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Effect of growth regulators on yield and quality parameters of summer squash (*Cucurbita pepo* L.)

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Abstract
An experiment was conducted in summer squash to study the effect of four growth regulators *viz*., Naphthalene acetic acid (NAA), Gibberellic acid (GA_3), ethrel and Malic hydrazide (MH) for yield characters and quality traits in summers squash. Foliage application of NAA @ 100 ppm was found beneficial for yield per plant (Kg) and fruit yield per hectare (t/ha). With respect to quality parameters, NAA @ 100 ppm significantly recorded highest values for moisture content, total soluble solids of summer squash. Whereas, MH @ 200 ppm lowered the titrable acidity, increased ascorbic acid content, increased total sugars and reducing sugars. Significant differences were observed with the use of growth regulators on yield and quality traits of summer squash.

Keywords: Naphthalene acetic acid, GA_3- Gibberellic acid, MH- malic hydrazide

Introduction

Cucurbita pepo is a member of the Cucurbitaceae family. This plant bears both male and female blossoms on the same plant (monoecious) (Lerner, 2003) [5]. Summer squash generally display more male flowers and few female flowers. Growth regulators dignify as one of the most substantial treatments, applied nowadays in farming, which in maximum status amend the plant growth and the following fruiting. Plant growth regulators 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 and improve quality (Nickell 1983) [7]. Various hypotheses such as determination of sex by gibberellin levels as well as auxin and growth retardant balance have been drawn from the influence of exogenous application of various chemicals. Growth regulators are very important for the better growth, yield and quality of summer squash. Plant growth regulators like NAA, GA_3, ethrel and MH suppress the number of male flowers and increase the female flowers production and there by ultimately increase the yield and quality.

Since very small acquaintance is obtainable on the effect of growth regulators on yield of summer squash plants, the present fulfilment was endeavor to discover convenient growth regulators for increasing the yield possibility of summer squash. Growth regulators are regarded as one of the most important treatments used currently in agriculture which in most cases influence the fruit yield. Therefore, present study was conducted to investigate the effect of growth regulators on yield and quality parameters of summer squash.

Material and Methods

The research was conducted at College of Horticulture, Venkataramannagudem, Andhra Pradesh during *rabi* 2020-21 with a view to study the effect of growth regulators on yield and quality parameters of summer squash. The experiment was laid out following Randomized Block Design (RBD). The experiment included thirteen treatments; namely three concentrations each NAA (50, 100 and 150 ppm), GA_3 (50, 100 and 150 ppm), Ethrel (150, 200 and 250 ppm), MH (150, 200 and 250 ppm) and control (water spray). Two sprays of growth regulators were done at 2nd and 4th true leaf stages. Seeds are sown 1 inch deep on ridges with spacing of 60 cm x 60 cm. A space of 30 cm was uniformly left from the borders of the plot. Five plants were selected randomly from each plot to record the observations on yield and quality attributes. The immature fruits were harvested. Fruit yield per plant in Kg and fruit yield per hectare in ton per hectare. was recorded. Moisture content was worked out by using the formula suggested by (Ranganna, 1977) [9] expressed in percentage, TSS (total soluble solids) was measured by digital hand refractometer expressed in °Brix, ascorbic acid content was estimated using the formula given by (Sadasivam and Manickam, 1992) [11], reducing sugars and total sugars were estimated with the procedure given by Lane and Eynone (1923) [4] and their results were expressed in mg/100g.

Results and Discussion

The data on fruit yield per plant (Kg) and fruit yield per hectare (t/ha) of summer squash are presented in Table 1. The data revealed that, fruit yield of summer squash per hectare was significantly increased by growth regulators.

Highest fruit yield per plant was obtained in NAA @ 100 ppm (T_2) (0.96) which was found on par with ethrel @ 150 ppm (0.79), MH @ 150 ppm (0.76) followed by GA_3 @ 50 and 100 ppm (0.67,0.62) and MH @ 200 ppm (0.67). Among the growth regulator treatments, ethrel @ 200, 250 ppm (0.46), NAA @ 150 ppm (0.48) and GA_3 @150 ppm (0.52) recorded lower average fruit yield and were found at par with control (T_{13}) which recorded 0.36 kg per plant. The treated plants might have become physiologically more active to build up sufficient food stock for the developing flowers and fruits, ultimately leading to higher yield. An increase in fruit yield might be due to increase in pistillate flower production and ultimately harvest more number of fruits per plant. (Arora *et al*. 1987) [2]. These findings have also been obtained by Sinojiya *et al*. (2015) [13] in watermelon and Shafeek *et al*. (2016) [12] in summer squash.

Significantly highest fruit yield per hectare was obtained in NAA @ 100 ppm (T_2) (26.80) followed by ethrel @ 150 ppm (T_7) (21.93) and MH @ 150 and 200 ppm (21.13 and 19.84), respectively. Among the growth regulator treatments, ethrel @ 200, 250 ppm (12.88, 12.83) and NAA @ 150 ppm (13.39) recorded lower average fruit yield and were found at par with control (T_{13}) which recorded 9.94 ton per hectare. These results are in conformity with Thappa *et al*. (2011) [14] in cucumber, Sinojiya *et al*. (2015) [13] in watermelon and Shafeek *et al*. (2016) [12] in summer squash.

Growth regulators showed significant effect on moisture content which are presented in the Table 1. From the data, it was found that all growth regulators at higher concentrations showed negative effect on moisture content of the fruits. However, at low and medium concentrations, these treatments resulted in significantly maximum values over control except GA_3. The highest moisture content (90.58) was obtained in NAA @ 100 ppm (T_2) which was found on par with ethrel @ 150 ppm (90.52), MH @ 150 and 200 ppm (90.44, 90.33) followed by many other treatments. Lowest moisture content (89.11) was observed with control T_{13}. Similar trend was reported by Marbhal *et al*. (2006) [6] in bitter gourd and Aravind kumar *et al*. (2014) [1] in bitter gourd.

The data pertaining to total soluble solids in summer squash are presented in Table 1 and Fig 1. From the data it was observed that, total soluble solids was significantly influenced by growth regulators. All the growth regulator treatments recorded significantly high values over control. The results revealed that, maximum TSS (3.20) was recorded in T_2, NAA @ 100 ppm which was found statistically on par with T_7 (3.19) ethrel @ 150 ppm followed by T_{10} (3.17) MH @ 150 ppm. Whereas, lowest value (3.11) was observed in T_{13}, control. Increase in TSS with growth regulator treatments might be due to the diversion of more solids towards developing fruits and might also have enhanced the conversion of complex polysaccharides into simple sugars. (Ravi Kher *et al*. 2005) [10]. Similar results were also observed in Ouzounidou *et al*. (2008) [8] in muskmelon, Sinojiya *et al*. (2015) [13] in watermelon, Chaurasiya *et al*. (2016) [3] in muskmelon and Shafeek *et al*. (2016) [12] in summer squash.

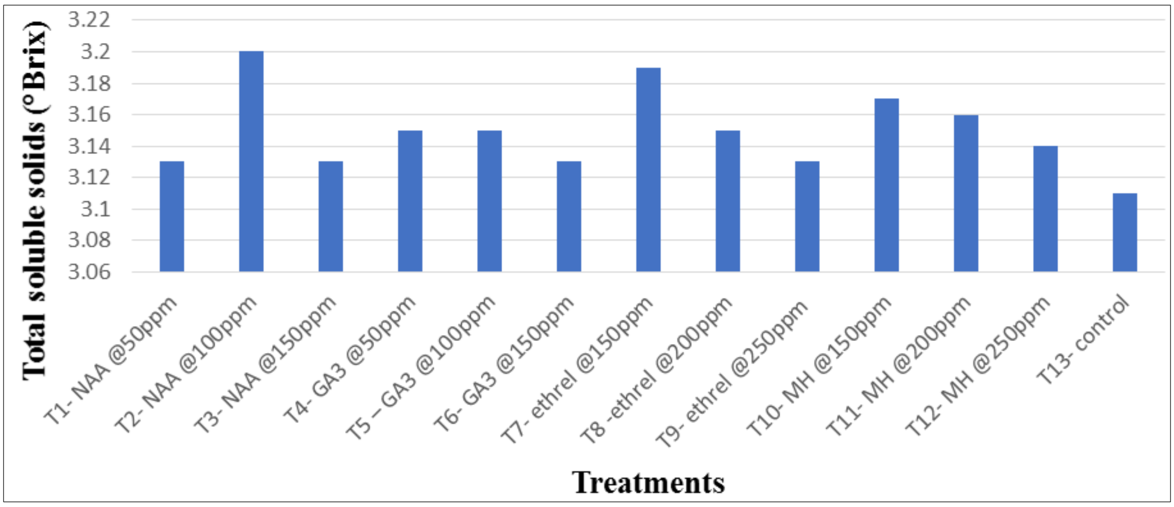

Fig 1: Effect of growth regulators on total soluble solids (˚Brix) of summer squash (*Cucurbita pepo* L.)

Table 1: Effect of growth regulators on yield and quality parameters of summer squash (*Cucurbita pepo* L.)

Treatments	Fruit yield per plant (Kg)	Fruit yield per hectare (t/ha)	Moisture content (%)	Total soluble solids (˚Brix)	Ascorbic acid (mg/100g)	Reducing sugars (%)	Total sugars (%)
T_1 - NAA @50ppm	0.54	15.06	89.27	3.13	12.89	1.14	3.27
T_2 - NAA @100ppm	0.96	26.80	90.58	3.20	16.09	1.29	3.78
T_3 - NAA @150ppm	0.48	13.39	89.21	3.13	12.13	1.12	3.21
T_4 - GA_3 @50ppm	0.67	18.74	89.55	3.15	13.60	1.17	3.33
T_5 - GA_3 @100ppm	0.62	17.11	89.32	3.15	13.15	1.14	3.27
T_6 - GA_3 @150ppm	0.52	14.57	89.23	3.13	12.84	1.13	3.26
T_7 - Ethrel @150ppm	0.79	21.93	90.52	3.19	15.91	1.23	3.74
T_8 - Ethrel @200ppm	0.46	12.88	89.49	3.15	13.42	1.15	3.30

T_9 - Ethrel @250ppm	0.46	12.83	89.13	3.13	10.75	1.14	3.19
T_{10} - MH @150ppm	0.76	21.13	90.44	3.17	14.93	1.19	3.33
T_{11} - MH @200ppm	0.67	19.84	90.33	3.16	16.26	1.30	3.82
T_{12} - MH @250ppm	0.59	16.42	89.29	3.14	15.55	1.19	3.35
T_{13} – Control	0.36	9.94	89.11	3.11	10.75	1.11	3.16
SE m±	0.06	1.53	0.11	0.00	0.34	0.01	0.02
CD at 1%	0.16	4.38	0.32	0.01	0.96	0.04	0.06

Titrable acidity in summer squash are presented in Table 1 and Fig.2. From the data it was observed that, titrable acidity was significantly influenced by growth regulators. Lowest titrable acidity (5.67) was recorded with MH @ 200 ppm (T_{11}) which was found statistically on par with T_2, NAA @ 100 ppm (5.68) followed by T_7, ethrel @ 150 ppm (5.69). Maximum titrable acidity (5.77) was observed in control (T_{13}). The results of the present study are in accordance with Ouzounidou *et al*. (2008) [8] in muskmelon.

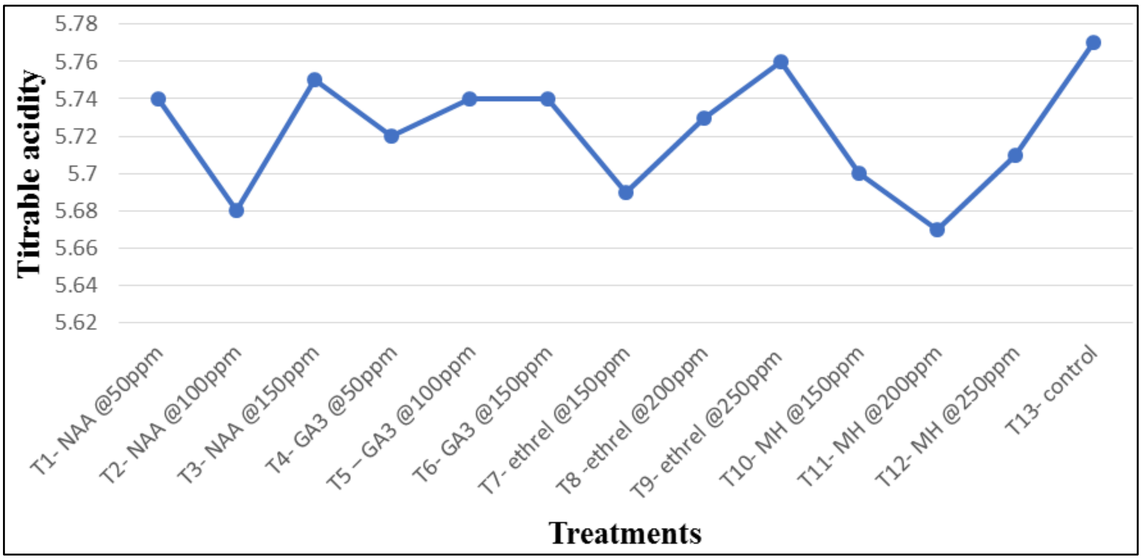

Fig 2: Effect of growth regulators on titrable acidity in summer squash (*Cucurbita pepo* L.)

The data pertaining to ascorbic acid content in summer squash are presented in the Table 1. From the data it was observed that, ascorbic acid content was significantly influenced by growth regulators. Ascorbic acid content was slightly lowered at higher concentration of growth regulators, whereas, it was found higher at medium concentrations in all the treatments. Maximum value (16.26) was observed in the treatment MH @ 200 ppm (T_{11}) which was found statistically on par with NAA @ 100 ppm T_2 (16.09) and ethrel @ 150 ppm (T_7) (15.91) followed by MH @ 250 ppm (15.55). Minimum ascorbic acid content (10.75) was observed in case of control (T_{13}). The results of the present study are in accordance with Ouzounidou *et al*. (2008) [8] in muskmelon and Shafeek *et al*. (2016) [12] in summer squash.

Growth regulators showed significant effect in reducing sugars which are presented in the Table 1. The data reveals that, reducing sugars were found maximum at medium concentration of growth regulators. Whereas, found minimum at higher concentrations, which was found on par with control treatment. Maximum reducing sugars content (1.30) was observed in MH @ 200 ppm (T_{11}) which was at par with NAA @ 100 ppm T_2 (1.29) followed by T_7 (1.23) ethrel @150 ppm. Minimum value (1.11) was observed in control (T_{13}). Findings of the present study are in accordance with Sinojiya *et al*. (2015) [13] in watermelon.

The data regarding total sugars present in summer squash are presented in the Table 1. It was found that, total sugars was significantly influenced by application of growth regulators. Growth regulator treatments at higher concentrations exhibited similar influence on total sugar content as recorded in reducing sugars. Almost all the treatments recorded higher total sugar content at medium concentrations. The results revealed that, maximum total sugar content value (3.82) was observed in MH @ 200 ppm (T_{11}) which was found on par with NAA @ 100 ppm T_2 (3.78) followed by ethrel @ 150 ppm T_7 (3.74). Lowest total sugar content (3.16) was recorded in treatment T_{13}, control. The results are in accordance with Sinojiya *et al*. (2015) [13] in watermelon.

Conclusion

It can be concluded that foliar application of NAA @100ppm ppm twice at 2 and 4 true leaf stage was found superior for fruit yield per plant, fruit yield per hectare, moisture content, total soluble solids and protein content. Other quality parameters like lower titrable acidity and higher content of ascorbic acid, total sugars and reducing sugars were recorded with application of MH @200ppm in summer squash.

References

1. Aravind Kumar PR, Vasudevan SN, Patil MG, Rajrajeshwari C. Influence of NAA, triacontanol and boron spray on seed yield and quality of bitter gourd (*Momordica charantia* cv. Pusa Vishesh). The Asian Journal of Horticulture 2014;7(1):36-39.
2. Arora SK, Pandita ML, Dahiya MS. Effect of plant growth regulators on vegetative growth, flowering and yield of ridge gourd (*Luffa acutangula* Roxb.). Haryana Agric. Univ. J. Res 1987;17(4):319-24.
3. Chaurasiya J, Verma RB, Mukhtar A, Adarsh A, Rajesh K, Tej P. Influence of plant growth regulators on growth,

sex expression, yield and quality of Muskmelon (*Cucumis melo L*.). Eco. Env. & Cons 2016;22:S39-S43
4. Lane, Eynone L. Determination of reducing sugars by means of Fehling solution with methylene blue indicator as an internal indicator. J. Soc. Chem. India 1923;42:32.
5. Lerner R. Senior study vegetables- Squash. Horticulture and Landscape Architecture Department, Purdue University 2003.
6. Marbhal SK, Musmade AM, Kashid NV, Kamble MS, Kampthe PV. Effect of growth regulation and picking sequence on seed quality of bitter gourd (*Momordica charantia* L.) var. Phule Green Gold. Prog. Hort 2006;38:72-76
7. Nickell LG. Plant growth regulators in the sugarcane industry. In: Chemical manipulation of crop growth and development. McLaren JC (ed). Butterworths, London 1983,167-189p.
8. Ouzounidou G, Papadopoulou P, Panastasia G, Ilias I. Plant growth regulators treatments modulate growth, physiology and quality characteristics of *Cucumis melo* L. Plants. Pak. J. Bot 2008;40(3):1185-1193.
9. Ranganna S. Manual of Analysis of fruit and vegetable products. Tata Mc Graw Hill Publishing Company Ltd., New Delhi 1977.
10. Ravi Kher, Shanoo Bhat, Wali VK. Effect of foliar application of GA_3, NAA and CCC on physicochemical characteristics of guava cv. Sardar. Haryana J Hort. Sci 2005;34(1-2):31-32.
11. Sadasivam S, Mainckam A. Biochemical methods for agricultural sciences. Wiley Eastern Ltd. New Delhi 1992,246p.
12. Shafeek MR, Helmy YI, Ahmed AA, Ghoname AA. Effect of foliar application of growth regulators (GA_3 and Ethrel) on growth, sex expression and yield of summer squash plants (*Cucurbita pepo* L.) under plastic house condition. International Journal of Chem Tech Research 2016,70-76p.
13. Sinojiya AG, Kacha HL, Jethaloja BP, Giriraj J. Effect of Plant Growth Regulators on Growth, Flowering, Yield and Quality of Watermelon (*Citrullus lanatus* Thunb.) cv Shine Beauty. Environment & Ecology 2015;33(4A):1774-1778.
14. Thappa M, Kumar S, Rafiq. Influence of plant growth regulators on morphological, floral and yield traits of cucumber (*Cucumis sativus* L.) Kesetsart J Nat. Sci 2011;45:177-188.