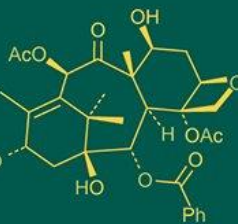
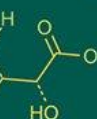
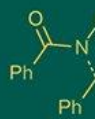


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Effect of methyl jasmonate and salicylic acid on vegetative growth and postharvest quality of strawberry (*Fragaria × ananassa* Duch.)

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Abstract

The present investigation was conducted from November 2025 to February 2026 under polyhouse conditions at the Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences. The experiment was designed using a Randomized Block Design (RBD), with 12 treatments and 3 replications. The aim was to evaluate the effects of different concentrations of methyl jasmonate (MeJA) and salicylic acid (SA) on the growth, flowering, fruit quality, and shelf life of the strawberry cultivar Winter Dawn. The results revealed significant variation among treatments for most of the parameters studied. Among all treatments, T₆ (0.3 mM Methyl Jasmonate + 2.0 mM Salicylic Acid) recorded maximum plant height, plant spread, fruit weight, TSS, total sugars, vitamin C, TSS/acid ratio, and shelf life, along with minimum acidity. The combined application of MeJA and SA proved superior to their individual applications in improving vegetative growth and fruit quality. Enhanced performance under combined treatments may be attributed to improved photosynthetic activity, nutrient uptake, antioxidant activity, and assimilate translocation. The study concluded that the combined application of 0.3 mM Methyl Jasmonate and 2.0 mM Salicylic Acid was most effective for improving growth, fruit quality, and postharvest life of strawberry under subtropical conditions of Prayagraj.

Keywords: Strawberry, *Fragaria × ananassa*, Methyl Jasmonate, Salicylic Acid, Plant Growth Regulators, Fruit Quality

Introduction

Strawberry (*Fragaria × ananassa* Duch.) is one of the most important soft fruit crops cultivated worldwide, prized for its appealing appearance, unique flavor, pleasant aroma, and high nutritional value. This man-made hybrid was developed through interspecific hybridization between *Fragaria chiloensis* and *Fragaria virginiana* and belongs to the Rosaceae family. The strawberry plant is octaploid in nature (2n = 8x = 56) and typically behaves as a perennial in temperate climates. However, in subtropical regions, it is commonly grown as an annual crop. Strawberry fruits are rich in vitamins, minerals, antioxidants, anthocyanins, and phenolic compounds, especially vitamin C, all of which contribute significantly to human nutrition and health. The characteristic red color of the fruits primarily comes from anthocyanin pigments (Sharma, 2002; Chadha, 2001) [16, 3].

Strawberry cultivation in India has grown significantly due to increased consumer demand and higher economic returns. This crop is commercially grown in several states, including Himachal Pradesh, Uttarakhand, Maharashtra, Uttar Pradesh, Punjab, Haryana, Karnataka, and West Bengal. However, cultivating strawberries in subtropical regions often leads to lower yields and poor fruit quality, primarily due to unfavourable environmental conditions and physiological stress. Therefore, it is essential to adopt appropriate crop management practices to enhance growth, improve fruit quality, and extend the shelf life of strawberries in these conditions.

Plant growth regulators (PGRs) are crucial for managing plant growth, flowering, fruiting, and postharvest quality by affecting various physiological and biochemical processes. The exogenous application of different PGRs has been shown to enhance yield and fruit quality in several horticultural crops (Turk & Stopar, 2010) [20].

Among these, salicylic acid (SA) and methyl jasmonate (MeJA) are particularly noteworthy as signaling molecules that play significant roles in plant growth, defense responses, stress tolerance, and fruit ripening. Salicylic acid helps regulate photosynthesis, nutrient uptake, stomatal conductance, and antioxidant activity, thereby improving plant performance under stress conditions. Recent reviews by Chen *et al.* (2023) ^[4] and Song *et al.* (2023) ^[19] have reported that SA significantly enhances stress tolerance, fruit quality, and postharvest life in horticultural crops.

Jasmonic acid and its derivative, methyl jasmonate (MeJA), are important plant signaling compounds that play a key role in regulating defense mechanisms, antioxidant activity, fruit ripening, and senescence (Wasternack, 2016) ^[22]. The exogenous application of MeJA has been shown to enhance fruit quality, increase anthocyanin accumulation, boost antioxidant activity, and extend the shelf life of various fruit crops. For instance, Rudell *et al.* (2002) ^[14] observed greater anthocyanin levels and improved fruit quality in apples following MeJA application, while Wang (1999) ^[21] reported a reduction in decay and an increase in antioxidant capacity in berries. Recent reviews by Jeyasri *et al.* (2023) ^[8] and Li and Ahammed (2023) ^[11] also emphasized the synergistic effects of salicylic acid (SA) and MeJA in enhancing plant physiological efficiency and stress tolerance.

Despite the beneficial effects of growth regulators, there is limited information on their combined influence on the growth, flowering, fruit quality, and shelf life of strawberries in the subtropical conditions of India. Therefore, this investigation was conducted to evaluate the effects of different concentrations of methyl jasmonate and salicylic acid on vegetative growth, flowering behavior, fruit quality, and shelf life of strawberries in these subtropical agro-climatic conditions.

Materials and Method

The present investigation, titled “Effect of Methyl Jasmonate and Salicylic Acid on Growth, Yield, and Postharvest Quality of Strawberry (*Fragaria × ananassa* Duch.),” was conducted from November 2025 to February 2026. The experiment was organized using a Randomized Block Design (RBD) consisting of 12 treatments, each with 3 replications. Each treatment included 6 plants, resulting in a total of 18 experimental plots and 216 plants throughout the study. Healthy runner plants were used as the planting material for this investigation. The primary objective of the study was to evaluate the effects of methyl jasmonate and salicylic acid on the growth, yield, and postharvest quality of strawberries.

Treatment details

The experiment comprised twelve treatments with varying concentrations and combinations of methyl jasmonate and salicylic acid. The treatments included T₀ - Control, T₁ - 0.3 mM Methyl Jasmonate, T₂ - 0.6 mM Methyl Jasmonate, T₃ - 0.9 mM Methyl Jasmonate, T₄ - 2.0 mM Salicylic Acid, and T₅ - 4.0 mM Salicylic Acid. Combined treatments consisted of T₆ - 0.3 mM Methyl Jasmonate + 2.0 mM Salicylic Acid, T₇ - 0.3 mM Methyl Jasmonate + 4.0 mM Salicylic Acid, T₈ - 0.6 mM Methyl Jasmonate + 2.0 mM Salicylic Acid, T₉ - 0.6 mM Methyl Jasmonate + 4.0 mM Salicylic Acid, T₁₀ - 0.9 mM Methyl Jasmonate + 2.0 mM Salicylic Acid, and T₁₁ - 0.9 mM Methyl Jasmonate + 4.0 mM Salicylic Acid.

Observation recorded

Plant Height (cm)

Plant height was recorded at 30, 60, and 90 days after transplanting (DAT) by measuring the height of randomly selected plants from the base of the plant to the tip of the tallest leaf using a measuring scale. The average plant height was expressed in centimeters (cm).

Number of Leaves

The number of leaves per plant was recorded at 30, 60, and 90 DAT by counting the fully expanded leaves present on randomly selected plants under each treatment. The mean number of leaves was calculated and expressed as leaves per plant.

Plant Spread (cm)

Plant spread was measured at 30, 60, and 90 DAT in two directions, namely east-west and north-south, using a measuring scale. The average of both directions was calculated and expressed in centimeters (cm).

Days to First Flowering

Days to first flowering were recorded by counting the number of days taken from the date of transplanting to the appearance of the first flower in each treatment.

Days to First Fruiting

Days to first fruiting were determined by recording the number of days taken from transplanting to the development of the first fruit under each treatment.

Fruit Weight (g)

Average fruit weight was determined by weighing randomly selected fruits from each treatment using a digital weighing balance. The mean fruit weight was expressed in grams (g).

Total Soluble Solids (TSS)

Total soluble solids of fruits were determined using a hand refractometer and expressed in °Brix. A few drops of fruit juice extracted from fresh fruits were placed on the prism of the refractometer for recording the observations.

Estimation of Titratable Acidity (%)

The titratable acidity of strawberry fruits was determined using the standard titration method, as outlined by Ranganna (1986) ^[13], employing sodium hydroxide (NaOH) solution and phenolphthalein as the indicator. Fresh juice was extracted from randomly selected strawberries and filtered through muslin cloth. An aliquot of the juice was diluted with distilled water and titrated with a 0.1 N NaOH solution until a light pink endpoint was achieved and maintained for approximately 15 seconds. The acidity was then calculated and expressed as a percentage of citric acid equivalent using the following formula:

$$\text{Titratable Acidity (\%)} = \frac{T \times N \times V_1 \times E \times 100}{V_2 \times W \times 1000}$$

Estimation of Vitamin C (Ascorbic Acid)

Vitamin C content of strawberry fruits was estimated by the 2,6-dichlorophenol indophenol dye titration method as described by A.O.A.C. (2000). Fresh fruit pulp was homogenized with metaphosphoric acid solution and filtered. An aliquot of the extract was titrated against the

standard dye solution until a light pink colour persisted for a few seconds. The ascorbic acid content was expressed as mg per 100 g pulp using the following formula:

$$\text{Ascorbic Acid (mg/100g pulp)} = \frac{T \times D \times V_1 \times 100}{V_2 \times W}$$

Estimation of Total Sugars (%)

Total sugars in strawberry fruits were estimated using the volumetric method developed by Lane and Eynon, as described by Ranganna (1986) [13]. The fruit juice was clarified, then hydrolyzed with hydrochloric acid, and finally neutralized with sodium hydroxide. The resulting solution was titrated with Fehling's solution, using methylene blue as an indicator, until a brick-red endpoint was reached. Total sugars were then calculated and expressed as a percentage using the following formula:

$$\text{Total Sugars (\%)} = \frac{F \times D \times 100}{T \times W}$$

Shelf Life (Days)

The shelf life of fruits was assessed by storing harvested fruits at room temperature and tracking the number of days until they were no longer acceptable for consumption due to spoilage.

Results and Discussion

Plant Height (cm.)

The data presented in Table 1 shows that plant height increased progressively from 30 days after treatment (DAT) to 90 DAT under all treatments. At 30 DAT and 60 DAT, the highest plant height was recorded in T₄ (2.0 mM Salicylic Acid), measuring 6.03 cm and 11.69 cm, respectively. By 90 DAT, the tallest plant height, recorded at 27.17 cm, was observed in T₆ (0.3 mM Methyl Jasmonate + 2.0 mM Salicylic Acid). In contrast, the minimum plant height at 90 DAT was 18.87 cm, seen in T₀ (Control).

The increased plant height observed with MeJA and SA treatments may be attributed to enhanced photosynthetic activity, cell elongation, and improved nutrient translocation. Similar results have been reported by Hayat *et al.* (2010) [6], Kazemi (2014) [9], Singh *et al.* (2017) [18], and Khan *et al.* (2015) [10].

Number of Leaves

The number of leaves increased gradually from 30 days after treatment (DAT) to 90 DAT under different treatments, as shown in Table 1. The highest number of leaves recorded at 90 DAT was 8.0 in Treatment T₄ (2.0 mM Salicylic Acid), followed by 7.67 in Treatment T₁. In contrast, the lowest number of leaves observed was 5.0 in Treatment T₁₀ (0.9 mM Methyl Jasmonate + 2.0 mM Salicylic Acid).

The increase in leaf number under salicylic acid treatment may be attributed to enhanced vegetative growth, chlorophyll synthesis, and improved metabolic activity. Salicylic acid likely promoted cell division and leaf initiation in plants. Similar results have been reported by Kazemi (2014) [9], Hayat *et al.* (2010) [6], Sharma *et al.* (2006) [17], and Singh *et al.* (2017) [18].

Plant Spread (cm.)

Table 1 shows that plant spread increased significantly from 30 days after planting (DAP) to 90 DAP under various

treatments. The maximum plant spread observed at 90 DAP was 35.3 cm in treatment T₆ (0.3 mM Methyl Jasmonate + 2.0 mM Salicylic Acid), followed closely by treatment T₇ with 34.3 cm. In contrast, the minimum plant spread of 25.83 cm was recorded in the control group (T₀). The combined application of Methyl Jasmonate and Salicylic Acid proved to be more effective in enhancing plant spread compared to individual treatments. This increase in plant spread may be attributed to improved vegetative vigor, greater leaf expansion, and enhanced translocation of assimilates. Similar results have been reported by Hayat *et al.* (2010) [6], Kazemi (2014) [9], Singh *et al.* (2017) [18], and Khan *et al.* (2015) [10].

Days to First Flowering

The earliest first flowering was observed at 38 days in T₁ (0.3 mM Methyl Jasmonate), followed by T₄ at 41 days. In contrast, the latest first flowering occurred at 48 days in T₅ (4.0 mM Salicylic Acid), as indicated in Table 1. The early flowering observed with Methyl Jasmonate treatment may be attributed to enhanced physiological and hormonal activities that promote floral initiation. Methyl Jasmonate likely accelerated reproductive development while reducing the duration of vegetative growth. Similar findings were reported by Kazemi (2014) [9], Hayat *et al.* (2010) [6], Sharma *et al.* (2006) [17], and Singh *et al.* (2017) [18].

Days to First Fruiting

The earliest fruiting occurred after an average of 46.7 days in the treatment with 0.3 mM Methyl Jasmonate (T₁). This was followed by treatments T₄ and T₇, which both took an average of 50.3 days. In contrast, the maximum time to first fruiting was observed in treatment T₅, which had 4.0 mM Salicylic Acid, taking an average of 58.3 days. The earlier fruiting observed in the Methyl Jasmonate treatment may be due to its role in accelerating flowering and improving reproductive efficiency. Methyl Jasmonate likely stimulated hormonal activities related to fruit set and development. Similar results have been reported by Kazemi (2014) [9], Hayat *et al.* (2010) [6], Singh *et al.* (2017) [18], and Khan *et al.* (2015) [10].

Fruit Weight (g.)

Data presented in Table 2 shows that the maximum fruit weight, recorded at 26.4 g, was found in T₆ (0.3 mM MeJA + 2.0 mM Salicylic Acid), followed by T₄ at 24.4 g. In contrast, the minimum fruit weight of 16.9 g was observed in T₀ (Control). The combined application of MeJA and Salicylic Acid (SA) proved to be more effective than the individual treatments in enhancing fruit weight. This increase in fruit weight may be attributed to improved photosynthetic activity, nutrient uptake, and the translocation of assimilates toward the fruits. Similar findings have also been reported by Asghari and Aghdam (2010), Kazemi (2014) [9], Sharma *et al.* (2006) [17], and Singh *et al.* (2017) [18].

Total Soluble Solids (°Brix)

The highest TSS (9.2 °Brix) was recorded in T₆ (0.3 mM Methyl Jasmonate + 2.0 mM Salicylic Acid), followed by T₇ (8.7 °Brix), while the lowest TSS (5.8 °Brix) was observed in T₀ (Control), as shown in Table 2. The increase in TSS under combined treatments may be due to enhanced conversion of starch into soluble sugars during ripening.

MeJA and SA treatments possibly improved carbohydrate metabolism and sugar accumulation in fruits. Similar findings were also reported by Rudell *et al.* (2002)^[14], Wang (1999)^[21], Sayyari *et al.* (2009)^[15], and Kazemi (2014)^[9].

Acidity (%)

Table 2 shows that the lowest acidity level, recorded at 0.46%, occurred in the treatment T₁₁ (comprising 0.9 mM Methyl Jasmonate and 4.0 mM Salicylic Acid), followed closely by T₆ with an acidity of 0.47%. In contrast, the highest acidity level of 1.19% was observed in the control group (T₀). The observed reduction in acidity in the treated plants may be attributed to the increased utilization of organic acids during respiration, as well as their conversion into sugars during the ripening process. The combined treatments were more effective at reducing acidity than the individual applications. These findings align with the results reported by Sayyari *et al.* (2009)^[15], Asghari and Aghdam (2010), Singh *et al.* (2017)^[18], and Sharma *et al.* (2006)^[17].

TSS/Acid Ratio

The highest TSS/acid ratio (19.6) was recorded in T₆ (0.3 mM Methyl Jasmonate + 2.0 mM Salicylic Acid), followed by T₁₁ (17.9), while the lowest ratio (4.9) was observed in T₀ (Control) as shown in Table 2. Increased TSS/acid ratio indicates improved sweetness and better fruit quality under combined treatments. The enhancement may be due to a simultaneous increase in TSS and reduction in acidity. Similar findings were also reported by Wang (1999)^[21], Rudell *et al.* (2002)^[14], Kazemi (2014)^[9], and Sayyari *et al.* (2009)^[15].

Total Sugars (%)

As presented in Table 2, the maximum total sugars (8.9%) were recorded in T₆ (0.3 mM Methyl Jasmonate + 2.0 mM Salicylic Acid), followed by T₇ (8.4%), whereas the minimum total sugars (5.1%) were observed in T₀ (Control).

The increase in sugar content may be attributed to enhanced carbohydrate metabolism and improved translocation of assimilates towards fruits. Combined application of MeJA and SA proved superior over individual treatments. Similar findings were also reported by Wang (1999)^[21], Rudell *et al.* (2002)^[14], Singh *et al.* (2017)^[18], and Asghari and Aghdam (2010).

Vitamin C (mg/100g)

The highest vitamin C content, measured at 60 mg per 100 g of pulp, was found in T₆ (0.3 mM Methyl Jasmonate + 2.0 mM Salicylic Acid). This was followed closely by T₄ and T₇, both of which contained 59 mg per 100 g of pulp. In contrast, the control group, T₀, had the lowest vitamin C content at 50 mg per 100 g of pulp, as indicated in Table 1. The increase in vitamin C levels observed in the treated plants may be attributed to enhanced antioxidant activity and a reduction in oxidative degradation during the ripening process. The combination of treatments proved to be more effective in preserving ascorbic acid levels. Similar results have been reported by Wang (1999)^[21], Sayyari *et al.* (2009)^[15], Kazemi (2014), and Singh *et al.* (2017)^[18].

Shelf Life (days)

Table 2, shows that the maximum shelf life of 5.3 days was observed in T₆, which consisted of 0.3 mM Methyl Jasmonate and 2.0 mM Salicylic Acid. This was followed by T₄, with a shelf life of 4.7 days. In contrast, the minimum shelf life of 2.3 days was recorded in both the control group (T₀) and T₅. The extension of shelf life under treatments with Methyl Jasmonate (MeJA) and Salicylic Acid (SA) can be attributed to delayed senescence, a reduced respiration rate, and enhanced antioxidant defense mechanisms. These combined treatments effectively preserved postharvest fruit quality for a longer period. Similar results were reported by Asghari and Aghdam (2010), Sharma *et al.* (2006)^[17], Wang (1999)^[21], and Sayyari *et al.* (2009)^[15].

Table 1: Effect of Methyl Jasmonate and Salicylic Acid on Vegetative Growth and Flowering Attributes of Strawberry.

Treatments	Plant Height (cm.)			No. of Leaves			Plant Spread (cm)			Days to First Flower Initiation (in days)	Days to first fruit set
	30 DAT	60 DAT	90 DAT	30 DAT	60 DAT	90 DAT	30 DAT	60 DAT	90 DAT		
T ₀ - Control	4.77	7.8	18.87	4.33	6	6.67	6.7	10.86	25.83	47	56.7
T ₁ - 0.3 mM Methyl Jasmonate	4.23	7.29	20.17	4	5	7.67	7.17	11.7	27.2	38	46.7
T ₂ - 0.6 mM Methyl Jasmonate	4.4	7.03	21.57	3.67	4.33	6.67	7.22	10.25	28.8	44	53.7
T ₃ - 0.9 mM Methyl Jasmonate	4.37	8.3	22.87	4	4	5.67	7.24	9.83	30.3	42	51.3
T ₄ - 2.0 mM Salicylic Acid	6.03	11.69	24.17	3.89	6	8	6.87	11.4	31.8	41	50.3
T ₅ - 4.0 mM Salicylic Acid	5	7.3	25.4	3.85	4.67	6.67	6.27	10.9	33.3	48	58.3
T ₆ - 0.3 mM Methyl Jasmonate + 2.0 mM Salicylic Acid	4.57	8.23	27.17	3.91	4.67	6.33	6.9	9.33	35.3	43	52.7
T ₇ - 0.3 mM Methyl Jasmonate + 4.0 mM Salicylic Acid	5.7	8.82	26.17	3.88	5.33	6.67	8.42	11.83	34.3	42	50.3
T ₈ - 0.6 mM Methyl Jasmonate + 2.0 mM Salicylic Acid	4.7	6.9	24.63	3.88	4	5.67	9	9.43	32.8	45	55
T ₉ - 0.6 mM Methyl Jasmonate + 4.0 mM Salicylic Acid	5.4	8.47	23.63	3.89	5	7	8.18	12.07	31.3	43	52.7
T ₁₀ - 0.9 mM Methyl Jasmonate + 2.0 mM Salicylic Acid	4.13	6.83	22.17	3.89	3.67	5	7.3	10.13	29.8	46	57
T ₁₁ - 0.9 mM Methyl Jasmonate + 4.0 mM Salicylic Acid	5.4	7.63	21.17	3.89	4	5.67	8.08	11.83	28.3	45	54.3
F- TEST	NS	NS	S	NS	NS	NS	NS	NS	S	S	S
SE-d	0.91	1.4	0.05	0.82	0.69	0.81	1.01	1.24	0.03	1.34	1.34
CD (5%)	1.89	2.9	0.1	1.7	1.43	1.68	2.1	2.57	0.06	2.78	2.78
CV	22.86	21.31	0.26	25.9	17.84	15.31	16.65	14.07	0.11	3.09	3.09

Table 2: Effect of Methyl Jasmonate and Salicylic Acid on Yield and Quality attributes of Strawberry.

Treatments	Weight of fruit (g.)	TSS (°Brix)	Acidity (%)	TSS/Acidity ratio	Total sugar (%)	Vitamin C (mg/100g)	Shelf life (in Days)
T ₀ - Control	16.9	5.8	1.19	4.9	5.1	50	2.3
T ₁ - 0.3 mM Methyl Jasmonate	19	7.6	0.59	12.9	7.3	52	4.3
T ₂ - 0.6 mM Methyl Jasmonate	21.4	8.2	0.58	14.2	7.9	54	3.3
T ₃ - 0.9 mM Methyl Jasmonate	20.3	7.4	0.66	11.2	7	56	4.3
T ₄ - 2.0 mM Salicylic Acid	24.4	7.8	0.62	12.6	7.4	59	4.7
T ₅ - 4.0 mM Salicylic Acid	22.4	6.6	0.76	8.7	6.1	58	2.3
T ₆ - 0.3 mM Methyl Jasmonate + 2.0 mM Salicylic Acid	26.4	9.2	0.47	19.6	8.9	60	5.3
T ₇ - 0.3 mM Methyl Jasmonate + 4.0 mM Salicylic Acid	23.2	8.7	0.49	17.1	8.4	59	4.3
T ₈ - 0.6 mM Methyl Jasmonate + 2.0 mM Salicylic Acid	20.9	7.2	0.49	14.7	6.9	58	3.3
T ₉ - 0.6 mM Methyl Jasmonate + 4.0 mM Salicylic Acid	21.6	7.6	0.55	13.8	7.3	57	3.7
T ₁₀ - 0.9 mM Methyl Jasmonate + 2.0 mM Salicylic Acid	18.6	6.7	0.52	12.9	6.4	54	2.7
T ₁₁ - 0.9 mM Methyl Jasmonate + 4.0 mM Salicylic Acid	22.4	8.2	0.46	17.9	7.9	55	3.7
F- TEST	S	S	S	S	S	S	S
SE-d	0.24	0.05	0.01	0.34	0.05	0.55	0.48
CD (5%)	0.5	0.1	0.02	0.71	0.11	1.14	1
CV	1.38	0.76	2.35	3.14	0.9	1.2	15.92

Conclusion

Based on the findings of the present investigation, it can be concluded that the application of methyl jasmonate (MeJA) and salicylic acid (SA), either alone or in combination, significantly influenced the vegetative growth, flowering, fruiting behavior, fruit quality, and shelf life of the crop. Among all the treatments, T₆ (0.3 mM Methyl Jasmonate + 2.0 mM Salicylic Acid) proved to be the most effective treatment, recording superior performance in terms of plant height, plant spread, fruit weight, total soluble solids, total sugars, vitamin C content, TSS/acid ratio, and shelf life. The same treatment also reduced acidity and improved overall fruit quality compared to the control.

The combined application of MeJA and SA exhibited better performance than their individual applications, indicating a synergistic effect of both growth regulators on physiological, biochemical, and postharvest attributes of the crop. Enhanced vegetative growth and fruit quality under these treatments may be attributed to improved photosynthetic efficiency, nutrient uptake, assimilate translocation, and antioxidant activity.

Therefore, the combined application of 0.3 mM Methyl Jasmonate + 2.0 mM Salicylic Acid may be recommended as an effective treatment for improving growth, yield, fruit quality, and shelf life under similar agro-climatic conditions.

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