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WATERMELON (*CUCUMIS MELO* L.) FRUIT QUALITY AS INFLUENCED BY GIBBERELLIC ACID APPLICATION

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ABSTRACT

This study was conducted to evaluate the effects of gibberellic acid (GA_3) on the growth, yield, and fruit quality of watermelon (*Citrullus lanatus* L.). Gibberellic acid is a plant growth regulator known to influence various physiological processes such as cell elongation, fruit development, and flowering. The experiment aimed to determine the optimal GA_3 concentration that enhances vine growth and fruit quality characteristics under local field conditions. A split-plot design was employed with three replications. The main plots were assigned to four concentrations of GA_3 (0, 20, 30, and 40 ppm), while the subplots consisted of three fruit load treatments (one, two, and three fruits per vine). Data were analyzed using Analysis of Variance (ANOVA), and treatment means were compared using the Least Significant Difference (LSD) test at a 5% level of significance. Results revealed that GA_3 application significantly influenced vine length, fruit weight, fruit diameter, and flesh thickness, but not the sugar content of the fruits. The 30 ppm GA_3 treatment consistently produced the most favorable results, yielding longer vines, larger fruits, and thicker flesh compared to the control. Meanwhile, plants with a single fruit per vine recorded the highest fruit weight and superior quality parameters, indicating that reduced fruit load allows greater assimilate allocation per fruit. The interaction between GA_3 concentration and fruit load showed that applying 30 ppm GA_3 to plants bearing a single fruit per vine achieved the optimum combination for yield and quality improvement. Overall, the study demonstrates that moderate gibberellic acid concentration, particularly at 30 ppm, enhances the growth and marketable quality of watermelon without adversely affecting sweetness. These findings suggest that GA_3 application can be a practical agronomic intervention to improve fruit size and yield potential under similar agro-climatic conditions. Further research is recommended to explore the economic feasibility of GA_3 use and its effects on postharvest quality and shelf life.

Key words: *Citrullus lanatus*, gibberellic acid, fruit load, fruit quality, yield

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INTRODUCTION

The utilization of plant growth regulators (PGRs) has demonstrated significant effectiveness in enhancing the quality and yield of horticultural crops, including muskmelon. Often referred to as "magic chemicals," these substances represent a new generation of agrochemicals capable of modifying natural growth regulatory systems even when applied in small quantities. Plant growth regulators have also been investigated as tools for modifying plant growth and fruit development. Gibberellic acid (GA_3) is a naturally occurring plant hormone belonging to the gibberellin group and is widely studied for its role in cell elongation, cell division, and reproductive development. The physiological effects of gibberellins vary according to crop species, concentration, timing of application, and growing conditions. Consequently, the use of PGRs has emerged as a rapid and efficient method to enhance crop production, garnering substantial interest across agricultural and horticultural research and practice [1, 2].

Watermelon (*Citrullus lanatus* L.) and muskmelon (*Cucumis melo*) are among the most economically important cucurbits, valued for their nutritional and medicinal properties. Watermelon (*Citrullus lanatus* L.) is a nutritious fruit that contains vitamin C, natural sugars, and other bioactive compounds. A reported vitamin C content of approximately 26 mg per 100 g of edible portion represents about 29% of the 90-mg Daily Value for vitamin C established for adults. The Recommended Dietary Allowance for vitamin C is 90 mg per day for adult men and 75 mg per day for adult women aged 19 years and older. Thus, rather than describing watermelon as "rich in vitamin C," it is more appropriate to describe it as a vitamin C source that contributes meaningfully to daily vitamin C intake. In addition to vitamin C and natural sugars, watermelon contains various phytoconstituents and nutrients, including carotenoids such as β-carotene and other apocarotenoids, flavonoids, terpenoids, carbohydrates, amino acids, fatty acids, phospholipids, glycolipids, volatile compounds, and essential minerals. The seeds also contain oil and other nutrients. These nutritional and phytochemical components contribute to the dietary and functional value of watermelon as a fruit crop. Cucumis melo, in particular, has been recognized for a wide range of medicinal activities, including analgesic, anti-inflammatory, antioxidant, antimicrobial, hepatoprotective, antidiabetic, and anti-cancer effects [3].

Understanding the regulation of flowering and fruit development is important in improving watermelon productivity and fruit quality. In melon crops, floral development and sex expression are influenced by genetic, environmental, and physiological factors, including temperature, water availability, mineral nutrition, light conditions, and plant growth regulators. Gibberellic acid (GA_3), in particular, is involved in plant growth and reproductive development and may influence processes

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associated with flowering, fruit set, and fruit development. However, the response of watermelon to exogenous GA_3 may vary depending on the concentration applied and the prevailing growing conditions. Although previous studies have reported the effects of GA_3 on growth and fruit characteristics in various horticultural crops, further evaluation is needed to determine its effects on watermelon under specific production conditions. Therefore, this study aimed to determine the effects of different concentrations of GA_3 on the growth, yield, and selected fruit quality characteristics of watermelon (*Citrullus lanatus* L.). Specifically, it evaluated the effects of the treatments on selected growth and fruit attributes and determined whether significant differences existed among the different GA_3 concentrations.

Watermelon fruit quality is influenced by biochemical composition, texture, and post-harvest characteristics. Gibberellic acid (GA_3) is an important plant hormone involved in growth, fruit set, and fruit development and may influence the balance between vegetative and reproductive growth [4]. Previous research has also reported beneficial effects of exogenous GA application on fruit yield and quality in horticultural crops [5], providing a basis for evaluating its effects on watermelon fruit development and quality.

Fruit quality is a multidimensional trait encompassing firmness, sugar content, color, and metabolite composition. The abscisic acid (ABA) and gibberellins interact antagonistically in regulating metabolic pathways, including sugar accumulation, organic acid metabolism, and stress responses [6]. In watermelon, such hormonal interactions are likely critical in determining fruit sweetness, acidity, and overall quality. Gibberellic acid (GA3) application in mango improved physicochemical properties and extended shelf life, indicating that similar effects could be achieved in watermelon through modulation of sugar content, acidity, and firmness [7].

Recent transcriptomic and metabolomic studies have provided deeper insights into GA-mediated regulation of fruit development. A conducted comparative transcriptome analysis of cultivated and wild watermelon during fruit development and ripening and identified differentially expressed genes associated with several processes, including sugar metabolism and accumulation, flesh carotenoid biosynthesis, flesh texture changes, and phytohormone-related pathways. These findings demonstrate the complex molecular regulation underlying watermelon fruit development and ripening [8]. Sun *et al*. [9] demonstrated that genes associated with cell wall modification are differentially expressed, influencing fruit firmness, while Kenea [10] emphasized that integrating hormonal treatments such as GA can optimize fruit quality traits through targeted breeding strategies. Fruit color, another key quality attribute, is largely determined by carotenoid accumulation. Dhanani *et al*. [11] employed Raman spectroscopy to monitor carotenoid changes during

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watermelon maturation, showing that GA may enhance desirable pigmentation by modulating gene expression in carotenoid biosynthesis pathways.

The application of gibberellic acid in watermelon cultivation presents a promising strategy for improving fruit size, firmness, sugar content, color, and shelf life. Empirical studies [5,7] support the notion that exogenous GA enhances both quantitative and qualitative fruit attributes, while molecular analyses [8,9,10] elucidate the mechanisms underlying these effects. Future research should focus on optimizing GA concentration, timing of application, and interaction with other PGRs such as ABA to maximize fruit quality and post-harvest performance.

Objectives:
Generally, the study will evaluate the effects of GA3 and fruit load on the yield and fruit quality of muskmelon. Specifically, it aimed to: Investigate the impact of GA3 on both the yield and fruit quality of watermelon.

RESEARCH METHODOLOGY

Materials and Methods

Acquisition of Seeds: The watermelon seeds utilized in this study were procured from Allied Botanical Corporation, located in Cauayan City.

Sampling and Soil Analysis: Soil samples were obtained randomly from the experimental site using a shovel. After removing any inert matter, the soil samples were air-dried and spread on old newspapers. A composite soil sample weighing one kilogram was transported to the Cagayan Valley Integrated Agricultural Laboratory in Ilagan, Isabela, Philippines. The soil analysis results were used as the basis for determining the appropriate fertilizer recommendations for the study.

Land Preparation: Prior to plowing, the area underwent thorough cleaning. It was initially plowed using a tractor and subsequently harrowed. The land was then left fallow for a period of two weeks, allowing weeds to decompose and weed seeds to germinate before the final plowing. The concluding step involved animal-drawn plows for the final harrowing, ensuring that the soil was finely pulverized in preparation for transplanting.

Seedling Cultivation: For cultivating watermelon seedlings within a greenhouse environment, seedling trays were employed. The growing medium consisted of a blend with a 1:1:1 ratio of organic fertilizer, standard soil, and carbonized rice hull. Seeds were sown individually, one per hole, within the seedling tray, and irrigation was carried out using a sprinkler system. After one week of sowing, a solution of 100 grams of urea dissolved in 10 liters of water was applied to the seedlings. Following fertilizer application, sprinkler irrigation was conducted to wash off any residue from

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the leaves of the plants. Transplanting was executed 20 days post-sowing, and a fungicide was applied to prevent the onset of diseases.

Experimental Treatments

The different treatments in the study were the following:

Main Plot (Gibberellic Acid Concentration)

C1- Control (Zero GA3)
C2- 20 ppm
C3- 30 ppm

Sub-plot (Fruit-Load)

T1- 2 Fruits per Plant
T2- 3 Fruits per Plant
T3- 4 Fruits per Plant

Laying-out of the Experimental Area and Experimental Design

Following the completion of the last harrowing process, a total area of 427.75 square meters was partitioned into three sections. Each of these sections measured 4.25 meters in width and 29 meters in length, and there was a one-meter-wide alleyway separating them. Further division took place within each section, resulting in the creation of nine individual plots within each section. Each of these plots had dimensions of 4.25 meters by 3 meters, and they were spaced half a meter apart from each other. The organization of treatments followed the prescribed protocol for implementing a split-plot design.

Application of Fertilizer and Gibberellic Acid

The application of inorganic fertilizer was based on the soil analysis conducted for the experimental area. The recommended fertilizer rate was 60-0-0 kg ha^{-1} (N-P_2O_5-K_2O). The required amount of fertilizer was determined based on the area of the experimental plots and was proportionately allocated to the plants or hills within each plot. The fertilizer was then applied to the soil according to the established crop-management practice for the experimental area. Gibberellic acid (GA_3) was applied according to the assigned treatment concentrations. The experimental treatments consisted of 0 ppm (control), 20 ppm, and 30 ppm GA_3. The GA_3 solutions were applied to the watermelon plants by spraying at 30 days after transplanting (DAT). The control plants received no GA_3 application. The application was conducted according to the treatment assignment to ensure that each experimental unit received its corresponding GA_3 concentration.

Installation of Plastic Mulch

Prior to the transplanting process, a layer of polyethylene, specifically black plastic mulch, was laid down. This black plastic mulch serves multiple purposes, including elevating soil temperature during the growing season, preserving moisture, and

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mitigating various common issues such as soil compaction, fruit ground rot, fertilizer leaching, crop oversaturation, evaporation, and weed competition. These advantages collectively contribute to enhancing both the quality and quantity of fruit yield, particularly in the initial harvests, especially when combined with the use of transplants.

Transplanting and Replanting

The seedlings were transplanted 15 days after sowing at a planting distance of 75 cm × 75 cm between rows and hills. One healthy seedling was planted in each planting hole. Missing hills were replanted five days after transplanting to maintain the intended plant population and uniformity of the experimental plots.

Fruit Loading

Fruit-load management was carried out by retaining healthy fruits at the intermediate nodes of the watermelon plants. The fruits selected for retention were located between the 6th and 8th nodes from the base of the plant. The number of fruits retained per plant was maintained according to the assigned fruit-load treatment: T1 – 2 fruits per plant, T2 – 3 fruits per plant, and T3 – 4 fruits per plant. Fruit selection and loading were performed when the developing fruits reached approximately egg size. At this stage, healthy and normally developing fruits were selected and retained according to the assigned treatment, while other developing fruits were removed to maintain the prescribed number of fruits per plant. This procedure was applied consistently across the experimental plants to establish the designated fruit-load treatments.

Care and Management

Crop Protection. Regular monitoring was done to monitor the occurrence of insect pests. Pests were controlled using chemical control. The weeds were likewise controlled by manual weeding. Fungicide was also sprayed after the rain to prevent damping-off.

Irrigation. Frequent watering was done during the duration the study. This was done by flooding along the furrows once a week to maintain the water requirement for the growth and development of the plants

Harvesting

Harvesting was done when slight cracking near the pedicel, flattening of the blossom end, and change in aroma occurred. Fruits were harvested by cutting the fruiting vine with sharp scissor and leaving a T-shape stem on the fruit.

Data Gathered

Growth and Yield Parameters

1. Length of vines (cm.) The vine was measured at the end of the study.

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2. Weight of Fruits per Plant (g.) The fruits were weighted and recorded.
3. Fruit Diameter (cm). The diameter of the fruits of the sample plants was measured using a Vernier caliper.

Fruit Quality

1. Thickness of Flesh. Each harvested watermelon fruit was cut longitudinally into two halves. The thickness of the edible flesh was measured using a graduated ruler in centimeters (cm). The measurement was taken from the inner surface of the rind to the cut surface of the flesh at the designated measurement point. The recorded values were expressed in centimeters.
2. Sugar Content. The sugar content of the fruits in the different treatments was determined using a refractometer (Brix Method).

Statistical Analysis

The data collected was analyzed using the Analysis of Variance for Split-plot Design. The Least Difference was used to determine if the result is significant. Statistical Tool for Agricultural Research (STAR) software developed by the International Rice Research Institute (IRRI), Philippines was used for the statistical analysis of the data.

RESULTS AND DISCUSSION

The data presented in Table 1 demonstrates the influence of gibberellic acid (GA3) on the length of watermelon vines. Interestingly, the concentration of GA3 appeared to have no significant impact on vine length, as the mean values were quite similar. Watermelons treated with GA3 at 30 ppm and 20 ppm exhibited the longest vines, ranging from 197.36 to 197.74 cm. Conversely, watermelons that did not receive GA3 treatment had the shortest vines, with a mean length of 196.73 cm.

When considering fruit load as a sole factor, it was observed that it did not exert a significant effect on vine length: plants with two, three, and four fruits per plant displayed comparable mean values, ranging from 179.72 to 221.22 cm. This finding aligns with prior work showing that exogenous gibberellic acid primarily influences fruit set, stem elongation, and internode elongation in horticultural crops [12,13]. In addition, fruit thinning has been reported to alter the distribution of photoassimilates, which are sugars and other organic compounds produced through photosynthesis and transported from leaves to growing plant organs. In melon crops, fruit thinning has been associated with changes in leaf development and the distribution of carbohydrates between vegetative tissues and developing fruits [14,15]. However, the present study did not detect a significant effect of fruit load on vine length, indicating that retaining two, three, or four fruits per plant did not produce a statistically measurable difference in vine growth. The vine lengths across various treatments ranged from mean values of 173.80 to 251.83 cm.

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Weight of fruits

The data on watermelon fruit weight as affected by GA_3 concentration and fruit load are presented in Table 2. The concentration of GA_3 had a significant effect on individual fruit weight. Plants treated with 30 ppm GA_3 (C3) produced the highest mean fruit weight (5,465.56 g), followed by those treated with 20 ppm GA_3 (C2), with a mean of 4,751.11 g. The control treatment without GA_3 (C1) recorded the lowest mean fruit weight at 3,974.44 g. The reported values represent treatment means calculated from the recorded fruit weights.

Examining fruit load as an isolated factor revealed a significant effect on fruit weight. Plants with four fruits per plant (T3) produced the highest mean fruit weight at 4,766.67 g, followed by plants with three fruits per plant (T2) at 4,733.33 g, while plants with two fruits per plant (T1) produced the lowest mean fruit weight at 4,691.11 g. These differences may be related to the distribution of photoassimilates, or sugars and other organic compounds produced by the leaves through photosynthesis, among the developing fruits. A higher fruit load may increase competition among fruits for available plant resources, whereas fruit thinning reduces the number of developing fruits and may allow greater allocation of available resources to the fruits that remain.

In terms of the interaction between GA_3 concentration and fruit load, the results showed no statistically significant effect on fruit weight, with treatment means ranging from 3,913.33 to 5,500.00 g. This indicates that the effect of GA_3 concentration on fruit weight did not significantly change according to the number of fruits retained per plant. The nonsignificant interaction may indicate that the effects of GA_3 concentration and fruit load on fruit weight were generally independent under the conditions of the study. Thus, although the individual factors may influence fruit development, their combined effects did not produce a statistically detectable difference in fruit weight.

Fruit diameter

Table 3 provides insights into the influence of GA3 concentration and fruit load on the diameter of watermelon fruits. When considered individually, GA3 concentration exhibited a noteworthy effect on fruit diameter. Watermelons treated with 20 ppm GA3 displayed the most substantial fruit length and diameter, with mean values ranging from 46.79 to 47.87 cm, closely resembling those of the control group, which received no GA3 treatment. Conversely, the application of 20 ppm GA3 (C2) resulted in the smallest fruits, with an average diameter of 46.71 cm. It's worth noting that the promotion of fruit growth often involves the use of plant growth regulators.

Examining GA3 concentration as an isolated factor, it was observed that it had no discernible effect on fruit load. There were no significant differences among plants carrying two fruits per plant (T1), three fruits per plant (T2), and four fruits per plant

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(T3). Similarly, no significant differences were observed in fruit diameter across the different treatment combinations, with mean values ranging from 29.61 to 61.67 cm.

Fruit Quality

The impact of gibberellic acid on watermelon fruit quality, specifically in terms of flesh thickness, is illustrated in Table 4.

Flesh Thickness: The thickness of watermelon flesh was significantly influenced by the application of gibberellic acid (GA_3) when considered as a sole factor. Plants treated with 30 ppm GA_3 exhibited the thickest fruit flesh, with a mean thickness of 7.21 cm, followed by those treated with 20 ppm GA_3, which had a mean thickness of 7.09 cm. Conversely, watermelons that were not treated with GA3 displayed the thinnest flesh, with an average thickness of 6.90. This variation in flesh thickness can be attributed to the application of GA3, which exerts a significant influence on flesh thickness.

Similarly, the influence of fruit load as an isolated factor on flesh thickness followed a comparable pattern, with mean values ranging from 7.86 to 7.46 observed in plants carrying three to four fruit loads and the thinnest flesh occurring in plants with two fruits, measuring an average of 5.96. GA3 affects plants by increasing carbohydrate metabolism and the accumulation of carbohydrates. Growth retardants are also capable of redistributing dry matter within the plant, thereby enhancing yield.

The combined treatment combinations revealed significant effects as influenced by gibberellic acid. Watermelons producing four fruit loads exhibited a thickness of 8.83 centimeters (C3T1), while the thinnest flesh was observed in watermelons without the application of gibberellic acid, with mean values ranging from 5.43 to 6.86 cm.

Sugar Content

Sugar Content of Fruit*:* The impact of gibberellic acid on watermelon fruit sugar content is detailed in Table 5. When considering gibberellic acid concentration as an isolated factor, no significant variation was observed in terms of sugar content. Watermelons treated with 20 ppm (C2), 30 ppm (C3), and those without GA3 application exhibited sugar contents of 10.74, 10.74, and 10.72 percent, respectively. These results suggest that the application of GA3, regardless of concentration, did not enhance the sugar content of watermelon fruit.

Regarding fruit loads, no significant differences were observed among treatment means. Watermelons producing two (2), three (3), and four (4) fruits did not significantly affect the sugar content of the fruit, with sugar contents ranging from 10.61 to 10.84 percent. These sugar content levels fall within the normal range for watermelon quality parameters [16].

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Similarly, the same trend of results was noted in various combinations, where the means remained statistically consistent, with a range from 10.79 to 10.54 percent.

Yield of Fruit per Hectare

The impact of gibberellic acid on the yield of fruit per hectare is depicted in Table 5.

Yield per Hectare: When examined as an individual factor, GA3 concentration significantly influenced the yield per hectare. The highest yield was recorded in plants treated with 30 ppm GA3 (C3), yielding an average of 54,655.56 kilograms. Following closely were plants treated with 20 ppm GA3 (C2), which yielded 47,511 kilograms, while the lowest yield per hectare was observed in plants that did not receive gibberellic acid treatment, with an average of 39,744.44 kg.

Similarly, the same trend in results was noted when evaluating fruit load as an individual factor, with comparable mean values and significant variations. Plants carrying 3 and 4 fruits per plant achieved the highest yields, ranging from 47,666.67 to 47,333.33 kilograms, respectively. Conversely, the lowest yield was obtained by plants producing 2 fruits per plant, with an average of 46,911.11 kilograms.

Concerning the various treatment combinations, no significant variations were discernible. The combined factors affecting yield per hectare of watermelon were statistically equivalent, with mean values ranging from 55,000.00 to 39,133.33 kilograms.

The Cost and Return Analysis provides valuable insights into the economic aspects of watermelon production across one hectare, considering the influence of gibberellic acid and fruit load, as delineated in Table 7. The yield of watermelon serves as a focal point in this analysis and is presented in descending order.

Yield Variation: The recorded yields are arranged in descending order, with the highest yield of 81,155.81 kilograms observed in the treatment C3T3. Following closely is C3T2, with a yield of 80,526.57 kilograms, and C3T1, with 79,846.30 kilograms. The treatments C2T2 and C2T3 yielded 70,220.53 kilograms and 70,169.51 kilograms, respectively. Meanwhile, C2T1 had a yield of 70,067.47 kilograms. The lower concentration of gibberellic acid (C1) yielded slightly lower, with C1T3 producing 59,863.47 kilograms, C1T2 yielding 58,894.09 kilograms, and C1T1 resulting in 57,856.68 kilograms.

Interpretation: The results illustrate the significant impact of gibberellic acid (GA3) concentration and fruit load on watermelon yield per hectare. It is evident that the highest yields are associated with a combination of higher GA3 concentration (C3) and a greater fruit load (T3). Specifically, treatment C3T3, which involved both the highest GA3 concentration and the highest fruit load, resulted in the most substantial yield.

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CONCLUSION AND RECOMMENDATIONS FOR DEVELOPMENT

The application of 30 ppm GA_3 significantly improved specific fruit characteristics and yield of watermelon. Among the measured fruit-quality parameters, GA_3 significantly increased flesh thickness, with plants treated with 30 ppm GA_3 recording the highest mean flesh thickness of 7.21 cm. GA_3 also significantly increased fruit weight and yield. However, sugar content was not significantly affected by GA_3 application, indicating that the treatment improved selected physical characteristics of the fruit rather than its measured sugar content.

When fruit load was considered as a sole factor, it significantly affected fruit weight and flesh thickness. Plants with four fruits per plant (T3) recorded the highest mean fruit weight (4,766.67 g) and the highest mean flesh thickness (7.86 cm) among the fruit-load treatments. This result may be associated with the ability of watermelon plants to maintain sufficient resources for fruit development despite retaining more fruits. However, the differences among fruit-load treatments were relatively small for fruit weight. Sugar content remained statistically comparable across the three fruit-load levels, suggesting that increasing the number of retained fruits did not significantly alter sugar accumulation under the conditions of the study.

For the combined effects of GA_3 concentration and fruit load, the interaction was not significant for fruit weight and fruit diameter. This means that the effect of GA_3 concentration on these characteristics did not significantly depend on the number of fruits retained per plant. In contrast, the interaction between GA_3 concentration and fruit load was significant for flesh thickness, indicating that the response of flesh thickness to GA_3 concentration varied according to fruit load. Thus, the absence of a significant interaction for fruit weight does not contradict the significant main effect of GA_3 concentration: GA_3 significantly affected fruit weight overall, but its effect did not significantly change across the different fruit-load levels.

Based on the findings of the study, the following recommendations are proposed:

1. **The application of 30 ppm GA_3 may be recommended** for watermelon production under conditions similar to those of the study, as it significantly improved fruit weight, flesh thickness, and yield compared with the untreated control. However, its effect on sugar content was not significant.
2. **A fruit load of four fruits per plant may be considered** for production systems with similar growing conditions, as it recorded the highest mean fruit weight (4,766.67 g) and flesh thickness (7.86 cm) among the fruit-load treatments. However, the choice of fruit load should also consider the farmer's production objectives and market requirements.

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3. **The combination of 30 ppm GA_3 and four fruits per plant may be considered a promising treatment combination** because it recorded the numerically highest yield (81,155.81 kg ha^{-1}) among the treatment combinations. However, because the GA_3 concentration × fruit-load interaction was not significant for yield, this combination should not be interpreted as statistically superior to the other treatment combinations.
4. **Further economic evaluation is recommended before making a definitive recommendation based on return on investment (ROI).** The present results provided yield data but do not include sufficient information on the production costs, cost of GA_3 application, labor, inputs, gross income, and net returns required to calculate and substantiate ROI. Future studies should therefore include a detailed cost-and-return analysis to determine the economic advantage of each GA_3 concentration and fruit-load treatment.

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Conflict of Interest

The author declares that there is no conflict of interest.

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Table 1: Length of Vines (cm) of Watermelon as Affected by Gibberellic Acid and Fruit Load

TREATMENTS	Length (cm) of Vines
Main plots (GA_3 Concentration)	
C_1-No GA3	196.73[b]
C_2-20 ppm	197.36[a]
C_3-30 ppm	197.46[a]
ANOVA RESULT	**
C.V. (%)	22.21
L.S.D $_{(0.05)}$	0.61
Sub-plot (Fruit-Load)	
T_1-2 Fruits per plant	190.62
T_2-3 Fruits per plant	221.22
T_3-4 fruits per plant	179.72
ANOVA RESULT	Ns
C.V. (%)	0.32
GA3 by Fruit load	
C_1T_1-No GA3 x 2 Fruits per plant	187.53
C_1T_2-No GA3 x 2 Fruits per plant	205.53
C_1T_3-No GA3 x 2 Fruits per plant	178.80
C_2T_1-20 ppm x 3 Fruit per plant	173.86
C_2T_2-20 ppm x 3 Fruit per plant	237.96
C_2T_3-20 ppm x 3 Fruit per plant	251.83
C_3T_1-30 ppm x 4 Fruits per plant	180.333
C_3T_2-30 ppm x 4 Fruits per plant	185.03
C_3T_3-30 ppm x 4 Fruits per plant	173.80
ANOVA RESULT	Ns

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Table 2: Weight of fruits (g) of Watermelon

TREATMENTS	Weight of Fruit (g)
Main plots (GA_3 Concentration)	
C1-No GA3	3974.44[c]
C2-20 ppm	4751.11[b]
C3-30 ppm	5465.56[a]
ANOVA RESULT	**
C.V. (%)	6.91
LSD $_{(0.05)}$	427.66
Sub-plot (Fruit Load)	
T_1-2 Fruits per plant	4691.11[c]
T_2-3 Fruits per plant	4733.33[b]
T3-4 fruits per plant	4766.67[a]
ANOVA RESULT	**
C.V. (%)	1.18
LSD $_{(0.05)}$	57.34
GA3 by Fruit load	
C1T1-No GA3 x 2 Fruits per plant	3913.333
C1T2-No GA3 x 2 Fruits per plant	4740.000
C1T3-No GA3 x 2 Fruits per plant	5420.000
C2T1-20 ppm x 3 Fruit per plant	3976.667
C2T2-20 ppm x 3 Fruit per plant	4746.667
C2T3-20 ppm x 3 Fruit per plant	5476.667
C3T1-30 ppm x 4 Fruits per plant	4033.333
C3T2-30 ppm x 4 Fruits per plant	4766.667
C3T3-30 ppm x 4 Fruits per plant	5500.000
ANOVA RESULT	ns

Table 3: Fruit diameter (cm) of Watermelon

TREATMENTS	Fruit Diameter (cm)
Mainplots (GA_3 Concentration)	
C1-No GA3	47.87[a]
C2-20 ppm	46.71[b]
C3-30 ppm	46.79[a]
ANOVA RESULT	**
C.V. (%)	13.37
LSD$_{(0.05)}$	8.24
Sub-plot (Fruit Load)	
T1-2 Fruits per plant	37.28
T2-3 Fruits per plant	47.32
T3-4 fruits per plant	56.78
ANOVA RESULT	Ns
C.V. (%)	4.32
GA3 by Fruit load	

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C1T1-No GA3 x 2 Fruits per plant	46.34
C1T2-No GA3 x 2 Fruits per plant	35.89
C1T3-No GA3 x 2 Fruits per plant	29.61
C2T1-20 ppm x 3 Fruit per plant	54.43
C2T2-20 ppm x 3 Fruit per plant	49.78
C2T3-20 ppm x 3 Fruit per plant	37.75
C3T1-30 ppm x 4 Fruits per plant	61.67
C3T2-30 ppm x 4 Fruits per plant	54.04
C3T3-30 ppm x 4 Fruits per plant	54.63
ANOVA RESULT	Ns

Table 4: Thickness of the flesh (cm)

TREATMENTS	**No. of Fruit load of per Vine**
Mainplots (GA_3 Concentration)	
C1-No GA3	6.99[a]
C2-20 ppm	7.09[b]
C3-30 ppm	7.21[a]
ANOVA RESULT	**
C.V. (%)	5.48
$LSD_{(0.05)}$	0.49
Sub-plot (Fruit Load)	
T1-2 Fruits per plant	5.96[b]
T2-3 Fruits per plant	7.46[a]
T3-4 fruits per plant	7.86[a]
ANOVA RESULT	**
C.V. (%)	1.46
$LSD_{(0.05)}$	0.18
GA3 by Fruit load	
C1T1-No GA3 x 2 Fruits per plant	6.76[a]
C1T2-No GA3 x 2 Fruits per plant	5.68[b]
C1T3-No GA3 x 2 Fruits per plant	5.43[c]
C2T1-20 ppm x 3 Fruit per plant	8.23[a]
C2T2-20 ppm x 3 Fruit per plant	7.51[b]
C2T3-20 ppm x 3 Fruit per plant	6.65[c]
C3T1-30 ppm x 4 Fruits per plant	8.83[a]
C3T2-30 ppm x 4 Fruits per plant	7.89[b]
C3T3-30 ppm x 4 Fruits per plant	6.86[c]
ANOVA RESULT	**

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Table 5: Sugar Content of Watermelon

Treatment	Sugar
Mainplots (GA_3 Concentration)	
C1-No GA3	10.72
C2-20 ppm	10.74
C3-30 ppm	10.74
ANOVA RESULT	ns
C.V. (%)	2.03
LSD (0.01)	
Sub-plot (Fruit Load)	
T1-2 Fruits per plant	10.84
T2-3 Fruits per plant	10.61
T3-4 fruits per plant	10.74
ANOVA RESULT	ns
C.V. (%)	0.31
LSD (0.01)	
GA3 by Fruit load	
C1T1-No GA3 x 2 Fruits per plant	10.76
C1T2-No GA3 x 2 Fruits per plant	10.99
C1T3-No GA3 x 2 Fruits per plant	10.79
C2T1-20 ppm x 3 Fruit per plant	10.72
C2T2-20 ppm x 3 Fruit per plant	10.54
C2T3-20 ppm x 3 Fruit per plant	10.57
C3T1-30 ppm x 4 Fruits per plant	10.81
C3T2-30 ppm x 4 Fruits per plant	10.64
C3T3-30 ppm x 4 Fruits per plant	10.79
ANOVA RESULT	ns

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Table 6: Yield of Fruit per Hectare Watermelon as Affected

Treatment	Yield per Hectare
Mainplots (GA3 Concentration)	
C1-No GA3	58871.41c
C2-20 ppm	70152.50b
C3-30 ppm	80509.56a
ANOVA RESULT	**
C.V. (%)	4.31
LSD (0.01)	3940.77
Sub-plot (Fruit Load)	
T1-2 Fruits per plant	39744.44
T2-3 Fruits per plant	47511.11
T3-4 fruits per plant	54655.55
ANOVA RESULT	ns
C.V. (%)	1.25
GA3 by Fruit load	
C1T1-No GA3 x 2 Fruits per plant	57856.68
C1T2-No GA3 x 2 Fruits per plant	58894.09
C1T3-No GA3 x 2 Fruits per plant	59863.47
C2T1-20 ppm x 3 Fruit per plant	70067.47
C2T2-20 ppm x 3 Fruit per plant	70220.53
C2T3-20 ppm x 3 Fruit per plant	70169.51
C3T1-30 ppm x 4 Fruits per plant	79846.30
C3T2-30 ppm x 4 Fruits per plant	80526.57
C3T3-30 ppm x 4 Fruits per plant	81155.81
ANOVA RESULT	ns

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