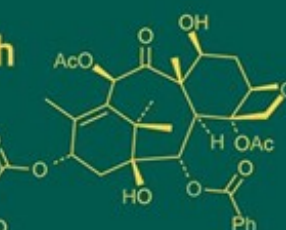


International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2026): 5.29
Indexing: Embase
IJABR 2026; SP-10(10): 718-722
www.biochemjournal.com
Received: 18-08-2026
Accepted: 26-09-2026
Published: 08-10-2026

The names and affiliations of all authors are provided below, following the references.

Effect of PGR combinations on yield, quality, and economics of pomegranate (*Punica granatum* L.) cv. Bhagwa

Maneesh¹, Hirdesh Kumar², Jay Prakash Thakur³, Sachin Kumar⁴, Mandavi Shrivastava⁵, Arun Sahu⁶, Arun Sahu⁶, Aditya Kaurav⁷

DOI: <https://www.doi.org/10.33545/26174693.2026.v10.i10Si.10368>

ABSTRACT

The experiment was conducted at the Vikrant Agriculture Research and Development Centre, Sakatpura, Vikrant University, Gwalior (Madhya Pradesh) during the study period 2024-25. Aimed to assess the effect of PGR combination on yield, quality and economics of pomegranate. The treatment comprising eight treatments in randomized block design with three replications. Viz., The treatment comprising ten treatments with thrice replication. T₁- Water spray (Control), T₂- GA₃ (25 ppm), T₃- NAA (20 ppm), T₄- GA₃ (25 ppm) + NAA (20 ppm), T₅- GA₃ (50 ppm), T₆- NAA (40 ppm), T₇- GA₃ (50 ppm) + NAA (40 ppm), T₈- GA₃ (75 ppm), T₉- NAA (60 ppm) and T₁₀- GA₃ (75 ppm) + NAA (60 ppm). The result revealed that Yield parameters viz., number of flowers per plant (180.07), fruit set (52.66%), fruit length (8.67 cm), fruit width (8.95 cm), number of fruits per plant (49.43), fruit weight (224.84 g), yield per plant (11.11 kg) and yield (185.09 q/ha) were highest recorded under treatment T₁₀ [GA₃ (75 ppm) + NAA (60 ppm)] followed by T₇ [GA₃ (50 ppm) + NAA (40 ppm)]. Similarly quality parameters of pomegranate maximum [(viz., total soluble solids (15.27 °Brix), TSS:acid ratio (47.33), juice content (51.43%), ascorbic acid (14.88 mg/100 g) and anthocyanin content (16.47 mg/100 g)] were recorded under treatment T₁₀ [GA₃ (75 ppm) + NAA (60 ppm)], followed by T₇ [GA₃ (50 ppm) + NAA (40 ppm)]. Similarly, the minimum acidity (0.38%) was recorded under treatment T₁₀ [GA₃ (75 ppm) + NAA (60 ppm)], followed by T₇ [GA₃ (50 ppm) + NAA (40 ppm)] with 0.40% and T₄ [GA₃ (25 ppm) + NAA (20 ppm)] with 0.43% acidity. cost of cultivation, gross returns, net returns and benefit:cost ratio of pomegranate cultivation. The highest gross returns (₹277638.9/ha), net returns (₹217734.9/ha) and benefit:cost ratio (3.63) were recorded under treatment T₁₀ [GA₃ (75 ppm) + NAA (60 ppm)], followed by T₇ [GA₃ (50 ppm) + NAA (40 ppm)].

Keywords: Pomegranate, Plant Growth Regulators, Gibberellic acid, Naphthalene Acetic Acid, Fruit quality

Introduction

Pomegranate (*Punica granatum* L.) is one of the most important fruit crops of tropical and subtropical regions and belongs to the family Punicaceae. The somatic chromosome number of *Punica granatum* is $2n = 2x = 16, 18$. It is popularly referred to as the “fruit of paradise” due to its attractive appearance, pleasant flavour and high nutritional value. The crop is believed to have originated in Iran, Afghanistan and has spread widely across the Mediterranean region, Asia and other parts of the world. (Gajbhiye *et al.*, 2022; Naik, 2022) [1, 2]. Pomegranate fruits are highly valued for their nutritional richness and medicinal properties. The edible portion consists of juicy arils which are a good source of carbohydrates, organic acids, vitamins and minerals. The fruits contain appreciable amounts of sugars (12-16%), organic acids, vitamin C and bioactive compounds such as anthocyanins, tannins and polyphenols, which contribute to their antioxidant potential (Meena *et al.*, 2018) [3].

Despite its economic importance, the productivity and quality of pomegranate in many growing regions remain below their potential due to several constraints. Imbalanced and excessive use of chemical fertilizers has led to deterioration of soil health, reduced nutrient use efficiency and increased incidence of physiological disorders and pest problems. Continuous monocropping and inadequate organic matter application have resulted in declining soil fertility, poor microbial activity and reduced water-holding capacity, ultimately affecting plant growth, yield and fruit quality. Moreover, irregular flowering, heavy fruit drop and variability in fruit size and quality are common challenges faced by pomegranate growers, which directly influence marketability and profitability (Davarpanah *et al.*, 2017) [4].

Plant Growth Regulators (PGRs) have been widely studied for their influence on flowering, fruiting and fruit growth and development in different fruit crops. In pomegranate, the use of PGRs such as Gibberellic acid

Corresponding Author: Maneesh

M.Sc. Scholar, School of Agriculture Science, Vikrant University, Gwalior, MP, India

(GA₃) and Naphthalene Acetic Acid (NAA) have been reported to increase fruit size and yield through cell elongation and cell enlargement. NAA is found effective in reducing flower and fruit drop, resulting in better retention of fruits on the plant and proper hormonal regulation. The application of GA₃ and NAA improved fruit quality by increasing sugar content, juice percentage, and colour. Results from different studies demonstrated that different concentrations of GA₃ and NAA, as well as their different combinations, affected the yield and fruit quality attributes differently. However, the optimum levels of GA₃ and NAA for improved fruit yield and quality, as well as their interaction under different agro-climatic conditions, are not well established. Therefore, it is necessary to evaluate the performance of pomegranate to different concentrations and combinations of GA₃ and NAA to identify the most effective growth regulator for improved productivity. (Gajbhiye *et al.*, 2020) [5]. However, research on their combined effect in pomegranate plants remains limited. This study evaluates their impact on yield and quality and economics performance, aiming to identify the best combinations for improved propagation, plant establishment and productivity.

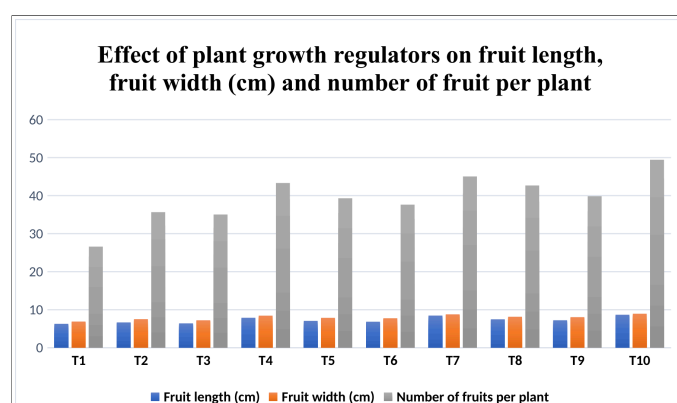
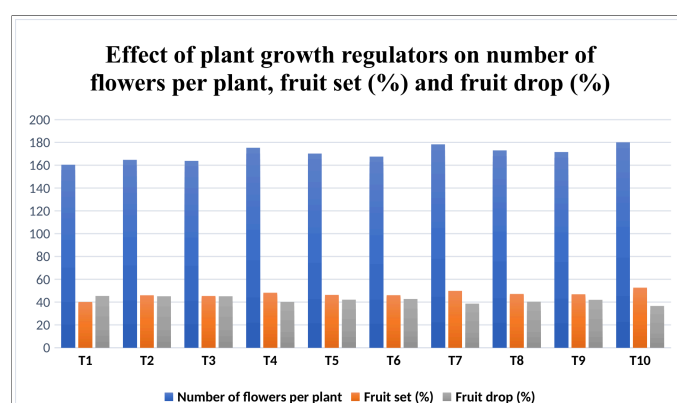
Methods and Material

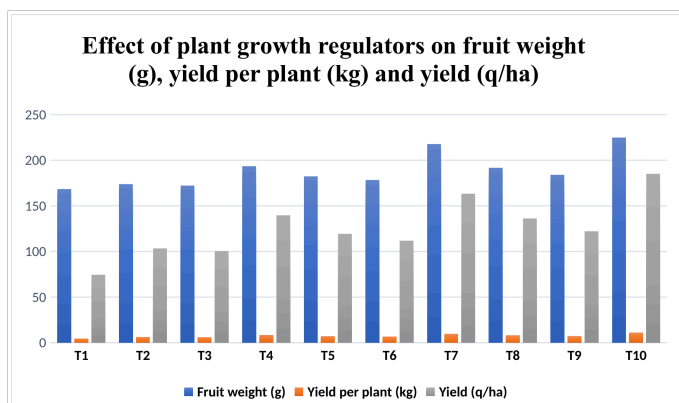
The experiment was conducted at the Vikrant Agriculture Research and Development Centre, Sakatpura, Vikrant University, Gwalior (Madhya Pradesh) during the study period 2025-26. The experimental site is located at 26°13' North latitude and 76°14' East longitude, at an altitude of 211.52 meters above mean sea level in the Gwalior district of the Gird region of northern Madhya Pradesh. The region falls under a semi-arid and sub-tropical climatic zone characterized by extreme weather conditions, including hot and dry summers and cold winters. The monsoon generally commences in the last week of June, with an average annual rainfall of 700-800 mm, most of which is received between late June and mid-December. Winter rainfall is sporadic and uncertain. During the experimental period, the maximum temperature ranged between 45-47 °C in summer, while the minimum dropped to 5.0-5.5 °C in winter. Occurrence of frost is also expected from the last week of December. Typically, the monsoon begins in the second fortnight of June and continues until September. Occasional light showers may occur during winter, with the majority of rainfall (around 700 mm) received from July to September. The treatment comprising ten treatments with thrice replication. T₁- Water spray (Control), T₂- GA₃ (25 ppm), T₃- NAA (20 ppm), T₄- GA₃ (25 ppm) + NAA (20 ppm), T₅- GA₃ (50 ppm), T₆- NAA (40 ppm), T₇- GA₃ (50 ppm) + NAA (40 ppm), T₈- GA₃ (75 ppm), T₉ - NAA (60 ppm) and T₁₀- GA₃ (75 ppm) + NAA (60 ppm). The foliar application of plant growth regulators (PGRs) was carried out as per the treatment schedule using gibberellic acid (GA₃) and naphthalene acetic acid (NAA) at different concentrations, applied alone and in combination. The required quantity of each PGR was accurately weighed and first dissolved in a small volume of suitable solvent (GA₃ in a small amount of alcohol and NAA in a few drops of NaOH), and then the volume was made up with distilled water to obtain the desired concentration (ppm). The spraying was done using a hand-operated knapsack sprayer, ensuring uniform coverage of the foliage. A small quantity of sticking agent (such as Tween-20 @ 0.1%) was added to the spray solution to enhance adhesion and absorption. Observations on yield parameters, quality and economics of pomegranate fruits under different treatments were recorded following standard procedures prescribed for each character. The experimental data were statistically analyzed using Fisher's analysis of variance (ANOVA) method as outlined by Panse and Sukhatme (1967). The significance of treatment effects was tested using 'F' and 't' tests at the 5 per cent probability level ($p = 0.05$).

Result and Discussion

Effect of PGR combination on yield parameter of pomegranate

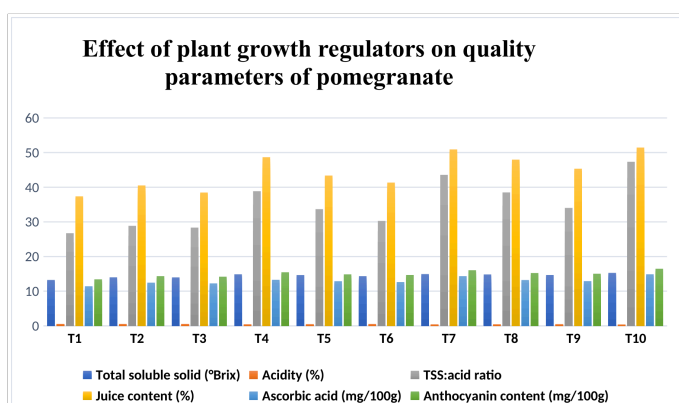
The data pertaining to yield parameter of pomegranate are presented in Table 1. The observations were statistically analysed and the results indicated a significant effect of different concentration of plant growth regulators treatments on yield parameters. Yield parameters viz., number of flowers per plant (180.07), fruit set (52.66%), fruit length (8.67 cm), fruit width (8.95 cm), number of fruits per plant (49.43), fruit weight (224.84 g), yield per plant (11.11 kg) and yield (185.09 q/ha) were highest recorded under treatment T₁₀ [GA₃ (75 ppm) + NAA (60 ppm)] followed by T₇ [GA₃ (50 ppm) + NAA (40 ppm)]. Similarly results revealed that the minimum fruit drop (36.63%) was recorded in treatment T₁₀ [GA₃ (75 ppm) + NAA (60 ppm)] which was found to be significantly superior over all other treatments. This was followed by T₇ [GA₃ (50 ppm) + NAA (40 ppm)]. It might due to the combined foliar application of GA₃ (75 ppm) + NAA (60 ppm) significantly enhanced flowering, fruit set, fruit size, fruit weight, and overall yield while reducing fruit drop in pomegranate. The improvement may be attributed to the synergistic action of GA₃, which promotes cell division, cell elongation, and assimilate translocation, and NAA, which reduces abscission by maintaining endogenous auxin levels and improving fruit retention. Consequently, better fruit retention and enhanced sink strength resulted in higher fruit number and yield. Similar findings have been reported by several researchers, who observed that the combined application of GA₃ and NAA significantly improved yield attributes and minimized fruit drop in pomegranate. Similar findings were also reported by Merwad *et al.* (2016) [6], Jhade *et al.* (2020) [7], Hussain *et al.* (2021) [8], Firoz *et al.* (2021) [9], Mishra *et al.* (2022) [10] Raigond *et al.* (2024) [11] and Moradinezhad *et al.* (2024) [12].





Effect of plant growth regulators on quality parameters of pomegranate

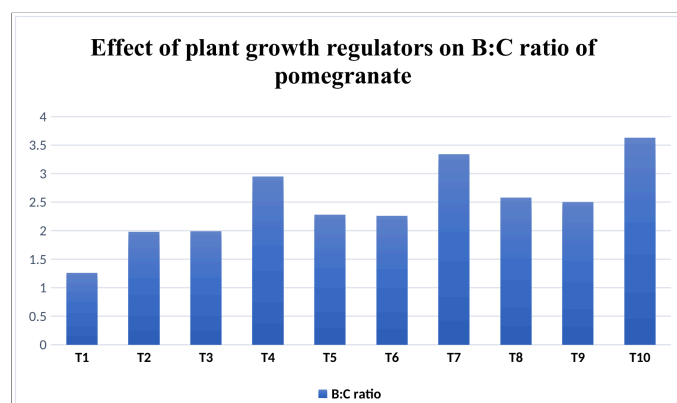
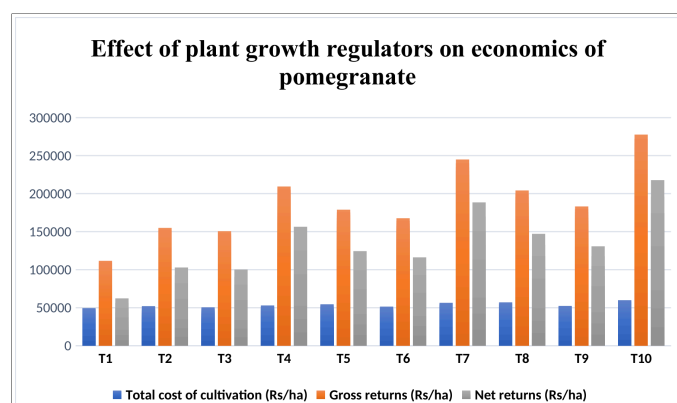
The data pertaining to quality parameter of pomegranate are presented in Table 2. The results revealed that different combination of plant growth regulator treatments significantly influenced the quality parameter of pomegranate. Maximum [(viz., total soluble solids (15.27 °Brix), TSS:acid ratio (47.33), juice content (51.43%), ascorbic acid (14.88 mg/100 g) and anthocyanin content (16.47 mg/100 g))] were recorded under treatment T₁₀ [GA₃ (75 ppm) + NAA (60 ppm)], followed by T₇ [GA₃ (50 ppm) + NAA (40 ppm)]. Similarly, the minimum acidity (0.38%) was recorded under treatment T₁₀ [GA₃ (75 ppm) + NAA (60 ppm)], followed by T₇ [GA₃ (50 ppm) + NAA (40 ppm)] with 0.40% and T₄ [GA₃ (25 ppm) + NAA (20 ppm)] with 0.43% acidity. It might due to the combined application of GA₃ (75 ppm) + NAA (60 ppm) significantly enhanced the quality parameters of pomegranate fruits such as TSS, TSS: acid ratio, juice content, ascorbic acid and anthocyanin contents and reduced the fruit acidity. The improvement in fruit quality could be due to the synergistic action of GA₃ and NAA, which increased the photosynthetic activity, carbohydrate translocation from source to sink and conversion of starch to soluble sugars, resulting in increased TSS and improved TSS:acid ratio. The reduction in titratable acidity may be due to the use of organic acids in respiration and the conversion of organic acids to sugars during fruit maturation. Similar findings were also reported by Mandal *et al.* (2012) [13], Hasani *et al.* (2012) [14], Eiada *et al.* (2013) [15], Prakash *et al.* (2014) [16], Kumar *et al.* (2015) [17], Narayanswamy *et al.* (2019) [18], Hussain *et al.* (2021) [8], Mishra *et al.* (2022) [10] and Pal *et al.* (2024) [19] in pomegranate.



Effect of plant growth regulators on economics of pomegranate

The data pertaining to economics of pomegranate are presented in Table 3. The economic analysis indicated that different plant growth regulator treatments significantly influenced the cost of cultivation,

gross returns, net returns and benefit:cost ratio of pomegranate cultivation. The highest gross returns (₹277638.9/ha), net returns (₹217734.9/ha) and benefit:cost ratio (3.63) were recorded under treatment T₁₀ [GA₃ (75 ppm) + NAA (60 ppm)], followed by T₇ [GA₃ (50 ppm) + NAA (40 ppm)] with gross returns of ₹244902.0/ha, net returns of ₹188466.0/ha and B:C ratio of 3.34. Treatment T₄ [GA₃ (25 ppm) + NAA (20 ppm)] also performed better with gross returns of ₹209416.2/ha, net returns of ₹156448.2/ha and B:C ratio of 2.95. The minimum gross returns (₹111705.0/ha), net returns (₹62205.0/ha) and B:C ratio (1.26) were observed under T₁ [Water spray (Control)]. The higher economic returns under T₁₀ may be attributed to increased fruit yield, better fruit weight and improved fruit quality parameters obtained due to the combined application of GA₃ and NAA, which ultimately enhanced marketable yield and profitability. The better performance of T₇ and T₄ might also be associated with improved flowering, fruit set and reduced fruit drop, resulting in higher economic gains. These findings are in close conformity with the reports of Digraze *et al.* (2016) [20], Narayanswamy *et al.* (2019) [18], Jhade *et al.* (2020) [7], Hussain *et al.* (2021) [8], Murthy *et al.* (2021) [21] and Mishra *et al.* (2022) [10] in pomegranate, who also observed higher profitability and economic returns with the application of plant growth regulators.



Conclusion

It can be concluded that different combination plant growth regulators, particularly treatment T₁₀ [GA₃ (75 ppm) + NAA (60 ppm)] was found to be the most effective in improving yield, quality and economic parameters of pomegranate, followed by T₇ [GA₃ (50 ppm) + NAA (40 ppm)]. Treatment T₁₀ recorded the highest gross returns (₹277638.9/ha), net returns (₹217734.9/ha) and benefit:cost ratio (3.63), whereas the control treatment T₁ [Water spray] exhibited the lowest performance for most of the observed parameters under the prevailing agro-climatic conditions.

Table 1. Effect of plant growth regulators on yield parameters of pomegranate

Treatments	Number of flowers per plant	Fruit set (%)	Fruit drop (%)	Fruit length (cm)	Fruit width (cm)	Number of fruits per plant	Fruit weight (g)	Yield per plant (kg)	Yield (q/ha)
T ₁ - Water spray (Control)	160.42	40.17	45.36	6.28	6.87	26.60	168.39	4.47	74.47
T ₂ - GA ₃ (25 ppm)	164.73	45.95	45.13	6.65	7.51	35.66	173.87	6.20	103.29
T ₃ - NAA (20 ppm)	163.85	45.38	45.08	6.41	7.22	35.03	172.15	6.03	100.46
T ₄ - GA ₃ (25 ppm) + NAA (20 ppm)	175.33	48.22	40.14	7.88	8.43	43.33	193.47	8.38	139.61
T ₅ -GA ₃ (50 ppm)	170.23	46.36	42.09	7.07	7.86	39.31	182.34	7.16	119.29
T ₆ -NAA (40 ppm)	167.55	46.03	42.75	6.83	7.74	37.63	178.35	6.71	111.79
T ₇ -GA ₃ (50 ppm) + NAA (40 ppm)	178.35	49.85	38.67	8.45	8.77	45.05	217.68	9.80	163.27
T ₈ -GA ₃ (75 ppm)	173.01	47.16	40.33	7.47	8.15	42.67	191.66	8.17	136.11
T ₉ -NAA (60 ppm)	171.57	46.87	42.02	7.23	8.04	39.85	184.06	7.33	122.12
T ₁₀ -GA ₃ (75 ppm) + NAA (60 ppm)	180.07	52.66	36.63	8.67	8.95	49.43	224.84	11.11	185.09
S.E(m)±	5.56	1.53	1.49	0.18	0.22	1.20	6.20	0.17	3.53
C.D. at 5%	15.85	4.37	4.26	0.50	0.61	3.40	17.67	0.48	11.22

Table 2. Effect of plant growth regulators on quality parameters of pomegranate

Treatments	Total soluble solid (°Brix)	Acidity (%)	TSS:acid ratio	Juice content (%)	Ascorbic acid (mg/100g)	Anthocyanin content (mg/100g)
T ₁ - Water spray (Control)	13.24	0.54	26.72	37.35	11.42	13.41
T ₂ - GA ₃ (25 ppm)	14.01	0.51	28.86	40.51	12.46	14.32
T ₃ - NAA (20 ppm)	13.97	0.52	28.34	38.47	12.24	14.17
T ₄ - GA ₃ (25 ppm) + NAA (20 ppm)	14.88	0.43	38.84	48.66	13.28	15.47
T ₅ -GA ₃ (50 ppm)	14.64	0.48	33.65	43.35	12.86	14.84
T ₆ -NAA (40 ppm)	14.34	0.5	30.27	41.33	12.64	14.68
T ₇ -GA ₃ (50 ppm) + NAA (40 ppm)	14.95	0.4	43.56	50.89	14.34	16.04
T ₈ -GA ₃ (75 ppm)	14.82	0.45	38.48	47.95	13.21	15.23
T ₉ -NAA (60 ppm)	14.67	0.47	34.02	45.32	12.89	15.03
T ₁₀ -GA ₃ (75 ppm) + NAA (60 ppm)	15.27	0.38	47.33	51.43	14.88	16.47
S.E(m)±	0.31	0.009	0.86	1.21	0.28	0.36
C.D. at 5%	0.87	0.025	2.46	3.44	0.79	1.03

Table 3. Effect of plant growth regulators on economics of pomegranate

S. No.	Treatment details	Total cost of cultivation (Rs/ha)	Gross returns (Rs/ha)	Net returns (Rs/ha)	B:C ratio
T ₁	Water spray (Control)	49500.0	111705.0	62205.0	1.26
T ₂	GA ₃ (25 ppm)	51999.0	154935.0	102936.0	1.98
T ₃	NAA (20 ppm)	50469.0	150689.7	100220.7	1.99
T ₄	GA ₃ (25 ppm) + NAA (20 ppm)	52968.0	209416.2	156448.2	2.95
T ₅	GA ₃ (50 ppm)	54498.0	178928.4	124430.4	2.28
T ₆	NAA (40 ppm)	51438.0	167682.9	116244.9	2.26
T ₇	GA ₃ (50 ppm) + NAA (40 ppm)	56436.0	244902.0	188466.0	3.34
T ₈	GA ₃ (75 ppm)	56997.0	204168.3	147171.3	2.58
T ₉	NAA (60 ppm)	52407.0	183176.7	130769.7	2.50
T ₁₀	GA ₃ (75 ppm) + NAA (60 ppm)	59904.0	277638.9	217734.9	3.63

References

- Gajbhiye BR, Gourkhede PH, Kachave TR. Yield, Quality, Disease Resistance and Plant Nutrition of Pomegranate (*Punica granatum* L.) Influenced by Integrated Nutrient Management. *Agricultural Mechanization of Asia*. 2022;53(6):9099-9112.
- Naik P. Studies on Integrated Nutrient Management in Pomegranate (*Punica granatum* L.) cv. Bhagwa. M.Sc. Thesis, Odisha University of Agriculture and Technology Bhubaneswar; 2022.
- Meena CL, Meena RK, Sarolia DK, Dashora LK, Singh D. Effect of integrated nutrient management on fruit quality of pomegranate cv. Ganesh. *Journal of Agriculture and Ecology*. 2018;5:67-75.

4. Davarpanah S, Tehranifar A, Davarynejad G, Aran M, Abadia J, Khorassani R. Effects of foliar nano-nitrogen and urea fertilizers on the physical and chemical properties of pomegranate (*Punica granatum* cv. Ardestani) fruits. *HortScience*. 2017;52(2):288-294.
5. Gajbhiye BR, Patil VD, Kachave TR. Effect of integrated nutrient management on growth and yield of pomegranate (*Punica granatum* L.). *Journal of Pharmacognosy and Phytochemistry*. 2020;9(4):1703-1706.
6. Merwad MA, Eisa RA, Saleh MMS. The beneficial effect of NAA, Zn, Ca and B on fruiting, yield and fruit quality of Alphonso mango trees. *International Journal of ChemTech Research*. 2016;9(3):147-157.
7. Jhade RK, Deshmukh G, Ambulkar PL, Alawa SL. Impact of plant growth regulators on yield and yield attributing characters in pomegranate (*Punica granatum* L.) cv. Bhagwa in Satpura plateau region of Madhya Pradesh. *International Journal of Chemical Studies*. 2020;8(1):2579-2582.
8. Hussain F, Murthy BNS, Reddy MLN, Satisha J, Upreti KK, Laxman RH, Srinivasulu B. Induction of flowering and improvement of fruit yield and quality in pomegranate (*Punica granatum*) cv. Bhagwa by various plant growth regulators. *Environment Conservation Journal*. 2021;22(2):p49.
9. Firoz S, Murthy BNS, Reddy MLN, Satisha J, Upreti KK, Laxman RH, Srinivasulu B. Induction of flowering and improvement of fruit yield and quality in pomegranate (*Punica granatum*) cv. Bhagwa by various plant growth regulators. *Environment Conservation Journal*. 2021;22(1&2):49-58.
10. Mishra S, Nihari J, Singh RK. Effect of Plant Growth Regulators (PGR) on flowering and fruiting of Pomegranate (*Punica granatum* L.) cv. Bhagwa under Prayagraj agro - climatic condition. *Energy Ecology and Environment*. 2022;28(2):912-914.
11. Raigond P, Singh NV, More AK, Parashuram S, Giri NA, Awachare C, Sowjanya R, Patil PG, Babu KD, Marathe RA. Impact of PGRs, polyamines and potassium to improve pomegranate flowering behaviour, fruit set and fruit quality. *Biocatalysis and Agricultural Biotechnology*. 2024;61:103355.
12. Moradinezhad F, Ranjbar A. Foliar application of fertilizers and plant growth regulators on pomegranate fruit yield and quality: a review. *Journal of Plant Nutrition*. 2024;47(5):797-821.
13. Mandal G, Dhaliwal HS, Mahajan BVC. Effect of pre-harvest application of NAA and potassium nitrate on storage quality of winter guava (*Psidium guajava*). *Indian Journal of Agricultural Sciences*. 2012;82(11):985-989.
14. Hasani M, Zamani Z, Savaghebi G, Fatahi R. Effects of zinc and manganese as foliar spray on pomegranate yield, fruit quality and leaf minerals. *Journal of Soil Science and Plant Nutrition*. 2012;12(3):471-480.
15. Eaida A, Eaida MA, Al Hadethi. Effect of foliar application with manganese and zinc on pomegranate growth, yield and fruit quality. *Journal of Horticultural Science and Ornamental Plants*. 2013;5(1):41-45.
16. Prakash K, Ponnuswami V, Kulakarni DN. Effect of pre-harvest chemical spray on quality of pomegranate (*Punica granatum* L.) cv. Bhagwa. *Trends in Biosciences*. 2014;7(11):1090-1092.
17. Kumar J, Kumar R, Rai R, Mishra DS. Response of 'Pant Prabhat' guava trees to foliar sprays of zinc, boron, calcium and potassium at different plant growth stages. *The Bioscan*. 2015;10(2):495-498.
18. Narayanswamy P, Anawal VV, Ekabote SD. Effects of plant growth regulators on flowering, fruit set and yield of 'Bhagwa' pomegranate (*Punica granatum* L.). *Acta Horticulturae*. 2019;1254:129-134.
19. Pal D, Kumar M, Yadav MK, Chauhan C, Rani V, Pal A, Pandey V. Effect of different combinations of plant growth regulators and assessment of clonal fidelity among in vitro raised micro-shoots of pomegranate (*Punica granatum* L.) cv. Bhagwa. *Plant Science Today*. 2024.
20. Digraze SS, Tambe TB, Kadam AS, Kalalbandi BM. Effect of different plant growth regulators and chemicals on growth and yield of pomegranate (*Punica granatum* L.) cv. Bhagwa. *Advance Research Journal of Crop Improvement*. 2016;7(1):96-99.
21. Murthy SF, Reddy B, Satisha MJ, Upreti KK, Laxman RH, Srinivasulu B. Induction of flowering and improvement of fruit yield and quality in pomegranate (*Punica granatum*) cv. Bhagwa by various plant growth regulators. *Environment Conservation Journal*. 2021;22(1&2):49-58.
22. Hussain F, Murthy BNS, Reddy MLN, Satisha J, Upreti KK, Laxman RH, Srinivasulu B. Induction of flowering and improvement of fruit yield and quality in pomegranate (*Punica granatum*) cv. Bhagwa by various plant growth regulators. *Environment Conservation Journal*. 2021;22(2):p49.
23. Jhade RK, Deshmukh G, Ambulkar PL, Alawa SL. Impact of plant growth regulators on yield and yield attributing characters in pomegranate (*Punica granatum* L.) cv. Bhagwa in Satpura plateau region of Madhya Pradesh. *International Journal of Chemical Studies*. 2020;8(1):2579-2582.

How to cite this article: Maneesh, Kumar H, Thakur JP, Kumar S, Shrivastava M, Sahu A, et al. Effect of PGR combinations on yield, quality, and economics of pomegranate (*Punica granatum* L.) cv. Bhagwa. *International Journal of Advanced Biochemistry Research*. 2026;SP-10(10):718-722. doi: <https://www.doi.org/10.33545/26174693.2026.v10.i10Si.10368>

Authors

Maneesh

M.Sc. Scholar, School of Agriculture Science, Vikrant University, Gwalior, MP, India

Hirdesh Kumar

Assistant Professor, School of Agriculture Science, Vikrant University, Gwalior, MP, India

Jay Prakash Thakur

Professor, School of Agriculture Science, Vikrant University, Gwalior, MP, India

Sachin Kumar

Assistant Professor, School of Agriculture Science, Vikrant University, Gwalior, MP, India

Mandavi Shrivastava Arun Sahu

Assistant Professor, School of Agriculture Science, Vikrant University, Gwalior, MP, India

Arun Sahu

Assistant Professor, School of Agriculture Science, Vikrant University, Gwalior, MP, India

Aditya Kaurav

Assistant Professor, School of Agriculture Science, Vikrant University, Gwalior, MP, India