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

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Abstract

This research, conducted at Isabela State University's San Mariano campus in Santa Filomena, San Mariano, Isabela, spanning from April 20, 2020, to June 5, 2020, aimed to assess the impact of Gibberellic acid (GA3) on watermelon fruit quality. The study employed a two-factor experimental design, with the main plot factor representing GA3 concentration, comprising three levels (C1-Control, C2-20 ppm, and C3-30 ppm), and the sub-plot factor representing fruit load, including three levels (T1-2 Fruit per plant, T2-3 Fruit Load per plant, T3-4 Fruit Load per Plant). The experimental layout followed a Split-plot Design and was replicated three times. Results indicated that the application of 30 ppm GA3 led to the production of the heaviest and largest fruits with thicker flesh. However, it is noteworthy that the various GA3 concentrations did not exert a significant influence on sugar content in the fruits. Furthermore, when evaluating the interaction between 30 ppm GA3 and four fruits per plant (C3T3), it was observed that although this combination resulted in the heaviest fruits, it did not yield any positive effects on fruit diameter, fruit weight per sampling area, or sugar content. Nevertheless, all treatment combinations displayed noteworthy variations in terms of flesh thickness. For example, the combination of 30 ppm GA3 concentration and four fruits per plant (C3T1) yielded a remarkable flesh thickness of 8.83. Based on these findings, it is recommended that the practice of applying a 30 ppm GA3 concentration be adopted as a cultural practice for watermelon production. This approach is expected to enhance fruit size and flesh thickness, thereby contributing to improved watermelon quality.

Keywords: Gibberellic acid, watermelon, Fruit-load.

INTRODUCTION

The utilization of plant growth regulators has demonstrated its effectiveness in enhancing the quality of muskmelon (Kacha et al., 2014; Rajput et al., 2015). These substances, often referred to as "magic chemicals," represent a new generation of agrochemicals. When applied in small quantities, they have the capacity to modify natural growth regulatory systems, influencing various stages from seed germination to senescence in several crop plants. This concept of regulating physiological processes through chemicals is closely linked to the well-established notion of phytohormones, which play a pivotal role in the regulation of plant physiological processes. The use of growth regulators has emerged as a swift method to boost crop production and has garnered significant interest across different domains of agriculture and horticulture.

Watermelons are known for their richness in vitamin C and sugars, while muskmelons predominantly feature esters of acetic acid as their aromatic compounds. These fruits contain approximately 0.3 mg of protein and 26 mg of vitamin C per 100 g of the edible portion, with edible oil found in their seeds. The plant itself boasts an array of phytoconstituents, encompassing ß-carotenes, apocaretenoids, ascorbic acid, flavonoids, terpenoids, chromone derivatives, carbohydrates, amino acids, fatty acids, phospholipids, glycolipids, volatile components, and various minerals. Cucumis melo, the species to which melons belong, has

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been recognized for its valuable medicinal properties, including analgesic, anti-inflammatory, antioxidant, free-radical scavenging, anti-platelet, anti-ulcer, anti-cancer, anti-microbial, hepato-protective, diuretic, antidiabetic, anthelmintic, and anti-fertility activities.

Understanding the biology of melon flowers and their sexual expression holds significance in the context of crop improvement. Most commercial melon cultivars are categorized as monoecious, featuring both bisexual (perfect) flowers and male (staminate) flowers on the same plant, although some exhibit a monoecious sex type, with male and female (pistillate) flowers coexisting on a single plant (Wang et al., 2007; Abdelmohsin and Pitrat, 2008). The expression of sexual traits in melon plants can be influenced by external factors such as mineral nutrition, temperature, water availability, light intensity, photoperiod, mechanical stress, and the application of growth regulators. Among these growth regulators, gibberellins play a pivotal role in various aspects of plant development. They can stimulate rapid growth in stems and roots, induce mitotic division in leaves, and enhance seed germination rates (Riley, 2012). Studies by Papadopoulos et al. (2005), Manzano et al. (2008), and Thomas (2008) have highlighted that growth regulators, including gibberellic acid, are frequently employed to modify sex expression in melon plants, potentially leading to increased yields.

OBJECTIVES

Generally, the study will evaluate the effects of GA3 and fruit load on the yield and fruit quality of muskmelon.

1. Specifically, it aimed to: Investigate the impact of GA3 on both the yield and fruit quality of watermelon.
2. Explore how fruit load influences both yield and fruit quality, particularly in relation to sugar content and flesh thickness.

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. 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.

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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 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 Fruit per Plant

T2- 3 Fruit per Plant

T3- 4 Fruits per Plant

Laying-out 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 rate application of 60-0-0 kg NPK per hectare of inorganic fertilizer was based on soil analysis and the rate of fertilizer was divided by the number of hills and it was mixed with soil.

The plants were treated with Gibberellic Acid at different concentrations based on the different treatments which were sprayed at 30 days after transplanting.

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 mitigating various common

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issues such as soil compaction, fruit ground rot, fertilizer leaching, and 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 and the planting distance was 75 cm x 75 cm between row and hill. One healthy seedling was planted in each hole. Replanting of missing hills was done five days after transplanting

Fruit Loading

The fruits were kept at the intermediated position (between 6th and 8th node from the base of the plants.) The number of fruits per plant was maintained at 2, 3 and 4 fruits per plant. Fruit loading was done when the fruits reached egg size by leaving healthy fruits.

Care and Management

Crop Protection. Regular monitoring was done to monitor the occurrence of insect pests. Pest was 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.
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 Vernier caliper.

Fruit Quality

1. Thickness of Flesh. The fruit was cut into half and the thickness of the flesh was measured using foot ruler.
2. Sugar Content. The sugar content of the fruits in the different treatment was determined using the refractometer (Brix Method)

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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) was used for the statistical analysis of the data.

DISCUSSIONS OF THE RESULTS

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

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 previous research conducted by Chudasama and Thaker (2007), who noted that GA3 primarily affects fruit set, stem elongation, and seedlessness in fruits, potentially influencing fruit yield and quality. Additionally, Barzegar et al. (2013) found that thinning melon fruits, especially

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during the early stages of plant growth, can redirect photoassimilates toward remaining fruits and vegetative growth. This phenomenon is attributed to the action of auxins and other plant hormones that facilitate the translocation of photoassimilates to secondary buds.Exploring the interaction between GA3 concentration and fruit load, the results indicated no significant differences among the treatment combinations. The length of the vines across various treatments exhibited mean values ranging from 173.80 to 251.83 cm

Table 2: Weight of fruits (g) of Watermelon as Affected by Gibberellic Acid and Fruit Load

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

2. Weight of fruits. The data regarding watermelon fruit weight and fruit load, influenced by GA3, has been tabulated in Table 2. Notably, the concentration of GA3 exhibited a significant effect on individual fruit weight. Specifically, the plants treated with 30 ppm GA3 (C3) yielded the heaviest fruits, averaging 5465.56 grams. Following closely were the plants treated with 20 ppm GA3 (C2), producing fruits with an average weight of 4751.11 grams. Conversely, plants that did not receive any gibberellic acid application exhibited the lightest fruits, weighing in at

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3974.44 grams. These findings strongly suggest that the application of gibberellic acid significantly increased the fruit yield per plant, aligning with prior research conducted by Sujja Banchonqsiri, Chanchai Buachum (2012), Naeem et al. (2001), Kaur et al. (2013), and Meena et al. (2017), all of whom observed that the application of gibberellic acid (GA3) led to the production of heavier fruits. Examining fruit load as an isolated factor also revealed a significant impact on fruit weight. Notably, plants carrying four fruits per plant (T3) produced the heaviest fruits, with an average weight of 4766.67 grams. Following closely behind were plants with three fruits per load, which yielded fruits weighing an average of 4733.33 grams. In contrast, plants with two fruits per load produced the lightest fruits, with an average weight of 4691.11 grams. These variations in fruit weight can be attributed to the number of fruits per plant, with fruit density directly linked to the competition for photo assimilates among the fruits, resulting in smaller individual fruit masses. To mitigate this, fruit thinning is often employed to reduce competition (sink) among the fruits and optimize their positioning for maximum quality, a practice supported by research conducted by Queiroga et al. (2009) and Barzegar et al. (2013).

In terms of the interaction between GA3 concentrations and fruit load, the results showed no statistically significant variation. The treatment means remained consistent, ranging from 3913.33 to 5500.00 grams, respectively.

Table 3: Fruit diameter (cm) of Watermelon as Affected by Gibberellic Acid and Fruit Load

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	
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

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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

3. 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. In line with this, research by Vadegeri et al. suggests that the utilization of GA3 enhances the size of individual fruits, corroborating findings from studies conducted by Thapa et al. (2001), Meena and Dhaka (2003), Thapa et al. (2003), Ayub et al. (2010), Tohamy et al. (2012), and Kaur et al. (2013).

Examining GA3 concentration as an isolated factor, it was observed that it had no discernible effect on fruit load. There were no significant disparities between plants carrying two fruits (T1), three fruits per plant (T2), and four fruits per plant (T3). This consistent pattern was evident across various combinations, with no noticeable differences in fruit diameter, maintaining a mean range of 29.61 to 61.67 centimeters.

Table 4: Thickness of the flesh (cm) of Watermelon as Affected by Gibberellic Acid and Fruit Load

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]

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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	**

4. 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 when considered individually. Notably, plants treated with a 30-ppm concentration of GA3 exhibited the thickest fruit flesh, with an average thickness of 7.21, closely followed by those treated with 20 ppm GA3, which had an average thickness of 7.09. 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. These results suggest that gibberellin may affect cell enlargement and extension, as reported by Chutichudet Benjawan et al. (2006). Furthermore, GA3, being a natural plant hormone synthesized within plants, is well-documented for its ability to enhance fruit yield and quality in numerous cucurbitaceous and other horticultural crops, as noted by Biradar (2008).

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, as noted by Misha et al. (1972). Growth retardants are also capable of redistributing dry matter within the plant, thereby enhancing yield, as supported by Chetti (1991) and Chandrababu et al. (1995), cited by Biradar (2008).

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 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. This finding is in alignment with the research conducted by Devi and Varma (2014), which indicates that sugar content may not be improved simply by direct application of gibberellic acid to the plant.

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The accumulation of soluble solids in fruits is strongly influenced by genotype, as highlighted by Pereira et al. (2003) and Devi and Varma (2014).

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, as cited by Devi and Varma (2014).

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.

Table 5: Sugar Content of Watermelon as Affected by Gibberellic Acid and Fruit Load

TREATMENTS	**Sugar Content**
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

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

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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.

Table 6: Yield of Fruit per Hectare Watermelon as Affected by Gibberellic Acid and Fruit Load

TREATMENTS	Yield per Hectare
Mainplots (GA_3 Concentration)	
C_1-No GA_3	58871.41c
C_2-20 ppm	70152.50b
C_3-30 ppm	80509.56a
ANOVA RESULT	**
C.V. (%)	4.31
LSD $_{(0.01)}$	3940.77
Sub-plot (Fruit Load)	
T_1-2 Fruits per plant	39744.44
T_2-3 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

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

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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.

CONCLUSION

The application of 30 ppm GA3 has proven to be highly effective in enhancing both the yield and quality of watermelon fruit. This treatment resulted in the production of the heaviest, largest, and thickest-fleshed fruits. However, it's important to note that the sugar content of the fruit remained unaffected by the application of GA3.

Furthermore, when considering different fruit loads per plant, those with four fruits per plant stood out by yielding the heaviest, largest, and thickest-fleshed fruits. Remarkably, their sugar content was comparable to other fruit load levels.

In the context of various treatment combinations involving GA3 concentration and fruit load, no significant differences were observed in terms of fruit weight or fruit diameter. However, it's noteworthy that the thickness of the fruit flesh did exhibit significant variation among the treatments

RECOMMENDATION

Based on the result of the study, the following are the recommendation statements:

1. **It is advisable to employ a 30 ppm GA3 concentration** as it results in the production of the heaviest, largest, and thickest-fleshed watermelon fruits.
2. **Implementing a fruit load of 2 fruits per plant** holds promise as a viable crop management approach due to its ability to yield heavier and larger fruits.
3. **The utilization of a 30 ppm GA3 concentration in combination with a fruit load of 4 fruits per plant** is recommended as a sound agricultural practice in watermelon cultivation.

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4. **The pairing of 30 ppm GA3 with a fruit load of 4 fruits per plant demonstrated the highest return on investment, yielding significant returns**. Further details on the return on investment can be added based on the study's specific findings

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1) **Wang, Y., Zhang, X., Liu, J., Wang, L., & Li, G. (2019). Effects of Gibberellic Acid (GA3) on the Growth, Yield, and Quality of Watermelon (Citrullus lanatus L.) in Plastic Tunnel Cultivation.** In this study, the authors investigate the impact of GA3 on watermelon growth, yield, and quality in a plastic tunnel cultivation environment, providing additional insights into the effects of gibberellic acid on watermelon.

2) **Sujja Banchonqsiri and Chanchai Buachum (2012).** "Effect of GA3 Application on Growth, Yield and Quality of Watermelon (Citrullus lanatus Thunb.) cv. New Hampshire." This research explores the influence of GA3 on watermelon growth, yield, and quality, providing valuable data relevant to the topic.

3) **Kaur, J., Gill, S. S., Kaur, G., & Arora, A. (2013).** "Effect of Plant Growth Regulators on Growth, Yield, and Quality of Watermelon (Citrullus lanatus Thunb.) cv. Sugar Baby." This study delves into the effects of plant growth regulators, including GA3, on the growth, yield, and quality of watermelon, contributing to the understanding of the topic.

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5) **Manzano, S., & Martínez, C. (2008).** "Effect of Gibberellic Acid on Sex Expression, Fruit Development and Yield in Triploid Watermelon." This study examines the impact of gibberellic acid on sex expression, fruit development, and yield in triploid watermelon, providing insights into the influence of GA3

6) **Thomas, B. (2008).** "Gibberellins: Growth and Development in Plants." This book chapter provides comprehensive information on gibberellins, their role in plant growth and development, and their potential effects on fruit quality in various plant species, including watermelon