International Journal of Advanced Biochemistry Research 2025; SP-9(9): 1778-1781

International Journal of Advanced Biochemistry Research

ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2025): 5.29
IJABR 2025; SP-9(9): 1778-1781
www.biochemjournal.com
Received: 15-06-2025
Accepted: 19-07-2025

Sneha Sahu
M.Sc. Scholar, Department of Vegetable Science, College of Horticulture and Research Station, MGUVV, Durg, Chhattisgarh, India

Anita Kerketta
Assistant Professor, Department of Vegetable Science, College of Horticulture and Research Station, MGUVV, Durg, Chhattisgarh, India

Amit Dixit
Professor, Department of Vegetable Science, College of Horticulture and Research Station, MGUVV, Durg, Chhattisgarh, India

Bharti Sao
Assistant Professor, Department of Floriculture and Landscaping, College of Horticulture and Research Station, MGUVV, Durg, Chhattisgarh, India

Muskan Mehara
M.Sc. Scholar, Department of Vegetable Science, College of Horticulture and Research Station, MGUVV, Durg, Chhattisgarh, India

Ritu Chandrawanshi
M.Sc. Scholar, Department of Vegetable Science, College of Horticulture and Research Station, MGUVV, Durg, Chhattisgarh, India

Corresponding Author:
Sneha Sahu
M.Sc. Scholar, Department of Vegetable Science, College of Horticulture and Research Station, MGUVV, Durg, Chhattisgarh, India

Influence of different plant growth regulator on yield attributes of pumpkin (*Cucurbita moschata*)

Sneha Sahu, Anita Kerketta, Amit Dixit, Bharti Sao, Muskan Mehara and Ritu Chandrawanshi

DOI: https://www.doi.org/10.33545/26174693.2025.v9.i9Sw.5778

Abstract
A field experiment was conducted during the summer season of 2024–25 at the Instructional Farm, Khudmudi, College of Horticulture and Research Station, Mahatma Gandhi University of Horticulture & Forestry, Durg (C.G.), to evaluate the "Influence of Different Plant Growth Regulators on Yield Attributes of Pumpkin (*Cucurbita moschata*)"**.** The experiment was laid out in a Randomized Block Design (RBD) with ten treatments and three replications. Treatments comprised different concentrations of plant growth regulators, namely NAA (50, 75, and 100 ppm), GA_3 (25, 50, and 100 ppm), and Ethrel (100, 150, and 200 ppm), along with a control treatment. The study revealed that application of plant growth regulators had a significant influence on yield and economic parameters of pumpkin. Among the treatments, foliar application of Ethrel at 200 ppm proved most effective, recording the maximum number of fruits per plant (3.25), highest average fruit weight (2.80 kg), maximum fruit yield per plant (8.97 kg), fruit yield per plot (53.80 kg), and total yield (314.61 q/ha). This treatment also recorded the highest economic return with a maximum net profit (Rs. 1,92,418.00) and benefit-cost (B:C) ratio (3.24). These findings indicate that the use of plant growth regulators particularly Ethrel at 200 ppm plays a crucial role in improving both the productivity and economic viability of pumpkin cultivation.

Keywords: Pumpkin, growth regulator, NAA, GA_3, ethrel, yield

Introduction
Pumpkin belongs to the family Cucurbitaceae and is a monoecious plant, bearing both male and female flowers on the same plant. The species is an allopolyploid with a chromosome number of 2x = 40. Typically, male flowers are produced first on the axils of the nodes, followed by the emergence of female flowers after several successive stages of male flower production. Pumpkin is consumed in multiple forms—fresh as a vegetable, as processed food, and as livestock feed. Interestingly, pumpkin flowers are reported to be more nutritious than the fruits themselves. The young leaves, flowers, and fruits are rich sources of carotene, a precursor of vitamin A (USDA, 2022). Additionally, pumpkins have medicinal potential, with reported use in reducing tapeworm infection and as a diuretic, though these properties remain underexplored on a larger scale.

Plant growth regulators (PGRs) play a crucial role in influencing flowering behavior, improving fruit set, and ultimately enhancing crop yield (Bose *et al.*, 1999) [17]. Naphthalene Acetic Acid (NAA), a growth promoter, stimulates cell division, shoot elongation, photosynthesis, and RNA synthesis. It also enhances leaf area index and chlorophyll content, thereby improving photosynthetic efficiency (Kore *et al.*, 2003) [9]. Gibberellic acid (GA_3) promotes cell division, cell wall elongation, and increases cell wall plasticity and membrane permeability. It induces parthenocarpy and modifies yield-contributing traits, ultimately improving crop productivity (Deepanshu and Singh, 2017) [6]. Ethrel is another important PGR, widely used to increase the proportion of female flowers by promoting gynoecium development, enhancing fruit ripening, and inducing stress responses that encourage lateral cell expansion (Taiz and Zeiger, 2002) [16]. Additionally, it stimulates flower opening, adventitious root formation, senescence, branching, and activates respiratory enzymes. Considering the above, the present experiment was undertaken to study the effect of different plant growth regulators (NAA, GA_3, and Ethrel) on the growth and yield of pumpkin, and to determine the most suitable concentration along with its economic feasibility.

Materials and Methods

The experiment was conducted during the summer season of 2024–25 at the Instructional Farm, Khudmudi, College of Horticulture and Research Station, Sankara, Patan, Mahatma Gandhi University of Horticulture & Forestry, Durg (C.G.).

The soil of the experimental field was sandy loam, neutral in reaction, with a pH of 6.6. Pits measuring 30 × 30 × 30 cm^3 were prepared and a basal dose of 20 t/ha of farmyard manure (FYM) was applied. Recommended doses of nitrogen, phosphorus, and potassium (100:60:60 kg/ha, respectively) were also incorporated prior to sowing. The experiment was laid out in a Randomized Block Design (RBD) with three replications and ten treatments, including one control, three levels of NAA (50, 75, and 100 ppm), three levels of GA_3 (25, 50, and 100 ppm), and three levels of Ethrel (100, 150, and 200 ppm). Each plot measured 5.7 m × 3.0 m with a spacing of 3.0 m × 0.9 m between row and plants. Observations were recorded for yield attributes including average fruit weight (kg), number of fruits per vine, fruit yield per plant (kg), and total fruit yield per hectare (t/ha). Economic parameters were also computed. The data were subjected to statistical analysis of variance (ANOVA) as per the method described for RBD, and treatment means were compared using the F-test at a 5% level of significance.

Results and Discussion

Vine length (m)

Close examination of table 1 revealed that the maximum vine length (5.85 m) was observed with the foliar spray of GA_3 at 100 ppm (T_6), while the minimum vine length (2.76 m) was recorded with control (T_0). However, treatments NAA 100 ppm (T_3) (5.24) was found statistically at par with GA_3 100 ppm (T_6). Gibberellins are known to promote stem elongation, which may be attributed to the role of GA_3 in stimulating cell enlargement and internodal elongation, as well as enhancing RNA and protein synthesis, thereby contributing to increased growth and overall plant development. These results are in close agreement with the findings of Ansari and Chowdhary (2018) [2] and Kumari *et al.* (2019) [10] in bottle gourd.

Number of fruits per plant

Close examination of table 1 revealed that the maximum number of fruits per vine (3.25) was recorded under treatment T_9 (Ethrel @ 200 ppm), which was significantly superior to all other treatments. This was statistically at par with T_8 (Ethrel @ 150 ppm) with 3.22 fruits per vine, T_7 (Ethrel @ 100 ppm) with 3.18, T_1 (NAA @ 50 ppm) with 3.11, and T_4 (GA_3 @ 25 ppm) with 3.06 fruits per vine. The minimum number of fruits per vine (2.74) was observed in the control treatment (T_0).The increase in number of fruits per vine under Ethrel treatments may be attributed to its ability to suppress male flower production, promote the development of female flowers, and enhance fruit set percentage, thereby increasing the total number of fruits per vine. These findings are in close agreement with the results reported by Mehdi *et al.* (2012) [13] and Nayak *et al.* (2018) [14] in cucumber.

Average weight of fruits (kg)

Close examination of table 1 revealed that the highest average fruit weight (2.80 kg) was recorded under treatment T_9 (Ethrel @ 200 ppm). This treatment was significantly superior but statistically at par with T_8 (Ethrel @ 150 ppm) and T_7 (Ethrel @ 100 ppm), which recorded 2.69 kg and 2.56 kg, respectively. The lowest fruit weight (1.56 kg) was observed in the control treatment (T_0). The increase in fruit weight due to Ethrel application may be attributed to the plants remaining physiologically active for a longer period, leading to enhanced synthesis and translocation of photosynthates towards developing flowers and fruits. These findings are consistent with the results reported by Gosai *et al.* (2020) [7] in cucumber (*Cucumis sativus*).

Fruit yield per plant (kg)

The data on fruit yield per plant presented in table 1 revealed that the maximum fruit yield (8.97 kg) was recorded under treatment T_9 (Ethrel @ 200 ppm), which was significantly superior but statistically at par with T_8 (Ethrel @ 150 ppm), recording 8.61 kg. The minimum fruit yield (4.23 kg) was observed in the control treatment (T_0). The higher yield obtained with Ethrel application may be attributed to an enhanced rate of photosynthetic activity, accelerated translocation, and efficient utilization of photosynthates, leading to better fruit development (Das and Das, 1996) [5]. These findings are in close agreement with those of Ansari and Chaudhary (2018) [2] in bottle gourd and Jyoti *et al.* (2016) [8] in ridge gourd.

Fruit yield per plot (kg)

The data on fruit yield per plot, as presented in table 1 revealed that the maximum fruit yield (53.80 kg) was recorded under treatment T_9 (Ethrel @ 200 ppm). This treatment was significantly superior but statistically at par with T_8 (Ethrel @ 150 ppm) and T_7 (Ethrel @ 100 ppm), which recorded 51.64 kg and 48.52 kg, respectively. The minimum fruit yield per plot (25.41 kg) was observed in the control treatment (T_0). These findings are in close agreement with the results reported by Ansari and Chaudhary (2018) [2] and Kumari *et al.* (2019) [10] in bottle gourd, who also observed enhanced yield with the application of plant growth regulators.

Fruit yield per hectare (q/ha)

The data on fruit yield per hectare, as presented in table 1 revealed that the maximum fruit yield (314.61 q/ha) was recorded under treatment T_9 (Ethrel @ 200 ppm). This treatment was significantly superior but statistically at par with T_8 (Ethrel @ 150 ppm), which recorded 301.98 q/ha. The minimum fruit yield (148.59 q/ha) was observed in the control treatment (T_0). The higher yield under Ethrel treatment may be attributed to increased fruit set percentage, fruit weight, fruit length, and fruit diameter, which collectively contributed to the maximum yield. These findings are in agreement with previous reported by Chaurasiya *et al.* (2016) [4] in muskmelon, Jyoti *et al.* (2016) [8] in ridge gourd, Nayak *et al.* (2018) [14] in cucumber, Ansari and Chaudhary (2018) [2] and Kumari *et al.* (2019) [10] in bottle gourd

Economic Parameter

The influence of plant growth regulators on economic parameters, including net return and benefit-cost (B:C) ratio, is presented in Table 2. The maximum gross return (Rs. 2,51,688.00), net return (Rs. 1,92,418.00), and B:C ratio (3.24) were recorded under treatment T_9 (Ethrel @ 200 ppm). In contrast, the minimum gross return (Rs 1,18,872.00), net return (Rs. 60,842.00), and B:C ratio (1.04) were observed in the control treatment (T_0).

Table 1: Effect of plant growth regulator on yield traits of Pumpkin (*Cucurbita moschata*)

Treatments notation	Treatment details	Vine Length (m)	No. of fruits / plant	Average weight of fruits (kg)	Yield per plant (kg)	Yield per plot (kg)	Yield per hectare (q)
T_0	Control	2.76	2.74	1.56	4.23	25.41	148.59
T_1	NAA @ 50ppm	4.24	3.11	2.43	7.49	44.91	262.63
T_2	NAA @ 75ppm	4.67	3.01	2.14	6.40	38.5	225.14
T_3	NAA @ 100ppm	5.24	2.95	1.87	5.47	32.79	191.75
T_4	GA_3 @ 25ppm	3.68	3.06	2.30	6.98	41.85	244.73
T_5	GA_3 @ 50ppm	4.93	2.98	2.00	5.90	35.2	205.84
T_6	GA_3 @ 100ppm	5.85	2.80	1.74	4.82	28.89	168.94
T_7	Ethrel @ 100ppm	2.92	3.18	2.56	8.09	48.52	283.74
T_8	Ethrel @ 150ppm	3.17	3.22	2.69	8.61	51.64	301.98
T_9	Ethrel @ 200ppm	3.86	3.25	2.80	8.97	53.80	314.61
S.E(m)±		0.23	0.07	0.08	0.21	1.86	8.58
C.D. at 5%		0.71	0.21	0.26	0.63	5.52	25.50

Table 2: Effect of plant growth regulator on economic parameter of Pumpkin (*Cucurbita moschata*)

Treatment notation	Treatment details	Total cost of Cultivation (Rs./ha)	Gross return (Rs./ha)	Net return (Rs./ha)	B: C ratio
T_0	Control	58030.00	118872.00	60842.00	1.04
T_1	NAA @ 50ppm	58275.00	210104.00	151829.00	2.60
T_2	NAA @ 75ppm	58397.50	180112.00	121714.5	2.08
T_3	NAA @ 100ppm	58520.00	153400.00	94880.00	1.62
T_4	GA_3 @ 25ppm	58767.50	195784.00	137016.50	2.33
T_5	GA_3 @ 50ppm	59505.00	164672.00	105167.00	1.76
T_6	GA_3 @ 100ppm	60980.00	135152.00	74172.00	1.21
T_7	Ethrel @ 100ppm	58650.00	226992.00	168342.00	2.87
T_8	Ethrel @ 150ppm	58960.00	241584.00	182624.00	3.09
T_9	Ethrel @ 200ppm	59270.00	251688.00	192418.00	3.24

Conclusion

Based on the findings, it is concluded that treatment T_6 (GA_3 @ 100 ppm) resulted in the maximum vine length (5.85 m), whereas treatment T_9 (Ethrel @ 200 ppm) recorded the highest yield (314.61 q/ha), maximum net return (Rs. 192,418.00), and the highest benefit–cost ratio (3.24).

Therefore, treatment T_9 (Ethrel @ 200 ppm) may be recommended as the most effective practice for enhancing productivity, profitability, and sustainability in pumpkin cultivation."

Acknowledgement

The authors express their sincere gratitude to the Chairman, Department of Vegetable Science, the Director of Research, and the Dean, Postgraduate Studies, Mahatma Gandhi University of Horticulture & Forestry, Durg (C.G.), for providing the necessary facilities and support during the course of this investigation.

References

1. Acharya SK, Thakar C, Brahmbhatt J, Joshi N. Effect of plant growth regulators on cucurbits. J Pharmacogn Phytochem. 2020;9(4):540-544.
2. Ansari AM, Chowdhary BM. Effects of boron and plant growth regulators on bottle gourd (*Lagenaria siceraria* (Molina) Standl.). J Pharmacogn Phytochem. 2018;1965:202-6.
3. Baruah GKS, Das RK. Effect of plant growth regulators on growth, flowering and yield of bottle gourd at different sowing dates. Ann Agric Res. 1997;8(3):371-374.
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.). Ecol Environ Conserv. 2016;22(Suppl):S39-S43.
5. Das BC, Das TK. Studies on the response of GA_3, NAA and Ethrel on the vegetative growth and yield of pumpkin (*Cucurbita moschata* Poir.). Orissa J Hort. 1996;24(1-2):74-8.
6. Deepanshu PKS. Effect of plant growth regulators on quality, yield and growth of bottle gourd (*Lagenaria siceraria*). Ecol Environ Conserv. 2017;23(4):2206-9.
7. Gosai S, Adhikari S, Khanal S, Poudel PB. Effects of plant growth regulators on growth, flowering, fruiting and fruit yield of cucumber (*Cucumis sativus* L.): A review. Arch Agric Environ Sci. 2020;5(3):268-74.
8. Jyoti S, Patel NB, Patel JB. Effect of growth regulators and stages of spray on seed yield and seed quality parameters of ridge gourd [*Luffa acutangula* (Roxb.) L.]. J Appl Nat Sci. 2016;8(3):1551-4.
9. Kore VN, Khade HP, Nawale RN, Patil SRS, Mane AV. Effect of growth regulators on growth, flowering and yield of bottle gourd variety Samrat under Konkan conditions. J Soils Crops. 2013;13:18-21.
10. Kumari K, Kamalkant KR, Singh VK. Effect of plant growth regulators on growth and yield of bottle gourd (*Lagenaria siceraria* (Mol.) Standl.). Int J Curr Microbiol Appl Sci. 2019;8(7):1881-5.
11. Kumari K, Kant K, Ranjan A, Kumari S, Kumar M, Kumari K. Effect of plant growth regulators on yield and economics of bottle gourd (*Lagenaria siceraria* (Molina) Standl.). J Pharmacogn Phytochem. 2020;9(2):2068-70.
12. Mahmood T, Farooq M, Khokhar MA, Hussain SI. Plant growth regulators affecting sex expression of bottle gourd (*Lagenaria siceraria* (Molina) Standl.) plants. Pak J Agric Res. 2012;25(1):1-5.
13. Mehdi M, Ahmed N, Jabeen N, Baseerat Afroza BA. Effect of different concentration of Ethrel on growth, fruiting behavior and yield of cucumber (*Cucumis*

sativus L.) under greenhouse conditions. Asian J Hort. 2012;7(2):579-81.

14. Nayak SR, Parmar VK, Patel AN, Suchismita J, Lathiya JB, Tandel YN. Efficacy of pinching and plant growth regulators in enhancing yield characters of cucumber (*Cucumis sativus* L.). Int J Chem Stud. 2018;6(1):1804-7.
15. Sharma NK, Arora SK, Dhankhar BS. Effect of plant growth substances on growth, flowering, sex expression and fruit yield in bottle gourd (*Lagenaria siceraria* (Mol.) Standl.). Haryana J Univ Res. 1988;18(4):291-7.
16. Taiz L, Zeiger E. Photosynthesis: physiological and ecological considerations. Plant Physiol. 2002;9:172-174.
17. Bose TK, Som MG, Kabir J. Flowering, sex mechanism, pollination and fruit set in vegetable crops. Calcutta: Naya Prokash; 1999. p. 53-54.