber with NAA at 30 or 100ppm reduced the number of days for the first female flower to appear. Gedam *et al* (1998) found that foliar application of bitter gourd with GA<sub>3</sub> at 35ppm and NAA at 50ppm produced the earliest female and male flower respectively. On the other hand, Nagaich *et al* (1999) found that sprayed of NAA at 100 or 200ppm on pumpkin had no effect on the earliness of male or female flower.

Fruit yield of melon was lowest when foliar sprays of GA<sub>3</sub> at 25ppm (Arora *et al* 1994). While, Kshirsagar *et al* (1995) found that yield of marketable cucumber was increased when foliar application by NAA at 100ppm. Also, Baruah and Das (1997) reported that sprayed with NAA at 25ppm produced the best yield on bottle gourd.

On the other hand, Morsy (1992) found that there were no significant difference in the number of fruits per plant of cantaloupe when sprayed by GA, NAA or IAA at different concentration 50,100 and 150ppm. Also lozi *et al* (2000) found that application of squash with NAA at 50ppm or GA<sub>3</sub> at 100ppm did not affect the number of fruit per plant.

Fruit length, diameter and flesh thickness of cantaloupe were not affected by the GA or IAA at 50, 100 and 150ppm and by NAA at 150ppm as reported by Morsy (1992). Kshirsagar *et al* (1995) found that application of GA at 5, 15 or 25ppm and NAA at 100, 250 or 200ppm had no significant effect on fruit length diameter and weight of cucumber. Puzari (1999) found that GA did not affect on the fruit size of spine gourd fruits. lozi *et al* (2000) reported that application of NAA at 50ppm or GA<sub>3</sub> at 100ppm did not affect on the squash fruit size or weight. While, Das and Rabha (1999) reported that the foliar application of NAA at 30 or 100ppm on cucumber plants were produced the largest fruits.

The used of growth regulators, i.e. GA, NAA, IAA at 50, 100 or 150ppm did not induced any affect on the fruit total sugar content, TSS, Carotenoids and fiber reflected of cantaloupe as reported by Morsy (1992). Also, Puzari (1999) found that GA did not affect on the total sugar, TSS and ascorbic acid of spine gourd fruits.

Foliar application of GA, NAA or IAA at 50 or 150ppm was increase the seed yield of cantaloupe which estimated as number of seed per fruit (Morsy, 1992). The same author added that that applied GA, IAA or NAA at 50, 100 and 150ppm did not show any effect on the seed germination percentage. Also, Gedam *et al* (1996) found that sprayed of bitter gourd plants with NAA at 50ppm had the best effect on seed quality.

Gedam *et al* (1998) found that application of NAA at 50ppm increased the seed yield of bitter gourd. While, Puzari (1999) found that GA did not affect on the number of seed of spine gourd.

Therefore, the objective of this study was to compare the effect of GA, NAA or IAA when it is spraying on vegetative growth, yield fruit characteristics, fruit chemical composition and seed yield of cantaloupe under protected cultivation.

## **MATERIALS AND METHODS**

This experiment was conducted under the unheated plastic greenhouse at Kaha Research Station, Egypt during early summer 1997 and 1998 seasons.

Seeds of cantaloupe (*Cucumis melo* var. *indorus*, Noud), Honey Dew variety were sown on December 31<sup>th</sup> 1997 and 30<sup>th</sup> 1998 in pots of size 15cm. Filled with peat moss and sand at the ratio 3 : 1 by volume. The

germinating media was supplied with the necessary nutrients, fungicides and the pH was adjusted up to 6.8 by calcium carbonate according to Smith (1971). Seedlings were transplanted after 15 days from sowing under greenhouse spaces between rows were 100cm and 50cm between plants. All agricultural practices took place as reported in the recommendations of Ministry of Agriculture.

The experiment included 10 treatments in a complete randomized block design with three replications. Three growth regulators, i.e. Gibberellic Acid (GA<sub>3</sub>), Indole Acetic Acid (IAA) and Naphthalene Acetic Acid (NAA) were applied at the concentration of 50, 100 and 150ppm three times at the second, fourth and sixth leaf stages. Wetting agent was applied with the aforementioned chemicals and control plants were sprayed with distilled water only.

Data were recorded on the following characters:

- 1- Vegetative growth characters which included number of branches per plant, fresh and dry matter percentage. All these characters were measured after 90 days from transplanting.
- 2- Earliness of flowering which were taken as the average number of days from sowing to the opening of the first staminate and hermaphrodite flowers.
- 3- Pollen grain viability was estimated by collecting the pollen grains according to Mear and Bennekon (1969).
- 4- Fruit yield per plant determined as weight (g.) and number of fruits.
- 5- Fruit characteristic i.e., fruit length and diameter (cm) and flesh thickness (cm).
- 6- Fruit chemical properties, i.e. Total sugar content (g./100g. dry weight), Total soluble solid percentage (TSS), Carotenoid content (mg/100g. fresh weight) Ascorbic acid mg/100gm and Crude fiber of fruits (mg/g. dry weight). All these chemical properties were determined according to A. o. A. C. (1965).
- 7- Seed yield per plant determined as number of seed per fruit, weight of 1000seed (g.) and weight of seed per plant (g.).
- 8- Seed character i.e. seed germination percentage which was calculated according to Bartlett (1937) by the following equation:

$$\frac{\text{Number of germinated seeds}}{\text{Total number of seeds}} \times 100$$

All obtained data were statistically analyzed using the analysis of variance method for both seasons according to Snedecor (1956). The T. test was used to compare the treatments.

## **RESULTS AND DISCUSSION**

### **1- Vegetative growth characters:**

Data of vegetative growth presented in Table (1) indicated that foliar application of any of the three growth regulated (GA, IAA or NAA) at the

different concentration (50, 100, 150ppm) had no significant effect on the number of branches per plant which led to insignificantly affected on plant fresh and dry weight. These data agreed with those findings by Brantley & Warren (1960) on muskmelon, Singh & Rondhawa (1969) on bottle gourd, Mohamedien (1972) on squash, Khademi & Khoshkhui (1977) on pepper and Morsy (1992) on cantaloupe.

**2-Flowering characters:**

Data in Table (1) show clearly that the growth regulators had a favorable effect on pollen grain viability percentage. The highest pollen grain viability was associated with foliar application of NAA at 50, 100 150 or 50ppm during the two seasons. The same improving effect of NAA on pollen grain viability was also found by Morsy (1992).

**Table (1): Effect of various growth regulators on the vegetative growth and flowering characters.**

Treatments	Number of branches/plant		Plant fresh weight (gm/plant)		Plant dry weight (mg/plant)		Pollen grain viability %		Earliness ♂ (days)		Earliness ♀ (days)	
	97/98	98/99	97/98	98/99	97/98	98/99	97/98	98/99	97/98	98/99	97/98	98/99
GA 50	8.50	6.85	535.00	581.00	57.85	48.70	70.43	70.90	39.25	39.10	53.75	53.65
100	7.05	6.85	459.00	487.00	42.55	45.73	70.67	76.00	39.80	40.50	50.65	51.50
150	6.95	6.50	500.00	521.00	46.23	47.15	72.77	76.77	41.00	41.10	52.25	53.55
IAA 50	6.75	6.10	439.00	484.50	43.73	43.48	77.33	80.43	41.00	41.55	52.55	52.75
100	7.45	7.15	464.00	470.00	36.63	41.95	79.90	81.00	40.50	40.80	53.50	55.65
150	7.30	6.90	513.50	544.50	49.78	48.65	76.90	83.80	41.00	40.70	52.85	53.95
NAA 50	6.95	6.95	472.50	465.00	52.80	55.83	82.67	89.10	40.35	40.80	53.20	52.70
100	6.45	6.70	427.50	424.50	43.88	43.68	82.67	88.13	40.75	40.50	51.00	51.70
150	6.75	7.20	389.50	419.50	32.33	36.98	89.43	86.13	40.25	40.70	51.75	50.95
Control	7.05	6.45	401.00	409.00	34.15	32.65	69.20	69.67	40.75	40.30	53.25	51.70
L.S.D.	N.S	N.S	N.S	N.S	N.S	N.S	6.19	4.37	N.S	N.S	N.S	N.S

As regard to effect of foliar application of growth regulators (GA, IAA and NAA) on the flowering data in Table (1) show clearly that all of these growth regulators did not effect on the number of days from sowing to the opening of the first male or hermaphrodite flowers under greenhouse conditions.

These data are in harmony with the finding of Nagich *et al* (1999) on pumpkin. These data also are not agreed with the finding of EL-Kholy & Hafez (1982), Das *et al* (1995) and Gedam *et al* (1998).

**Fruit yield:**

Data presented in Table (2) show clearly that foliar application of GA, IAA or NAA at different concentration i.e., 50, 100, 150ppm did not affect the number and weight of fruits per plant. The insignificant effect on the number of fruits per plant may be due to the insignificant effect of these growth regulators on the number of branches per plant as shown in Table (1). These results are agreed with the finding of Morsy (1992) on cantaloupe and lozi *et al* (2000) on squash. These results are also not agreed with the finding of Arora *et al* (1994) Kshirsagar *et al* (1995) and Baruah and Das (1997).

**Table (2): Effect of various growth regulators on the fruit yield and physical fruit characters.**

Treatments	Number of fruits / plant		Weight of fruits / plant (gm)		Fruit length (cm)		Fruit diameter (cm)		Flesh thickness (cm)	
	97/98	98/99	97/98	98/99	97/98	98/99	97/98	98/99	97/98	98/99
GA 50	1.10	1.47	933.33	1212.43	12.35	11.57	11.80	10.80	3.23	3.33
100	1.20	1.60	883.33	1186.70	11.50	12.03	10.83	10.77	2.80	2.87
150	1.15	1.40	940.00	1157.33	12.13	11.77	11.30	10.77	2.87	3.10
IAA 50	1.10	1.53	847.83	1213.53	12.25	12.00	11.50	10.80	3.40	3.43
100	1.10	1.53	928.00	1254.17	12.55	11.57	11.75	10.57	2.57	2.70
150	1.25	1.53	966.00	1096.67	11.00	11.10	10.08	10.10	2.77	2.87
NAA 50	1.10	1.53	896.67	1231.57	12.45	12.33	11.83	10.70	2.83	3.07
100	1.15	1.53	1024.67	1250.60	11.70	10.70	11.50	9.77	2.73	2.93
150	1.20	1.60	962.67	1427.53	11.30	11.47	10.68	10.67	2.70	2.93
Control	1.15	1.47	980.90	1135.57	12.33	11.43	11.70	10.33	2.87	2.87
L.S.D.	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S

**Fruit characters:**

Data given in Table (2) show that foliar spraying of GA, IAA and NAA at 50, 100 and 150ppm did not affect on the physical fruit character i.e. fruit length, fruit diameter and flesh thickness. Similar results were found by Morsy (1992) on cantaloupe and Kshirsagar *et al* (1995) on cucumber, Puzari (1999) on gourd and lozi *et al* (2000) on squash. These results also are not agreed with the finding of Das and Rabha (1999).

Also, it is observed from Table (3) That application of GA, IAA and NAA at 50, 100 and 150ppm did not induced any affect on the some chemical fruit characters i.e. total sugars, T.S.S., and ascorbic acid. These results are agreed with the findings of Morsy (1992) and Puzari (1999). Data also show that all the growth regulators were increased the carotenoids of fruits at the second season only. Data show also that the application of IAA and NAA at 50, 100,150 were increased the fiber of fruits. These data are not agreed with Morsy (1992) and Puzari (1999).

**Table (3):Effect of various growth regulators on the chemical fruit characters.**

Treatments	Total sugars (gm/100gm)		TSS		Carotenoides (mg/100gm)		Ascorbic acid (mg/100gm)		Fibers (mg/g)	
	97/98	98/99	97/98	98/99	97/98	98/99	97/98	98/99	97/98	98/99
GA 50	18.20	18.18	11.48	11.07	4.2	4.0	4.63	4.30	255	253
100	18.50	18.48	10.85	9.50	4.0	3.7	4.50	4.37	285	288
150	17.65	17.53	11.40	10.67	3.8	3.5	4.60	4.17	305	293
IAA 50	18.25	18.25	11.50	10.30	3.7	3.2	3.78	3.60	333	327
100	18.50	18.48	11.70	10.47	3.5	2.7	4.28	3.47	308	325
150	18.25	18.30	10.28	10.00	4.0	2.9	4.28	3.57	305	325
NAA 50	18.70	18.58	11.60	10.87	3.8	3.2	5.23	3.97	335	347
100	18.50	18.35	11.25	10.70	4.2	3.4	5.23	4.03	325	312
150	17.03	17.10	10.85	9.80	3.0	2.5	4.25	3.63	328	333
Control	16.98	16.83	11.43	9.87	2.9	2.2	3.43	3.20	368	327
L.S.D.	N.S	N.S	N.S	N.S	N.S	0.783	N.S	N.S	53.16	51.86

**Seed yield:**

Data presented in Table (4) show clearly that the foliar application of growth regulators had a favorable effect on number of seeds per fruit and weight of seeds per plant while, it had no effect on the weight of 1000 seeds. The highest value of number of seeds per plant was associated with foliar spraying of IAA at 150, 100, and 50ppm respectively. The significant increasing on number of seed per fruit may be contributed directly by the improving of pollen grain viability. These data are in harmony with findings of Morsy (1992) and Gedam *et al* (1998). These data are also not agreed with the finding of Puzari (1999).

**Seed quality:**

The data recorded in Table (4) show that the different growth regulators were induced significant effect on the seed germination percentage at the first season only. The same improving effect on the seed germination was also found by Gedam *et al* (1996). These data are not agreed with the finding with Morsy (1992).

**Table (4):Effect of various growth regulators on seed yield and seed quality.**

Treatments	Number of seeds/ fruit		Weight of seeds/ plant (gm)		Weight of 1000 seed (gm)		Seed germination %		
	97/98	98/99	97/98	98/99	97/98	98/99	97/98	98/99	
GA	50	355.67	331.80	9.30	9.20	25.30	24.23	75.00	51.00
	100	310.33	336.77	11.33	11.37	25.85	26.67	90.00	45.00
	150	310.67	284.23	12.63	12.30	24.75	25.97	61.00	52.00
IAA	50	357.00	361.47	10.83	10.73	26.80	28.90	79.00	61.00
	100	361.67	383.80	10.43	10.27	25.40	26.87	83.50	54.00
	150	402.00	410.53	13.03	12.97	25.80	25.67	74.00	53.00
NAA	50	336.67	341.67	11.30	10.83	23.85	24.97	71.00	59.00
	100	317.67	282.57	9.90	9.97	21.40	21.33	67.00	55.00
	150	319.00	257.23	8.30	8.20	24.15	25.70	64.00	54.00
Control		308.33	308.33	7.43	7.40	21.15	24.43	62.00	54.00
L.S.D.		27.68	72.12	1.03	0.57	N.S	N.S	17.47	N.S

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Snedecor, G.W., (1956). Statistical methods. 5<sup>th</sup> ed., The Iowa state university. Press. Amer. Iowa, U.S.A.

**تأثير منظمات النمو النباتية على الشمام تحت الصوب البلاستيكية  
مرسى أنور مرسى و نبيل محمد طلعت قابيل  
أقسام بحوث الخضر - معهد بحوث البساتين - مركز البحوث الزراعية**

أجريت تجارب حقلية خلال الموسم الصيفي المبكر لعام ١٩٩٧/١٩٩٨ و ١٩٩٨/١٩٩٩ في وحدة بحوث الخضر بقها لدراسة تأثير منظمات النمو على الكنتالوب للحصول على أحسن محصول للبذور وجودة الثمار. ولم يؤدي الرش بالجبرلين (GA) أو الأندول أستيك أسيد (IAA) أو النفثالين استيك أسيد (NAA) بتركيز ٥٠، ١٠٠، ١٥٠ جزء في المليون إلى حدوث أى تأثير على بعض صفات النمو مثل عدد الفروع للنبات والوزن الطازج والجاف للنبات وعدد الأيام لبدء التزهير ومحصول الثمار وجودة الثمار وقد كان للرش بهذه المنظمات للنمو تأثير مفضل على حيوية حبوب اللقاح والتي أدت إلى زيادة عدد بذور الثمار وأدت إلى زيادة معنوية في نسبة إنبات البذور.