The Pharma Innovation Journal 2022; 11(6): 2103-2107

www.ThePharmaJournal.com

The Pharma Innovation

**ISSN (E): 2277-7695**
**ISSN (P): 2349-8242**
**NAAS Rating: 5.23**
TPI 2022; 11(6): 2103-2107

www.thepharmajournal.com
Received: 17-02-2022
Accepted: 23-05-2022

**Mokkala Siva Prasad**
M.Sc. Scholar, Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

**Dr. Vijay Bahadur**
Associate Professor and Head, Department of Horticulture, SHUATS, Prayagraj, Uttar Pradesh, India

**Dr. Anita Kerketta**
Assistant Professor, Department of Horticulture, SHUATS, Prayagraj, Uttar Pradesh, India

**Dr. VM Prasad**
Professor, Department of Horticulture, SHUATS, Prayagraj, Uttar Pradesh, India

**Corresponding Author:**
**Mokkala Siva Prasad**
M.Sc. Scholar, Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

# Influence of $GA_3$ and ethrel on growth, floral and yield parameters of muskmelon (*Cucumis melo* L.)

**Mokkala Siva Prasad, Dr. Vijay Bahadur, Dr. Anita Kerketta and Dr. VM Prasad**

**DOI:** https://doi.org/10.22271/tpi.2022.v11.i6ab.13505

**Abstract**
The experiment was conducted in the Horticulture Research Farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom, University of Agriculture, Technology and Sciences, Prayagraj (UP) during February to May 2021. The experiment was be laid out in randomized block design (R.B.D.) with 10 treatments with 3 replications. the results revealed that treatment $T_2$ (GA3 60 PPM+ETHREL 150PPM)- performs the best in the following parameters, days to 1st true leaf emergence(21.53),days to 2nd true leaf emergence(25.33), days to 1st male flower emergence(34.8), average fruit weight (0.61),average fruit length(10.93), average fruit diameter (11.64), average fruit yield per plant (2.60) average fruit yield per hectare (27.61tn/ha), internode length (10.72),average vine length (1.44), nodes at 1st male flower emergence (2.26), no of leaves (82.20), bcr (2.51: 1). Therefore, the treatment $T_2$ ($GA_3$ 60 PPM+ETHREL 150PPM) is the best when compared to other treatments and control.

**Keywords:** Muskmelon, PGR, $GA_3$, ethrel, growth, sex modification, yield, ASN-115

## Introduction
The muskmelon (*Cucumis melo* L., 2n = 2x = 24) (Origin: Persia) is one of the most important vegetables crop. It belongs to the family Cucurbitaceae. Edible melon belongs to either *Cucumis melo* var. *reticulatus* or *C. melo* var. *cantaloupensis*. Muskmelon encompasses the netted, salmon-flesh cantaloupe, the smooth – skinned green fleshed 'Honey Dew', the wrinkled – skinned, white – fleshed, 'Golden Beauty' and several other dessert melons in USA. Other forms with very different plant and fruit characters are seen in Orient and India. In addition several wild forms occur in Africa and India and all of these are inter-fertile (Vidhi, 2016) [19].

In India, this crop is popular in northern states especially in Uttar Pradesh and Punjab and in most every place in plains. It is said to be the native of Tropical Africa with Central Asia and North - West India as secondary centres of origin (Whitaker and Davis, 1962). The total area under muskmelon cultivation in world estimated to be 803 thousand hectare with an annual production of 13.8 million metric tonnes (Horticultural Statistics at a Glance, 2018).

Muskmelon is a valuable cash crop grown throughout the world. This is a short duration vegetable crop and has andromonoecious sex form in which naturally there are greater numbers of male flowers than the female flowers. This flowering behaviour is not advantageous and economical, because it results in lower fruit set and yield, which is a common problem in Muskmelon cultivation. Therefore to realize higher productivity it becomes imperative to tilt this balance in favour of pistillate/hermaphrodite flowers. Maleness and femaleness can usually be altered by environmental variables such as temperature, photoperiod and nutrition or by the application of plant growth regulators (Krishnamoorthy, 1981) [1].

In muskmelon, 250 ppm of ethrel is generally recommended to promote more number of female flowers (Rudich *et al*., 1969). Growth regulators have tremendous effects on sex expression and flowering in various cucurbits leading to either suppression of male flowers or increase in number of female flowers (Al-Masoum and Al-Masri, 1999). Growth regulators play an important role in both morphology and physiology of the plants. The exogenous application of plant growth regulators can alter the sex ratio and sequence when applied at two or four leaf stage (Hossain *et al*., 2006) [10].

A shift towards femaleness in sex expression with the exogenous application of plant growth regulators has received considerable attention from the scientific community.

Treatment with Auxin increases the female sex tendency. While gibberellins cause a shift towards maleness at higher concentration and femaleness at lower concentration and treatments with growth retardants, which interfere with gibberellins biosynthesis or action, also induce a shift towards femaleness in cucurbits. Earlier reports have conclusively demonstrated that exogenous application of plant growth regulators can alter the sex ratio and sequence if applied at the two- or four true leaf stage, which is the critical stage at which the suppression or promotion of either sex is possible in Muskmelon and other cucurbits (Girek *et al*., 2013; Ram Asrey *et al*., 2001) [3].

Plant hormones play an integral role in controlling the growth, development, metabolism and morphogenesis of higher plants (Taiz and Zeiger, 1991) [17]. Gibberellins are the most powerful of the growth promoters because they increase internode length, promote flowering in many plants, and modify the flower sex expression in some plants. bioactive GA3 promote stem elongation, leaf expansion, and root growth (Yaxley *et al*., 2001) [23]. There are four types of gibberellins but gibberellic acid, GA3 ($C_{19}H_{22}O_6$) is best known. Fresh and dry weights of shoots and roots, plant height and leaf area with gibberellic acid treatment caused a significant ameliorative effect with respect to these growth attributes in wheat plants (Ashraf *et al*., 2002).

Ethylene is one of the important growth regulator commercially available in form of ethephon in 39% S.L. in water aqua. Chemically, ethephon is 2-Chloroethylphosphonic acid, which upon metabolism by plant, releases ethylene (Szyjewicz *et al*., 1984). Ethylene is an important natural plant hormone, used in agriculture to force the ripening of fruits (Wang *et al*., 2002) [20]. Thus, ethephon can be a cheap and easy way to enhance productivity of farmer

## Materials and Methods

The field experiment entitled, "Influence of $GA_3$ and Ethrel on Muskmelon (*Cucumis melo* L.) cv. ASN-115" was conducted in spring to summer season adapting randomized block design consisting of 10 treatments and three replications during February to May 2021. Horticulture Research Farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P.). The experiment includes the following treatments. $T_0$: Control $T_1$: GA3 60 ppm + Ethrel 100ppm $T_2$: GA3 60ppm + Ethrel 150ppm $T_3$: GA3 60ppm + Ethrel 200ppm $T_4$: GA3 90ppm + Ethrel 100ppm $T_5$: GA3 90 ppm+Ethrel 150ppm $T_6$: GA3 90 ppm + Ethrel 200ppm $T_7$: Ethrel 100ppm $T_8$: Ethrel 150ppm $T_9$: Ethrel 200ppm. The mean (maximum and minimum) temperature was 37.98 ºC and 24.21 ºC respectively, mean (maximum and minimum) relative humidity was 82.16 percent and 45.26 percent during the crop growing season. The experimental soil was sandy loam in texture, nearly neutral in soil reaction (pH 7.1), low in organic carbon (0.318%), medium in available N (87Kg/ha), medium available P (375Kg/ha) and medium available K (50Kg/ha). Fertilizers were applied in the form of urea, single super phosphate and murate of potash, respectively. The field beds were prepared and the seeds have been directly sown with respective spacing and covered by soil. The observation regarding yield were recorded after harvesting of crop. Statistical analysis 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 non-significance 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. The observations where recorded to days to 1st male flower emergence, days to 1st female flower emergence, node at 1st male flower emergence, node at 1st female flower emergence, no of male flowers, no of female flower, sex ratio, average number of fruits per plant, average fruit weight (kg), average fruit length(cm) average fruit diameter (cm), average fruit yield (kg/plant), average fruit yield tn/ha, internode length(cm), average vine length (m).

## Results and Discussion

**Table 1:** Effect of $GA_3$ AND Ethrel on Floral parameters of muskmelon

| Treatments | Days to 1st male flower emergence | Days to emergence of 1st female | Node no at 1st male flower emergence | Node no at 1st female flower emergence | No of male flowers | No of female flowers | Sex ratio |
|---|---|---|---|---|---|---|---|
| $T_0$ | 38.06 | 42.13 | 4.20 | 6.33 | 167.86 | 4.13 | 40.70 |
| $T_1$ | 36.06 | 39.2 | 2.46 | 5.60 | 176.4 | 4.66 | 38.16 |
| $T_2$ | 34.80 | 38.8 | 2.26 | 6.06 | 183.2 | 5.00 | 37.46 |
| $T_3$ | 36.33 | 40.53 | 2.53 | 5.66 | 164.46 | 4.73 | 35.47 |
| $T_4$ | 36.33 | 38.8 | 2.66 | 5.86 | 220.06 | 4.40 | 53.22 |
| $T_5$ | 35.00 | 38 | 2.80 | 6.00 | 182.53 | 4.46 | 41.36 |
| $T_6$ | 36.13 | 38.6 | 2.60 | 5.80 | 253.26 | 5.20 | 49.87 |
| $T_7$ | 39.53 | 38.86 | 3.26 | 5.46 | 139.13 | 10.13 | 14.05 |
| $T_8$ | 36.46 | 37.43 | 3.53 | 4.66 | 130.4 | 16.53 | 7.89 |
| $T_9$ | 35.53 | 40.4 | 3.00 | 5.33 | 141.66 | 11.20 | 12.61 |
| F-Test | S | S | S | S | S | S | S |
| S.Ed(±) | 1.18 | 0.89 | 0.49 | 0.29 | 27.48 | 0.78 | 7.15 |
| C.D at 5% | 2.48 | 1.87 | 1.03 | 0.60 | 57.73 | 1.65 | 15.01 |
| C.V. | 3.97 | 2.76 | 20.48 | 6.20 | 19.13 | 13.64 | 26.45 |

### Days to 1st male flower emergence

Application of growth regulator i.e, $T_2$($GA_3$ 60ppm + Ethrel 150ppm) recorded significantly the least number of days to 1st male flower emergence (34.80) followed by $T_5$ (35.00), $T_1$ (36.06), $T_6$ (36.13), $T_3$ (36.33), $T_4$ (36.33), $T_8$ (36.46) which is statistically at par value while the maximum number of days was taken by $T_7$(39.53).

In 'gibberellins' cause a shift towards maleness at higher concentration (>60ppm) and femaleness at lower concentration (5,10,15) and treatments with growth

retardants, which interfere with gibberellins biosynthesis or action, also induce a shift towards 'femaleness' in cucurbits (Rudich *et al*. 1969). In treatment GA3 60ppm by (Chaurasiya *et al*. 2016) [4], recorded minimum number of days to male flower emergence in muskmelon which showed similar results even after spraying with ethrel at different concentrations.

**Days to emergence of 1st female**

Application of growth regulator i.e, $T_8$ (Ethrel 150ppm) recorded significantly the least number of days to 1st female flower emergence (37.43) followed by $T_5$ (38.00), $T_4$ (38.8), $T_2$ (38.8), $T_7$ (38.86) $T_1$ (39.2) which are statistically at par value with $T_8$. while the maximum no of days was taken by $T_7$ (42.13).

The results are conformity with the findings of (Daryono *et al*. 2018) where, he concludes that ethepon treatment affected the formation of watermelon flower by decreasing the number of days to female or hermaphrodite flower induction, especially in the concentration of 75 ppm and 100 ppm. Whereas, Ethrel 150ppm have reduced the days to first pistillate flowers in muskmelon. Similar, findings as seen in cucumber by (Singh *et al*. 1985) at different concentrations of ethrel.

**Nodes at 1st male flower emergence**

Application of growth regulator i.e, $T_2$ ($GA_3$ 60ppm + Ethrel 150ppm) recorded significantly the least no of Nodes at 1st male flower emergence (2.26) followed by $T_1$ (2.46), $T_3$ (2.53), $T_6$ (2.60), $T_4$ (2.66), $T_5$ (2.80), $T_9$ (3.00), T7 (3.26) which are statistically at par value with $T_2$.while the highest node no as recorded in $T_0$ (4.20).

The 'gibberellins' cause a shift towards maleness at higher concentration (>60ppm) and femaleness at lower concentration (5, 10, 15) and treatments with growth retardants, which interfere with gibberellins biosynthesis or action, also induce a shift towards 'femaleness' in cucurbits (Rudich *et al*. 1969). In treatment $GA_3$ 60ppm by (Chaurasiya *et al*. 2016) [4], recorded lower node to first male flower emergence in muskmelon which showed similar results even after spraying with ethrel concentrations at different concentrations. Similar findings where also observed by Thappa *et al*. 2011, Vadigeri *et al*. 2001 [18], in cucumber and Koung *et al*. 2003 in winter squash.

**Nodes at 1st female flower emergence**

Application of growth regulator i.e, $T_8$ (Ethrel 150ppm) recorded significantly the least no of Nodes to 1st female flower emergence (4.66) while the highest node no of nodes to first female flower emergence was recorded in $T_0$ (6.33) in control.

The results are conformity with the findings of (Rudich *et al*. 1969). Where Ethrel 100 ppm have reported least node no to first pistillate flowers in muskmelon. Similar, findings are seen in cucumber (Singh N, 1985) at 200ppm of ethrel and snake gourd (Kohinoor *et al*. 2005) at ethrel 150 ppm.

**No of male flowers**

Application of growth regulator i.e, $T_8$ (Ethrel 150ppm) recorded significantly the least no of male flowers (130.40) followed by $T_7$ (139.13), $T_9$ (141.66), $T_3$ (164.46), $T_6$ (167.86), $T_1$ (176.40), $T_5$ (182.53), $T_2$ (183.2) are statistically at par with $T_8$. while, the highest number of male flowers was recorded in $T_6$ (253.26).

The results are conformity with the findings of (Daryono *et al*. 2018) where, he concludes that ethepon treatment affected the formation of watermelon flower by increasing the number of female or hermaphrodite flower and decreasing the number of male flowers, especially in the concentration of 75 ppm and 100 ppm. Similar, findings are seen in cucurbits by Girek *et al*. 2012, Sure *et al*. 2012 by applying ethrel. Whereas, increased male flowers was observed by applying ga3 Acharya *et al*. 2020. The ga3 can induce male flowers in plants partially or completely even in gynoecious lines concluded by Ram *et al*. 1972 in cannabis**.**

**No of female flowers**

Application of growth regulator i.e, $T_8$ (Ethrel 150ppm) recorded significantly the best treatment in terms of highest number of female flowers (16.53). While, the least number of female flowers was recorded in $T_0$ (4.13).

The results are conformity with the findings of (Chaurasiya *et al*. 2016) [4]. Where Ethrel 150 ppm have reported more number of female flowers in muskmelon. Similar, findings are seen in cucumber by (Singh *et al*. 1985) at different ethrel concentrations. Similar, findings was observed by Sinojiya *et al*. 2015, Pandey *et al*. 2020, Daryono *et al*. 2018.

**Sex ratio**

Application of growth regulator i.e, $T_8$ (Ethrel 150ppm) recorded significantly the least sex ratio (7.89) followed by $T_9$ and $T_7$ with 12.61 and 14.05 respectively which are ststistically at par with $T_8$. while, the highest sex ratio was recorded in the treatment $T_4$ (53.22).

The results are conformity with the findings of (Garg *et al*. 2020).Where Ethrel 150ppm have reported best male to female sex ratio in cucumber. Similar, findings are seen in bottle gourd by (Ansari *et al*. 2018). Similar, findings was observed by Singh *et al*. 1985, Pandey *et al*. 2020.

**Table 2:** Effect of GA3 and Ethrel on Growth and yield parameters of muskmelon

| Treatments | Average number of fruits per plant | Average fruit weight (kg) | Average fruit yield (Kg/plant) | Average fruit diameter (cm) | Average fruit length (cm) | Average fruit yield (t/ha) | Internode length (cm) | Vine length (M) |
|---|---|---|---|---|---|---|---|---|
| $T_0$ | 2.33 | 0.49 | 1.25 | 10.01 | 9.03 | 13.29 | 9.31 | 1.22 |
| $T_1$ | 2.86 | 0.55 | 1.82 | 9.80 | 10.53 | 19.28 | 9.81 | 1.34 |
| $T_2$ | 3.26 | 0.61 | 2.60 | 11.64 | 10.93 | 27.61 | 10.72 | 1.44 |
| $T_3$ | 2.83 | 0.53 | 1.78 | 11.57 | 10.38 | 18.85 | 9.78 | 1.34 |
| $T_4$ | 2.70 | 0.52 | 1.31 | 10.53 | 10.20 | 13.96 | 9.28 | 1.34 |
| $T_5$ | 2.66 | 0.52 | 1.76 | 11.13 | 10.16 | 18.66 | 9.21 | 1.29 |
| $T_6$ | 2.66 | 0.54 | 1.75 | 11.54 | 9.87 | 18.58 | 9.36 | 1.32 |
| $T_7$ | 3.03 | 0.47 | 1.56 | 10.17 | 9.46 | 16.62 | 9.16 | 1.11 |
| $T_8$ | 3.90 | 0.46 | 2.53 | 10.28 | 9.39 | 26.88 | 9.24 | 1.20 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| $T_9$ | 3.06 | 0.49 | 1.58 | 10.30 | 9.58 | 16.74 | 9.32 | 1.11 |
| F-Test | S | S | S | S | S | S | S | S |
| S.Ed(±) | 0.38 | 0.04 | 0.34 | 0.42 | 0.52 | 3.59 | 0.36 | 0.06 |
| C.D at 5% | 0.79 | 0.08 | 0.71 | 0.88 | 1.08 | 7.54 | 0.75 | 0.13 |
| C.V. | 15.75 | 9.05 | 23.08 | 4.82 | 6.35 | 23.08 | 4.58 | 5.86 |

**Average number of fruits per plant**

Application of growth regulator i.e, $T_8$ (Ethrel 150ppm) recorded significantly the highest average number of fruits per plant (3.90). While, the least number of fruits was recorded in $T_0$ (2.33).

The results are conformity with the findings of (Manish Kumar *et al*. 2020) Where, Ethrel 300ppm have reported most number of fruits per plant in bottlegourd. Similar, findings are seen in observed by Singh *et al*. 1985, Chaurasiya *et al*. 2016 [4] by applying ethrel.

**Average fruit weight (kg)**

Application of growth regulator i.e, $T_2$(GA3 60ppm + Ethrel 150ppm) recorded significantly the highest average fruit weight (0.61) followed by $T_1$ (0.55), $T_6$ (0.54), $T_3$ (0.53) which are statistically at par with $T_2$. while, the least average fruit weight was recorded in $T_8$(0.46).

The results are conformity with the findings of treatment $GA_3$ 60ppm by (Chaurasiya *et al*. 2016) [4], recorded highest average fruit weight in muskmelon. Which, showed similar results even after spraying with ethrel concentrations at different concentrations in my experiment. Similar, findings are seen in cucumber by Rahman *et al*. 2020, Kohinoor *et al*. 2005 in snake gourd.

**Average fruit yield (Kg/plant)**

Application of growth regulator i.e, $T_2$ (GA3 60ppm + Ethrel 150ppm) recorded significantly the highest average fruit yield (2.60) followed by $T_8$ (2.53) which is statistically at par with $T_2$ respectively. While, the least average fruit yield was recorded in $T_0$ (1.25). The results shows that highest yield per plant was observed in $T_2$ which shows that this combination has proven to be elite combination when compared to the other treatments.

The results are conformity with the findings of treatment $GA_3$ 60ppm by (Chaurasiya *et al*. 2016) [4], recorded highest average fruit yield in muskmelon. Which, showed similar results even after spraying with ethrel concentrations at different concentrations in my experiment. Similar, findings are seen in cucumber by (Rahman *et al*. 2020), (Mamun *et al*. 1990) and (Moneruzzaman *et al*. 2011) in wax apple.

**Average fruit diameter (cm)**

Application of growth regulator i.e, $T_2$ (GA3 60ppm + Ethrel 150ppm) recorded significantly the highest average fruit length (11.64) followed by $T_3$ (11.57), $T_6$ (11.54), $T_5$ (11.13) which are statistically at par with $T_2$ respectively. while, the least average fruit diameter was recorded in $T_1$ (9.80).

The results are conformity with the findings of **(**Mamun *et al*. 1990) in cucumber variety UPL-CU-1731 in terms of highest average fruit diameter. Similar effect was observed by (Moneruzzaman *et al*. 2011) in wax apple.

**Average fruit length (cm)**

Application of growth regulator i.e, $T_2$ (GA3 60ppm + Ethrel 150ppm) recorded significantly the highest average fruit length (10.93) followed by $T_1$ (10.53), $T_3$ (10.38) $T_4$ (10.20), $T_5$ (10.16) which are statistically at par with $T_2$ respectively. While, the least average fruit length was recorded in $T_0$ (9.03). The results are conformity with the findings of (Mamun *et al*. 1990) in cucumber variety UPL-CU-1731 in terms of highest average fruit length. similar effect was observed by (Moneruzzaman *et al*. 2011) in wax apple.

**Average fruit yield (t/ha)**

Application of growth regulator i.e, $T_2$ (GA3 60ppm + Ethrel 150ppm) recorded significantly the highest average fruit yield per hectare (27.61) followed by $T_8$ (26.88) which are statistically at par with $T_2$ respectively. Where, the least average fruit yield per hectare was recorded in $T_0$ (13.29). The results shows that highest yield in tonnes per hectare was observed in $T_2$ which shows that this combination has proven to be elite combination when compared to the other treatments.

The results are conformity with the findings of (Rahman *et al*. 2020), recorded highest fruit yield in cucumber. Which, showed similar results even after spraying with ethrel concentrations at different concentrations in my experiment. Similar, findings are seen in cucumber by (Mamun *et al*. 1990) and (Moneruzzaman *et al*. 2011) in wax apple.

**Internode length (cm)**

Application of growth regulator i.e, $T_2$ ($GA_3$ 60ppm + Ethrel 150ppm) recorded significantly the highest Internode length (10.72). While, the least internode length was recorded in $T_7$(9.16) followed by $T_8$ and $T_6$ with 9.21 and 9.24. The results shows that the combinations with ga3 shows higher internode length when compared to the ethrel alone.

$GA_3$ is involved in both cell division and cell elongation (Jones *et al*. 1979). Similarly, it can stimulate plant tissue results in enhanced vegetative growth in treatment $GA_3$ 60ppm by (Chaurasiya *et al*. 2016) [4]. Where as in this experiment it is applied with ethrel at 100,150,200 ppm concentrations in combination. In which the ethrel concentration at 150 ppm as found to be best combination in terms of internode length. Similar findings was observed by Khan *et al*. 2006, Dicks *et al*. 1979 in cucumber.

**Vine Length (M)**

Application of growth regulator i.e, $T_2$ (GA3 60ppm + Ethrel 150ppm) recorded significantly the highest vinelength (1.44) followed by $T_1$ (1.34), $T_3$ (1.34), $T_4$ (1.34), $T_6$ (1.32) are statistically at par with $T_2$. while, the least vinelength was recorded in $T_7$ and $T_9$ with (1.11) respectively. The results shows that the combinations with ga3 shows higher vinelength when compared to the ethrel alone.

$GA_3$ is involved in both cell division and cell elongation (Jones *et al*. 1979). similarly, it can stimulate plant tissue results in enhanced vegetative growth in treatment. The results are confimity with $GA_3$ 75 ppm (Devi *et al*. 2015) in muskmelon. Where as in this experiment it is applied with ethrel at 100,150,200 ppm concentrations. In which the ethrel concentration at 150 ppm as found to be best combination in

terms of vine length. Similar findings was observed by Hilli *et al*. 2010, Chaurasiya *et al*. 2016 [4], Garg *et al*. 2020.

**Economics**

In terms of economics and benefit cost ratio all the treatments are economically feasible i.e., all the treatments are BCR ratio is greater than 1. The results showed that $T_2$ (GA3 60ppm + Ethrel 150ppm) have recorded significantly the highest benefit cost ratio (2.51:1) and lowest benefit cost ratio was recorded in $T_0$ (1.24:1).

**Conclusion**

The results from the present investigation concluded that $T_2$($GA_3$60ppm+Ethrel150ppm) performs the best in the following parameters days to 1st true leaf emergence (21.53),days to 2nd true leaf emergence (25.33), days to 1st male flower emergence (34.8), average fruit weight (0.61),average fruit length (10.93), average fruit diameter (11.64), average fruit yield per plant (2.60) average fruit yield per hectare (27.61tn/ha), internode length (10.72),average vine length (1.44), nodes at 1st male flower emergence (2.26), no of leaves (82.20), B:C ratio (2.51: 1).from the above data it shows that, $T_2$ proves to be more efficient based on the above data and economical feasible as it consists of highest benefit cost ratio and followed by $T_8$(Ethrel 150ppm) have performed best in the following parameters sex ratio (M:F) - (7.89:1), TSS (11.75° brix),no of female flowers (16.53), average number of fruits per plant (3.90), days to emergence of 1st female (37.43), nodes at 1st female flower emergence (4.66), least no of male flowers (130.4).

**References**


1. Arabsalmani K, Jalali AH, Hasanpour J. Control of sex expression in Cantaloupe (*Cucumis melo* L.) by ethephon application at different growth stages. International Journal of Agricultural Science. 2012;2(7):605-612.
2. Arora SK, Pantida ML, Dahiya MS. Effect of plant growth regulators on vegetative growth, flowering and yield of ridge gourd (*Luffa acutangula* Roxb.) Haryana Agricultural University Journal of Research. 1987;17(4):319-324.
3. Asrey R, Singh GN, Shukla HS, Singh R. Effect of seed soaking with Gibberellic acid on growth and fruiting of muskmelon (*Cucumis melo* L.). Haryana Journal of Horticulture Science. 2001;30(3-4):277-278.
4. Chaurasiya J, Verma RB, Ahmad M, Adarsh A, Kumar R, Pratap T. Influence of plant growth regulators on growth, sex expression, yield and quality of muskmelon (*Cucumis melo* L.) Ecology Environment & Conservation. 2016;22:S39-S43.
5. Chaurasiya, Verma RB, Mukhtar Ahmad, Adarsh A, Rajesh Kumar, Tej Pratap. Influence of plant growth regulators on growth, sex expression, yield and quality of Muskmelon (*Cucumis melo* L.) Ecology, Environment and Conservation Paper. 2015;22:39-43.
6. Choudhury B, Babel YS. Studies on sex expression, sex ratio and fruit set as affected by different plant regulator sprays in (*Lagenaria siceraria* (Molina) Standl). Horticulture Science. 1969;1:61-71.
7. Dalai S, Singh MK, Singh KV, Kumar M, Malik S, Kumar V. Effect of foliar application of GA3 and NAA on growth, flowering, yield and yield attributes of cucumber (*Cucumis sativus* L.). Annals of Horticulture. 2015;8(2):181-194.
8. Georgia Ouzounidou, Parthena Papadopoulouanastasia, Giannakoula, IliasIlias. Plant growth regulators treatments modulate growth, physiology and quality characteristics of *Cucumis melo* L. plants. Pakistan Journal of Botany. 2008;40(3):1185-1193.
9. Hadvani VG. Effect of plant growth regulators on growth, flowering, yield and quality of muskmelon (*Cucumis melo* Linn.) cv. Rasmadhuri. Thesis M.Sc (Hort.) Junagadh Agricultural University, 2010.
10. Hossain D, Karim MA, Pramanik MHR, Rahman AAMS. Effect of gibberellic acid ($GA_3$) on flowering and fruit development of bittergourd (*Momordica charantia* L.) International Journal of Botany. 2006;2(3):329-332.
11. Krishnamoorthy HN, Sandooja JK. Effect of ethrel and gibberellic acid ongrowth, flowering and sex expression of (*Curcurbita pepo* L.) Haryana journal of horticultural sciences. 1981;10(3-4):249-252.
12. Manzano S, Martinez C, Kraakman P, Jamilena M. Use of ethylene production as a marker for the selection of gynoecy in unclon (*Cucumis melo*). Inpitrat M (ed) Proceeding of the IXth EUCARPIA meeting on genetics and breeding of cucurbitaceae. INRA, Avignon, 2008, 557-561.
13. Randhawa KS, Singh K. Modification of sex expression and sex ratio in muskmelon (*cucumis melo* L.) by different plant growth substances. Plant sciences. 1970;1:69-76.
14. Saimbhi MS, Chadha ML. The response of three musk-melon (*Cucumis melo* L.) varieties differing in sex form and their F1-hybrids to foliar sprays of 2-chloroethylphosphonic acid (ethrel). Indian Journal of Horticulture. 1974;31(4):360-363.
15. Shinde HJ, Desai UT, Masalkar SD, Choudhari SM. Effect of plant growth regulators to control vine length in watermelon. J Maharashtra Agric. Univ. 1994;19(1):150-151.
16. Stankovic L, Susic Z, Surlan G, Momirovic. Muskmelon sex expression modified by ethrel. Contemporary Agriculture. 2001;50:269-272.
17. Taiz L, Zeiger E. Plant physiology: Mineral nutrition. The Benjamin Cummings Publishing Co., Inc. Redwood City, 1991, 100-119.
18. Vadigeri BG, Madalgeri BB, Sheelavantar MN. Effect of Ethrel and Gibberellic acid on yield and quality of two cucumber varieties. Karnataka J Agric. Sci. 2001;14(3):727-730.
19. Vidhi J. Muskmelon: Origin, Production and Varieties India at BiologyDiscussion.com, 2016.
20. Wang A. Requirement of Hos2 histone deacetylase for gene activity in yeast. Science. 2002;298(5597):1412-4.
21. Whitaker TW, Davis GN. Cucurbits, Leonard Hill and International Science Publishing Corporation. 1962;45:57-67.
22. Yamasaki S, Fujii N, Takahashi H. Hormonal regulation of sex expression in plants. Vitamins and Hormones. 2005;72:79-110.
23. Yaxley JR, Ross JJ, Sherriff LJ, Reid JB. Gibberellin biosynthesis mutations and root development in pea. Plant Physiol. 2001;125:627-633.