Effect of NAA & IAA on Growth, Yield and Quality of Muskmelon (*Cucumis melo*.L)

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ABSTRACT

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The present experiment was carried out during *Zaid* 2021. In order to study the "Effect of NAA & IAA on Growth, Yield and Quality of Muskmelon (*Cucumis melo*.L) Under Prayagraj Agro climatic conditions". The trail was conducted at Biotechnology polyhouse, Department of Horticulture, Naini Agriculture Institute and Prayagraj. The experiment was laid out in randomized block design (RBD), with seventeen treatments replicated thrice. The foliar spray two growth regulators like NAA and IAA were spray at different concentration (NAA @10ppm, 20ppm, 30 ppm, 40 ppm, 50 ppm, 60 ppm, 70 ppm, 80 ppm. IAA @ 100 ppm, 200 ppm, 300 ppm, 400 ppm, 500 ppm, 600 ppm, 700 ppm, 800 ppm. The result revealed among all the treatments foliar application of NAA (80 ppm) is significantly gave positive impact on growth, yield and quality parameters i.e. Vine length (153.96 cm), number of days for 1st male flower (33.6 Days), No. of days for 1st female flower (38.83 Days), No. of Node at which 1st Male flower appears (4.1), No. of Node at which 1st Female flower appears (5.83) No. of Male flowers (207.33), No. of Female flowers(5.3) fruits per plant (3), diameter of the fruit (22.53 cm), length of the fruit(13.4cm), fruit yield per plant (1.4 kg), fruit yield per hectare (12.46 t), total soluble solids (11.30 Brix°), gross returns (3,73,800 Rs/ha), net returns (2,39,844 Rs/ha) and Benefit: cost ratio (2.79) were obtained among all other treatments with foliar application of NAA @80 ppm compared to other treatments.

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Keywords: *Muskmelon, NAA, IAA, growth, yield, Economics.*

Introduction

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Muskmelon (*Cucumis melo* L.) is an annual with a similar type of growth like cucumber. The leaf lobes are more rounded than those of cucumber and the crop requires slightly higher temperature for optimum growth than does the cucumber. Fruit maturity is achieved within about 85 to 120 days depending upon the variety, region, soil and climate. Muskmelon fruit is a fleshy pepo, varying considerably in shape. size and appearance according to the variety. Most varieties have ten longitudinal sutures and ribs, a few varieties lack such ribbing. In the mature fruit, the surface and ribs become covered with a network of corky tissue: in some varieties it is sparse while in others it is thick and dense. When the fruits of most varieties reach the edible maturity, a slight crack appears at the point of their attachment to the stem. When this crack completely encircles the attachment, the fruit has reached its edible maturity and is also ready for seed harvest. A single muskmelon fruit may contain about 400 to 600 seeds, which resemble those of cucumber in their size and appearance.

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Muskmelon (Cucumis melo L.) has high nutritive value and it is grown widely in India as well as in whole world and consume as vegetable. Muskmelon is rich in vitamin C (antioxidant) so. it is also good for health. Muskmelon is low in sugar and calories because of high per cent of water present in it which are useful for those who want to reduce body weight. The nutritive value varies from variety to variety. A rough analysis of the food value is given below. (**Choudhury, 2000**).

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The mechanism of sex expression in cucurbits is governed by genetical and environmental factors (**Nitsch** *et al.* **1952)**. The application of plant growth regulators has been found to be effective in initiating higher percentage of female flowers and there by modifying the sex ratio and ultimately resulting in more fruiting in cucurbits. A relationship between growth substances and sex expression probably exist in these plants. During the flowering period, a high auxin level in the vicinity of differentiating primordium and staminate organs by a low level favors the formation of pistillate organs. (**Heslop-Harrison. 1957**).

Plant growth regulators, other than nutrients, usually are organic compounds. They are either natural or synthetic compounds and are applied directly to a plant to alter its life processes or structure in some beneficial ways so as to enhance yield. improve quality and facilitate harvesting. **(Nickell, 1982**).

The modification in sex expression by exogenous application of plant growth regulators and certain chemicals had received considerable attention in cucurbitaceous crops such as *Cucumis*

sativus L. by **Choudhury** and **Phatak** (1959) and **Astmon *et al.* (1968)**: in *Cucumis melo* L. by **Brantely and Warren** (1960) and in *Lagenaria siceraria* (Moll Standl. by **Kalia and Dhillon (1966).**

Charles Darwin was the first who proposed the existence of auxin in 1880. It was the first class growth regulator that was discovered. Auxins are those compounds that give positive effect on formation of bud, enlargement of cell and root initiation and they are also helpful for the formation of other growth hormones.

Plant growth regulators are used in horticulture to improve crop growth by increasing fruit number, fruit set and size. Improved vegetative growth and production traits can increase crop productivity. The productivity in the horticultural system often depends on the manipulation of the physiological activities of the crops by chemical means (**Yeshitela** *et al*., **2004**).

The physiological processes like growth and development of the plant, enhancement of the fruit color, flower differentiation, fruit ripening, tissue growth, etc. are controlled by the appropriate application of plant growth regulators IAA & NAA (**Prajapati** *et al*., **2015**).

IAA also control vegetative growth of plant and helps to increase the plant population per area (**Latimer, 2019**). The plant regulators have positive role on growth, flowering, fruiting, and the fruit yield of cucumber. In fact, the application of growth regulators enhance the production of cucumber including other vegetables and fruits in respect of superior quality and better growth. According to **Gianfagua (1987),** plant growth regulators can modify development by interfering with the biosynthesis, metabolism, or translocation of endogenous hormones, or by supplying endogenous hormones when plant levels are low. The increase in flowering can produce more fruits and, together with the increase in size, it would increase production in fruit crops (**Dyer** *et al*., **1990**).

IAA is natural occurring hormone while NAA, IBA, 2-4D etc. are synthetic in nature. Apical dominance, root induction, control fruits drops, regulation of flowering, parthenocarpy, phototropism, geotropism, herbicides, inhibit abscission, sex determination, xylem differentiation, nucleic acid activity.

Sex expression the treatment with growth regulators has been found to change sex expression in cucurbits, okra and pepper. GA3 (10-25 ppm), IAA (100 ppm) and NAA (100 ppm) when sprayed at 2-4 leaf stage in cucurbits, then they have been found to increase the number of female flowers. The combination of NAA150 ppm + ethrel 250 ppm also increased number of fruits per vine. **Li and Hayata (2005)**, point out that the application of indole-3- acetic acid in the cultivation of zucchini (*Cucurbita pepo L.*) could be closely related to the setting and growth of the fruit.

Younis and Tigani (1977); Naqvi *et al.* (1998) point out that naphthalene acetic acid (NAA) has an effect on fruit retention in several vegetables and produces an increase in yield in many fruit crops. **Alam and Khan (2002)** point out that naphthalene acetic acid (NAA) reduces fruit drop, increases the number of fruit and yield in tomato crop, application of IAA in the crop of the pin (*Citrullus lanatus* Mansf.) found the longest fruits and the application of ANA decreased the width of the fruit. Instead, they coincide with the results obtained in other crops by **Dutta and Banik (2007)** who found with the application of naphthalene acetic acid (NAA) before flowering and three weeks after fruit set, a significant increase in length. and diameter of the guava fruit.

MATERIALS AND METHODS

The material and methods used in the present investigation include a brief description of the site of experiment, soil properties, climate condition prevalent in the locality during the period of experiment, statistical, particulars of treatments, planting material used and sampling techniques, are given below:

A field experiment was conducted during 25th February 2021 to 30th May 2021. In polyhouse at microbiology department, Department of Horticulture, Jacob Institute of Biotechnology and Engineering, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P.).

The experimental field has an even topography with a gentle slope and good drainage. The sample were drown from each replication of experimental plot at 0-15 cm depth before sowing of the crop and a composite sample was made to determine the physical and chemicalproperties of soil. The mechanical analysis of the sample soil was done with the half of Bouyoucos hydrometer (1952) method.

Sand 60% , clay

The experiment entitled, was conducted in spring to summer season adapting randomized block design consisting of 10 treatments and three replications. The experiment was laid out in simple randomized block design consisting of one hybrid variety with three replications. The different treatments were allocated randomly in each replication. The field was ploughed thoroughly and break the clods and brought soil to a fine tilth with the help of spade and rake. Thereafter field was leveled properly with rakers and ridges are made, Fertilizers in both inorganic and source forms were used. Urea was used as a nitrogen fertilizer, SSP as a phosphorus fertilizer, and Mop as a potash fertilizer. Organic manure was used in the form of decomposed farmyard manure (FYM) and vermicompost. After that sowing is done, The Replanting operation was

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•The application and frequency of application and other related details about NAA and IAA must be included here.
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•All other parameters shown in the results should be discussed in the "Materials and Methods" section for future reference by other researchers.

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carried out by removing weak and dead plants in order to maintain healthy plant population. The first weeding was done with the help of khurpi 15 days after sowing, and the second weeding was done 30 days after sowing followed by15 days interval up last Harvest. The experimental crop was given irrigation by flooding of regular intervals of 6-7 days and depending upon soil moisture at required stages of the crop. Application of Chlorpyriphos @2ml/L for control of red pumpkin beetle and Neem oil @3ml/L for control of leaf miner by using sprayer. Emamectin+Thymoxon @50g/15L for the control of sucking pest, dusting of Malathion for control of ants & termites. Fruits were harvested when they reaches full slip (what does it mean?) stage. i.e., when the fruit is detached from the plant naturally. As it was impractical to record observations on every plant due to the large plant population size, the technique of random sampling was used to record observations of various plant growth parameters throughout the study. As a representative sample of the entire population, plants were randomly selected from each plot by adopting random sampling technique.

The data recorded during the course of investigation were subjected to statistical analysis as per method of analysis of variance (Fisher, 1950). The significance and nonsignificance of the treatment effect were judged with the help of f" value (variance ratio) was compared with the table value at 5% level of significance. If calculated value exceeded then the value, the effect of considered to be significant. The significant difference between the means was tested against the critical difference at 5%level of significance.

Table No 1. Treatment details

Treatment	Treatment Details
T_0	CONTROL
T_1	NAA 10 PPM
T_2	NAA 20 PPM
T_3	NAA 30 PPM
T_4	NAA 40 PPM
T_5	NAA 50 PPM
T_6	NAA 60 PPM
T_7	NAA 70 PPM
T_8	NAA 80 PPM
T9	IAA 100 PPM
T10	IAA 200 PPM
T11	IAA 300 PPM
T12	IAA 400 PPM
T13	IAA 500 PPM
T14	IAA 600 PPM
T15	IAA 700 PPM
T16	IAA 800 PPM

Result and Discussion

The impact of NAA and IAA on Growth yield and Quality of Muskmelon.

Effect of NAA and IAA on Growth of Muskmelon.

The maximum No. of Leaves at 30,60 & 90 DAS is recorded in the T8 (15, 28.3, and 70.66) and T16 (16.6, 27.3, and 69.66) T8 is NAA @80 PPM & T16 is IAA @ 800 PPM.

The maximum VINE LENGTH at 30,60 & 90 DAS is recorded in the T8 (17, 103.16, and 153.96 CM) and T16 (14.66, 103.16, and 152.86 CM) T8 is NAA @80 PPM & T16 is IAA @ 800 PPM.

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It is strongly recommended to put a discussion.
The text in the results must be improved.
Citing related studies is highly encouraged.

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Effect of NAA and IAA on Floral parameters of Muskmelon.

Maximum No. of days for the 1st male flower T8 (33.6 Days) & T16 (33.3 Days) T8 is NAA@ 80 ppm and T16 is IAA @ 800 ppm, these two treatments promoted early flowering Maximum No. of days for the 1st female flower T8 (38.83 Days) & T16 (38.4 Days) T8 is NAA@ 80 ppm and T16 is IAA @ 800 ppm, these two treatments promoted early flowering No. of Node at which 1st Male flower appears T8 (4.1) & T16 (3.26) here T8 is NAA @ 80 ppm and T16 is IAA @ 800 ppm, these two treatments promoted early flowering No. of Node at which 1st Female flower appears T8 (5.83) & T16 (5.33) here T8 is NAA @ 80 ppm and T16 is IAA @ 800 ppm, these two treatments promoted early flowering Maximum No. of Male Flowers were recorded in T8 (207.33) and T16 (220) here T8 is NAA @ 80 ppm and T16 is IAA @ 800 ppm. Maximum No. of Female Flowers were recorded in T8 (5.3) and T16 (5.6) here T8 is NAA @ 80 ppm and T16 is IAA @ 800 ppm.

Effect of NAA and IAA on Yield parameters of Muskmelon.

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Maximum No. of fruits were recorded in T16 (3.3) and T15 (3.3) and T8 (2.3) here T16 is IAA @ 800 ppm , T15 is IAA @ 700 ppm and T8 is NAA @ 80 ppm. Maximum length of the fruit is recorded in T8 (13.4) and T7 (12.4) here T8 is NAA @ 80 ppm and T7 is NAA @ 70 PPM.

Maximum diameter of the fruit is recorded in T8 (22.53 CM), T7 (21.6 CM) and T16 (21.4 CM) here T8 is NAA @80PPM and T7 NAA @ 70 PPM and T16 IAA @ 800PPM.

Maximum Yield per Plant is recorded in T8 (1.4 kg\plant), T7 (1.3kg\plant) and T16 (1.3kg\plant) here T8 is NAA@80 PPM, T7 is NAA @ 70 PPM and T16 is IAA@800 ppm.

Maximum Yield per Plot is recorded in T8 (8.4 kg\plant), T7 (8.08kg\plant) and T16 (7.77kg\plant) here T8 is NAA@80 PPM, T7 is NAA @ 70 PPM and T16 is IAA@800 ppm.

Maximum Yield per Hectare is recorded in T8 (12.46 t\ha), T7 (11.97t\ha) and T16 (11.63t\ha) here T8 is NAA@80 PPM, T7 is NAA @ 70 PPM and T16 is IAA@800 ppm.

Effect of NAA and IAA on Quality parameters

Maximum Vitamin C content is recorded in T15 (30.96mg\100g) and T4 (24.59mg\100g) here T15 is IAA @ 700 PPM and T4 is NAA @ 40 ppm.

Maximum TSS Content is recorded in T8(11.30) and T12 (10.98) here T8 is NAA@80PPM and T12 is IAA@400PPM.

Treatments symbols	Treatment combinations	No. of leaves 30 DAS	No. of leaves 60 DAS	No of leaves 90 DAS	Vine length 30 DAS (m)	Vine length 60 DAS (m)	Vine length 90 DAS (m)
T_1	NAA 10ppm	10.33	21.67	47.33	11.33	99	149.9
T_2	NAA 20ppm	10	22	49	13	99.13	150.5
T_3	NAA 30ppm	11	21.5	48.66	13.33	99.3	149.6
T_4	NAA 40ppm	10.6	23	49.66	13	99.16	149.66
T_5	NAA 50ppm	10.67	22.33	50.33	13.66	98.66	150.4
T_6	NAA 60ppm	14.6	24.67	66	13.16	101	151.5
T_7	NAA 70ppm	14	25	65.66	16	102.66	152.61
T_8	NAA 80ppm	15	**28.3**	**70.66**	**17**	**103.16**	**153.96**
T_9	IAA 100ppm	10.66	22.3	44.33	13.8	99.5	149
T_{10}	IAA 200ppm	11.6	23.66	45	14.33	99.83	149.26
T_{11}	IAA 300ppm	11.6	23.67	45.33	14.5	99	149.33
T_{12}	IAA 400ppm	11	23	48	13.5	99.3	149.8
T_{13}	IAA 500ppm	11.3	24	48	15.33	99.66	151.3
T_{14}	IAA 600ppm	11.6	25.33	49.33	14	100	151.16
T_{15}	IAA 700ppm	15.6	26.33	66	14.3	101.55	151.26
T_{16}	IAA 800ppm	16.6	**27.3**	**69.66**	**14.66**	**103.06**	**152.86**
T_0	Control	9.6	20.67	43.33	11	97.66	146.16
	F-Test	**S**	**S**	**S**	**S**	**S**	**S**
	S.Ed (±)	0.77	1.25	1.75	0.89	1.61	1.08
	C.D at 5%	1.57	2.54	3.57	1.82	3.27	2.21
	CV	7.78	6.41	4.03	7.88	1.97	0.88

Table 2. Effect of NAA and IAA on growth in Muskmelon.

The results recorded pertaining to No. of leaves 30 DAS are presented in table 2.

Application of growth regulator i.e, T16(IAA 800 PPM) recorded significantly the highest with (16.6) followed by T15 with (15.6) which is statistically at par value while the lower number of leaves in T0(9.6). The results recorded pertaining to No. of leaves 60 DAS are presented in table 2. Application of growth regulator i.e, T8 (IAA 80 PPM) recorded significantly the highest with (28.7) followed by T16 with (27.3) which is statistically at par

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TSS and vitamin C's unit of measurements are needed and be separated table from the yield and yield components.

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Suggestion: The effect of NAA and IAA on the growth of muskmelon.

value while the lower number of leaves in T0(20.7). The results recorded pertaining to No. of leaves 90 DAS are presented in table 2. Application of growth regulator i.e, T8(NAA 80 PPM) recorded significantly the highest with (70.66) followed by T16 with (69.66) which is statistically at per value while the lower number of leaves in T0(43.33).

The results recorded pertaining to Vine length 30 DAS are presented in table 2 Application of growth regulator i.e, T8(NAA 80 PPM) recorded significantly the highest with (17cm) followed by T7(NAA 70 PPM) with (16 cm) which is statistically at per value while the lower number of leaves in T0(11cm). The results recorded pertaining to Vine length 60 DAS are presented in table 2. Application of growth regulator i.e, T8(NAA 80 PPM) recorded significantly the highest with (103.16cm) followed by T16(IAA 800 PPM) with (103 cm) which is statistically at per value while the lower number of leaves in T0(97.66cm). The results recorded pertaining to Vine length 90 DAS are presented in table 2. Application of growth regulator i.e, T8(NAA 80 PPM) recorded significantly the highest with (153.96cm) followed by T16(IAA 800 PPM) with (152.86 cm) which is statistically at par value while the lower number of leaves in T0(146.86cm). The significant increase in vine length in treatment of NAA

80 ppm might be the result of its stimulatory effect on plant growth due to cell elongation and rapid cell division in growing protein. **Chhonkar and Singh (1959)** opined that the increase in vine length under application of NAA was on account of its stimulatory effect on absorption of available nutrients present in the soil or by the modification in plant root system through the associated microflora of the soil similar results were also reported by **Das and Das (1996)** in pumpkin due to application of NAA (150 ppm).

Treatments symbols	Treatment combinations	Days to first male flower appearance	Days to first female flower appearance	Node at 1st male flower appear	Node at 1st female flower appear	No. of male flowers	No. of Female flowers	Sex ratio	No. of fruits per plant	Avg. weight of the fruit (g)	Avg. length of the fruit (cm)	Diameter (cm)	Avg. yield per plant (kg)	Avg. yield per hector (t)	TSS	Vitamin C
T_1	NAA 10ppm	37.6	42.1	5.36	7.33	207.33	3.3	51:1	2	551.7	9.23	18.1	1.1	9.79	8.73	23.41
T_2	NAA 20ppm	36.5	42.16	5.46	7.5	169	3.6	47:1	2	569.5	9.7	18.33	1.13	10.12	8.92	22.80
T_3	NAA 30ppm	36	41.5	5.23	7	172.33	3.66	48:1	2	620.3	10.4	21.33	1.24	11.02	6.43	21.36
T_4	NAA 40ppm	36.8	41	5.1	6.86	174.66	4	49:1	2	625.2	10.43	21.26	1.25	11.11	7.16	**24.59**
T_5	NAA 50ppm	35.83	42	4.76	6.76	182	4.3	42:1	2	640.1	10.9	19.76	1.27	11.37	8.43	21.64
T_6	NAA 60ppm	35.66	40.16	4.83	7	184.66	4.6	40:1	2	651	12	21.16	1.3	11.55	8.56	21.59
T_7	NAA 70ppm	34.83	40	4.8	6.8	190.33	4.6	41:1	2	625.6	12.4	21.6	1.34	11.97	9.6	23.02
T_8	NAA 80ppm	34.5	38.83	4.1	5.83	167.66	5.3	**39:1**	2.3	673.6	**13.43**	**22.53**	**1.4**	**12.46**	**11.30**	23.96
T_9	IAA 100ppm	38	43.33	5.43	7.5	180.33	3.6	50:1	2.3	334.8	8	18.83	0.78	6.94	8.4	21.89
T_{10}	IAA 200ppm	35.66	41.5	4.7	7.66	187.33	3.3	57:1	2.3	349.4	8.93	18.2	0.81	7.24	8.31	22.11
T_{11}	IAA 300ppm	35.33	41.16	4.9	6.5	192.33	3.3	59:1	2.3	355.6	7.4	19.9	0.82	7.37	8.86	21.23
T_{12}	IAA 400ppm	36.16	41.5	4.9	6.6	187.6	3.66	55:1	2.6	361	8.66	20.2	0.96	8.54	**10.98**	22.67
T_{13}	IAA 500ppm	36.33	41.16	4.0	6.16	182.66	4	52:1	2.67	369.1	9.03	20.6	0.98	8.74	10.51	23.17
T_{14}	IAA 600ppm	35.83	40.8	3.9	5.66	178.66	4.3	50:1	3	373.5	9.73	20.93	1.12	9.97	9.03	22.97
T_{15}	IAA 700ppm	35 .5	39.16	3.76	5.4	166.33	4.66	48:1	3.3	384.9	9.96	21.13	1.28	11.40	10.55	**30.96**
T_{16}	IAA 800ppm	**33.3**	**38.4**	**3.26**	**5.33**	**161.66**	**5.66**	**39.1**	3.3	393.3	**10.1**	21.43	**1.3**	**11.63**	10.03	23.14
T_0	Control	40.5	45.83	7.33	12	220	2.33	72:1	2	223.5	8.5	12.83	0.44	3.97	8.03	20.64
	F-Test	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	S	**S**

	S.Ed (±)	0.80	0.94	0.34	0.64	2.70	0.58	7.16	0.39	28.29	7.16	1.23	0.26	13.32	1.99	0.89
	C.D at 5%	1.63	1.91	0.70	1.30	5.49	1.18	14.59	0.79	57.62	14.59	2.51	0.53	27.12	4.05	1.81
	CV	**2.72**	**2.78**	8.71	11.27	1.75	17.55	19.38	20.21	7.27	19.38	**7.57**	20.63	20.55	20.78	4.72

Table 3. Effect of NAA and IAA on Growth, Yield and Quality of Muskmelon.

CONCLUSION

The results from the present investigation concluded that T8(NAA 80 PPM) performed the best in the following parameters No. of Leaves is recorded in the T8 (70.66) Vine length at is recorded in the T8 (153.96 cm) Yield per Hectare is recorded in T8 (12.46 t\ha), TSS Content is recorded in T8(11.30), T8 NAA@80ppm found to be superior for fruit yield and it showed highest gross return, net return and benefit cost ratio.

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REFERANCES

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