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Growth Response and Yield Performance of Green and Bulb-type Multiplier Onion (Allium cepa gr. aggregatum) Applied with Foliar Organic Concoctions

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Abstract

This study aimed to evaluate the effects of different foliar organic concoctions on the growth and yield of multiplier onions (Allium cepa var. aggregatum). The treatments included a Farmers' practice (Control) and four foliar organic concoctions: Oriental Herbal Nutrient, Fermented Plant Juice, Fermented Fruit Juice and Kuhol Amino Acid. Key parameters measured were plant height, number of leaves, leaf length, bulb diameter, neck diameter, and yield, both in terms of average and total weight. The results demonstrated that Fermented Fruit Juice consistently produced the greatest plant height, number of leaves, and leaf length in green type onions, indicating robust vegetative growth. Similarly, Fermented Plant Juice and Fermented Fruit Juice showed superior performance in bulb onions. Fermented Fruit Juice also resulted in the highest bulb number and diameter, contributing to the greatest average and total weight of both green and bulb onions. The control group provided a useful baseline but was generally outperformed by the organic treatments across most parameters. Fermented Fruit Juice emerged as the most effective treatment, followed closely by Oriental Herbal Nutrient and Fermented Plant Juice. Kuhol Amino Acids showed potential but delivered mixed results, suggesting the need for further optimization. Overall, the study highlights the significant benefits of using organic nutrient solutions in multiplier onion cultivation, offering sustainable and productive alternatives to conventional practices.

Keywords: *Bulb-type multiplier onion, Fermented Fruit Juice, Fermented Plant Juice, Green-type multiplier onion, Kuhol Amino Acid, Oriental Herb Nutrient*

Introduction

The global agricultural production system faces significant challenges, including high food demand from a growing population, escalating poverty and malnutrition, and the mismanagement of natural resources. These issues are

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compounded by the unprecedented consequences of global climate change, the shrinking availability of cultivable land, and the intensification of farming practices, all of which further impede sustainable food production. Therefore, adopting an environmentally friendly and sustainable farming approach is essential to ensure a stable global food supply.

The application of organic concoctions is considered an eco-friendly, efficient, and widely accepted green technology to enhance plant productivity while maintaining ecological balance and ensuring safe food for humans (Dela Cruz et al., 2019). These organic concoctions and extracts are beneficial for plants, animals, and even humans. For example, Oriental Herb Nutrient (OHN) and Lactic Acid Bacteria Serum (LABS) can be used by humans as probiotics and antibacterial agents to aid digestion.

For plants, organic concoctions can accelerate the decomposition of waste materials into soil fertilizer, promote plant growth due to the presence of auxin hormones, and serve as natural pesticides using ingredients like panyawan, tobacco, and chili. For animals, these concoctions can be added to drinking water to enhance digestion and act as antibacterial agents.

In the context of intensive farming that relies heavily on synthetic fertilizers and pesticides, organic concoctions offer a viable alternative. They can replace chemical-based fertilizers, pesticides, fungicides, repellents, growth enhancers, and other synthetic ingredients used for plants and animals. The production of these organic concoctions involves fermentation, which enhances their potency through the action of beneficial microorganisms.

Multiplier onion is considered a prime cash crop in the Philippines, prompting the country to emphasize improving its production and safety while maximizing the use of its limited land area. In late 2023, the price of onions surged to around Php. 700.00 per kilogram, significantly affecting the general population since onions are a staple in Filipino cooking. Filipinos consume approximately 17,000 metric tons of onions every month. The price surge is due to a combination of pest damage, adverse climate conditions, inflation, and importation challenges, which have left rural farmers particularly vulnerable. The Philippines faces extreme weather conditions, and climate change has exacerbated these issues. Heavy rains have battered farming communities, leading to a nationwide onion supply shortage.

As the disposable income of the population increases, so does the demand for onions. However, despite a significant increase in production over the past decade, local production still fails to meet consumption needs due to low land productivity and persistent pest problems. Additionally, the Philippine government exports thousands of tons of onions in fresh and chilled forms, costing millions of dollars. This export practice further strains the local supply, contributing to high prices and availability issues in the domestic market.

Given the advantages and potential benefits of organic concoctions, the study was conceptualized to assess how these organic concoctions affect the growth and yield attributes of multiplier onion in the controlled settings. Furthermore, the study looked into the possibility of producing onion using organic concoctions as fertilizer substitute for the synthetic inorganic fertilizer without affecting the yield level.

The study was conceived with the aim of exploring the advantages and potential benefits of organic concoctions, particularly in their impact on the growth and yield attributes of multiplier onion in within controlled settings in Luna, Apayao. Additionally, the study investigated the possibility of utilizing organic concoctions as a substitute for synthetic inorganic fertilizers in onion production, while maintaining or even enhancing yield levels.

Methodology

The study on the growth and yield performance of green and bulb type multiplier onion (Allium cepa gr. aggregatum) applied with foliar organic concoctions grown under controlled condition was conducted at Barangay San Gregorio, Luna, Apayao from June to August 2023. The experiment was established inside a greenhouse adjacent into a small stream which was the source of irrigation of the experiment.

The study was laid-out in a completely randomized design with four (4) replications. A total of 2,000 bulbs of multiplier onions were planted in a polyethylene bag with a size of 2.5 x 2.5 x 4 inches. The treatments were the different foliar organic concoctions; Oriental Herbal Nutrient, Fermented Plant Juice, Fermented Fruit Juice and Kuhol Amino Acid sprayed to the green and bulb type multiplier "*lasuna*" onion weekly. The Conventional practice using complete fertilizer applied as basal and ammonium sulfate applied as top dress fertilizer.

Treatments with their corresponding composition and application are as follows:

Treatment	Content	Application*
T1 - Conventional practice	14-14-14 21-0-0	Basal application of 14-14-14 Top dress application of 21-0-0 @20 DAP and 35DAP
T2 - Oriental Herb Nutrient	Fermented ginger (native) + onion (red pinoy) + garlic (Taiwan variety)	Green-type - Applied @7, 14, 21, 28, 35, and 42 DAP Bulb-type - Applied @7, 14, 21, 28, 35, 42, 49 and 56 DAP
T3 - Fermented Plant Juice	Fermented malunggay leaves	Green-type - Applied @7, 14, 21, 28, 35, and 42 DAP Bulb-type - Applied @7, 14, 21, 28, 35, 42, 49 and 56 DAP
T4 - Fermented Fruit Juice	Fermented tomato (Diamante Max)	Green-type - Applied @7, 14, 21, 28, 35, and 42 DAP Bulb-type - Applied @7, 14, 21, 28, 35, 42, 49 and 56 DAP
T5 - Kuhol Amino	Kuhol (native)	Green-type - Applied @7, 14, 21, 28, 35,

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Acid		and 42 DAP Bulb-type - Applied @7, 14, 21, 28, 35, 42, 49 and 56 DAP
T5 - Kuhol Amino Acid	Kuhol (native)	Green-type - Applied @7, 14, 21, 28, 35, and 42 DAP Bulb-type - Applied @7, 14, 21, 28, 35, 42, 49 and 56 DAP

*DAP-days after planting

Treatment Preparation

The concoctions were prepared and applied according to the protocol established by the Department of Agriculture - Agricultural Training Institute, Regional Training Center, Cordillera Administrative Region (DA-ATI-RTC,CAR). The substrates were gathered along with detailed information, including the collection locations and the specific species or varieties of the materials used.

Oriental Herbal Nutrient (OHN)

For the mixture of OHN, one kg of native ginger, 0.5 kg of red pinoy onion, and 0.5 kg of Taiwan garlic were sliced into quarter-inch pieces and mixed in a container with one liter of pure coconut vinegar. Two kilograms of brown sugar were then thoroughly mixed in. The mixture was covered, labeled with the name and date of fermentation, and left to ferment for 7-10 days in a cool, shaded place. After fermentation, the liquid was extracted into another container.

Fermented Plant Juice (FPJ)

To make the FPJ concoction, two kilograms of malunggay leaves were finely chopped and mixed thoroughly with two kg of brown sugar in a container. The mixture was then covered and labeled with the name and date of fermentation. It was left to ferment for 7-10 days in a cool, shaded place. After the fermentation period, the liquid was extracted into another container.

Fermented Fruit Juice (FFJ)

The FFJ was made using two kg of ripe Diamante Max tomatoes, finely sliced and smashed into quarter-inch pieces, then placed in a container with two kg of brown sugar, thoroughly mixed. The mixture was covered and labeled with the name and date of fermentation. It was left to ferment for 7-10 days in a cool, shaded place. After the fermentation period, the liquid was extracted into another container.

Kuhol Amino Acid (KAA)

The KAA mixture was made using two kg of native kuhol that were washed, crushed, and placed in a container with two kg of brown sugar, thoroughly mixed. The mixture was covered and labeled with the name and date of fermentation, then left to ferment for 7-10 days in a cool, shaded place. After the fermentation period, the liquid was extracted into another container.

Management of the Experimental Area

Planting Materials

The Batanes variety multiplier onion (lasuna) bulb was procured from local farmer of Ilocos Norte. This was used as planting materials for the experimental study.

Soil Media Preparation and potting

The planting medium was prepared consisting of top soil and carbonized rice hull with a ratio of 2:1 (garden soil: carbonized rice hull). The soil and carbonized rice hull were then mixed and sterilized by pouring hot water to the prepared media. A polyethylene bag with a size of 2.5 x 2.5 x 4 inches was filled with mixture.

Planting

One tiller/bulb of multiplier "lasuna" onion (Batanes variety) was planted for each polyethylene bag. Fifty (50) bulbs were planted in each treatment for both green and bulb type. A total of 2,000 bulbs of multiplier onion were planted in the experimental study. The planting materials were purchased from a local farmer of Ilocos Norte and initial weight and equatorial diameter were recorded prior to planting.

Treatment application

All treatments were applied through spraying except for the Control (Farmers' Practice). There was a 1-week interval on the application of different foliar organic concoctions. For the control which is the conventional method (Farmers' Practice), inorganic fertilizers were applied: 2.22 grams per hill of complete fertilizer (14-14-14) as basal application. Ammonium sulfate were applied at the rate of 1.33 grams and 1.67 grams at twenty (20) and thirty-five (35) days after planting (DAP), respectively.

The organic concoctions were applied by mixing two tablespoons of the concoction with one liter of water and spraying this mixture onto the multiplier onions.

Mulching

Mulching was done right after planting. Rice straw was used as mulching material. Mulching helps retain moisture.

Watering

Watering was done every morning for a two days interval.

Weeding

Hand weeding was done frequently to avoid weeds competing the multiplier "*lasuna*" onion.

Harvesting

Multiplier "*lasuna*" onion was harvested and uprooted at 45 days after planting for green type and 60 days for bulb type. The harvested samples were cleaned manually.

Data Gathered

Data on growth and yield components of both green and bulb type multiplier "lasuna" onion were recorded from the experimental study with 20 samples which was selected prior to planting.

Green type

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Plant height (cm): This was measured from the ground to the tip of the leaves from twenty sample plants which was selected prior to planting. The data was gathered weekly.

Leaf number: The total number of leaves per plant were counted from twenty sample plants. The data was gathered weekly.

Leaf length (cm): This was measured from the sheath to tip of the leaf from the sample plants using a ruler.

Number of bulbs: The total number of bulbs per plant were counted from twenty sample plants.

Bulb diameter in clump/single bulb (cm): The average bulb diameter of twenty sample bulbs were measured at the maximum wider of bulb using vernier caliper.

Neck diameter (cm): The average neck diameter of twenty sample bulbs were measured using a vernier caliper and expressed in centimeter after harvest.

Weight of 20 samples of green type multiplier onion: This is referring to the weight of 20 sample plants of green type multiplier onion. The data was gathered by weighing the 20 samples of multiplier onion (green type/grams).

Bulb type

Plant height (cm): This was measured from the ground to the tip of the leaves from twenty sample plants which was selected prior to planting. The data was gathered weekly.

Leaf number: The total number of leaves per plant were counted from twenty sample plants. The data was gathered weekly.

Leaf length (cm): This was measured from the sheath to tip of the leaf from the sample plants using a ruler.

Number of bulbs: The total number of bulbs per plant were counted from twenty sample plants.

Bulb diameter in clump/single bulb (cm): The average bulb diameter of twenty sample bulbs in clump and in single bulb were measured at the maximum wider of bulb using vernier caliper.

Weight of 20 samples of green type multiplier onion: This is referring to the weight of 20 sample plants of bulb type multiplier onion. The data was gathered by weighing the 20 samples of multiplier onion (bulb type/grams).

Total weight: The data was gathered by weighing the bulb type multiplier onion samples as well as the non-sample plants using a weighing scale. Weights of bulb type multiplier onion sample and non-sample plants for every treatment plot was recorded separately and expressed in grams.

Data Analysis

Data was analyzed using Analysis of Variance (ANOVA) based on Completely Randomized Design (CRD). Significant treatment was analyzed using Least Significant Difference at 5% and 1% respectively.

Discussion and Findings

Initial weight and initial equatorial diameter

The initial weight and equatorial diameter of the planting materials were recorded (Table 1). The samples used for each treatment were statistically the same in terms of the starting weight and equatorial diameter, removing the bias due to the planting materials. The planting materials had weight ranging from 3.99-4.48 grams/sample for both the green and bulb type. The initial equatorial diameter ranged from 1.25-1.34 cm.

Table 1. Initial weight and initial equatorial diameter of the planting materials.

Treatments	Initial weight (grams)		Initial Equatorial Diameter (cm)	
	Green Type	Bulb Type	Green Type	Bulb Type
T1 - Control	4.31	4.07	1.34	1.34
T2 - OHN	4.19	4.18	1.25	1.29
T3 - FPJ	4.48	4.08	1.34	1.26
T4 - FFJ	4.28	4.31	1.29	1.32
T5 - KAA	3.99	4.08	1.25	1.28
Statistical Inference	*ns*	*ns*	*ns*	*ns*
CV (%)	13.95	7.80	8.41	6.66

Green Type Multiplier Onion

Plant height

The weekly plant height of green-type multiplier onions treated with different foliar organic concoctions was recorded and summarized in Table 2. The multiplier onions managed under conventional practices (control) exhibited the greatest initial plant height, reaching 4.20 cm in the first week. This early growth advantage is attributed to the farmers' practice of using inorganic fertilizers, which provided readily available nutrients that the onions could absorb and utilize immediately.

Onions treated with FFJ exhibited the highest mean height at 12.82 cm, closely followed by the control group at 12.78 cm. FFJ proved effective in enhancing the plant height of multiplier onions 14 days after planting (DAP), consistent with Skimin et al. (2017), who reported that FFJ boosts auxin production, a phytohormone that accelerates plant growth. From 21 DAP to maturity, FPJ treatment resulted in the greatest plant height among all treatments, indicating its significant positive effect on the growth of multiplier onions. However, all treatments showed a notable decrease in height around the 35th week until the maturity of green-type multiplier onions. While the different foliar organic concoctions did not significantly impact the overall plant height of the green-type multiplier onion, OHN, FPJ, and KAA treatments resulted in greater plant heights compared to the control.

Table 2. Plant height of green-type multiplier onion (cm).

TREATMENTS	7 DAP	14 DAP	21 DAP	28 DAP	35 DAP	42 DAP	MAT
T1 – Control	4.20	12.78	19.37	25.13	23.64	22.93	22.77
T2 – OHN	3.75	11.31	19.89	26.21	25.77	24.44	24.05
T3 – FPJ	3.88	12.52	20.79	26.65	25.83	24.90	24.61
T4 – FFJ	3.69	12.82	20.36	25.49	24.15	22.80	22.48
T5 - KAA	4.08	12.60	19.70	25.86	25.59	24.53	24.06
Statistical Inference	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*
CV (%)	15.03	15.78	12.47	9.96	10.71	10.71	10.74

Number of leaves

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The weekly number of leaves of green-type multiplier onions treated with different foliar organic concoctions is detailed in Table 3. At 7 days after planting (DAP), KAA and FPJ treatments showed the highest number of leaves, with counts of 5.25 and 5.0, respectively. This suggests that KAA and FPJ effectively promote leaf development in the early stages of growth. Furthermore, FFJ treatment resulted in the highest leaf count at 14, 21, and 28 DAP, aligning with Skimin et al. (2017), who found that FFJ enhances auxin production, a phytohormone that accelerates plant growth. By 35 DAP, the control, FFJ, and KAA treatments each produced 15 leaves. At maturity, the control treatment exhibited the highest number of leaves at 14.25, indicating that the farmers' practice of using inorganic fertilizers supports leaf growth from 42 DAP to maturity. Statistically, the different foliar organic concoctions did not significantly affect the number of leaves from 14 DAP to maturity.

Table 3. Number of leaves of green-type multiplier onion

TREATMENTS	7 DAP	14 DAP	21 DAP	28 DAP	35 DAP	42 DAP	MAT
T1 – Control	4.50^{ab}	11.50	12.50	15.25	15.00	14.25	13.75
T2 – OHN	3.50^{b}	10.25	12.50	15.00	14.25	13.00	12.75
T3 – FPJ	5.00^{a}	11.75	12.25	14.75	14.50	13.75	13.25
T4 – FFJ	3.75^{b}	12.25	13.75	15.75	15.00	13.75	12.75
T5 - KAA	5.25^{a}	10.75	12.50	14.25	15.00	13.75	13.50
Statistical Inference	*	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*
CV (%)	16.07	13.32	15.28	12.29	11.31	10.49	11.07

Leaf length

Based on the leaf length measurements of onion samples treated with various organic concoctions, FPJ resulted in the longest leaf length at 23.53 cm, followed closely by OHN at 22.89 cm. Samples treated with KAA also exhibited substantial leaf growth, with an average leaf length of 22.75 cm. These results indicate that FPJ, OHN, and KAA are highly effective in promoting strong leaf development.

Although the differences in leaf length among the treatments were not statistically significant compared to the control, the data suggests a trend where the organic concoctions contributed to longer leaf growth than the conventional methods. This observation points to the potential benefits of using organic foliar treatments to enhance leaf development in multiplier onions, even if the results do not reach statistical significance. Thus, while the control treatment still performed well, the use of organic concoctions such as FPJ, OHN, and KAA appears to offer an advantage in promoting leaf length, contributing to overall plant vigor and potential yield.

Table 4. Leaf length of green-type multiplier onion (cm).

TREATMENTS	REPLICATION				MEAN
	I	II	III	IV	
T1 - Control	20.9	23.15	18.6	24.9	21.89
T2 - OHN	24.15	20.55	22.15	24.7	22.89
T3 - FPJ	27.9	20.65	22.95	22.6	23.53
T4 - FFJ	22.95	20.1	20.5	21.86	21.35
T5 - KAA	22.35	21.95	20.45	26.25	22.75

CV (%) = 10.61

Number of bulbs

The onions treated with FFJ produced the highest number of bulbs, averaging 7 bulbs per plant, indicating that this organic concoction is particularly effective in promoting bulb formation. This finding aligns with the research by *Skimin et al.* (2017), which reported that FFJ enhances the production of auxin, a phytohormone known to accelerate plant growth and development. In comparison, FPJ-treated samples had an average of 6.75 bulbs, while the control, OHN, and KAA treatments each resulted in 6.5 bulbs per plant. These results suggest that among the treatments tested, FFJ is the most effective in increasing bulb numbers, potentially offering a significant advantage for growers seeking to maximize onion yield through the use of organic foliar concoctions. The enhanced bulb production associated with FFJ could be attributed to its role in stimulating hormonal activity and overall plant health.

Table 5. Number of bulbs of green-type multiplier onion.

TREATMENTS	REPLICATION				MEAN
	I	II	III	IV	
T1 – Control	6	6	6	8	6.5
T2 – OHN	7	6	6	7	6.5
T3 – FPJ	8	7	6	6	6.8
T4 – FFJ	7	7	7	7	7.0
T5 – KAA	6	6	7	7	6.5

CV (%) = 10.83

Bulb Diameter in Clump

The Table 6 shows the bulb diameter of multiplier onion in clump (green) applied with different foliar organic concoctions grown under controlled condition. Based on the provided bulb diameters of multiplier onion in clump (green) for each treatment, the treatments, including Control, OHN, FPJ, FFJ, and KAA, do not show a noticeable impact on the bulb diameter of multiplier onion in clump (green) based on the data. The differences in bulb diameter among the treatments are very small, with values ranging from 2.89 cm to 2.98 cm. All treatments seem to have a similar effect on bulb diameter of multiplier onion in clump (green). Based on the results, there is no significant variation in bulb diameter among the treatments, showing that none of the treatments have a substantial effect on the bulb diameter of multiplier onion in clump (green).

Table 6. Bulb diameter of green-type multiplier onion in clump (cm).

TREATMENTS	REPLICATION				MEAN
	I	II	III	IV	
T1 - Control	2.87	2.85	2.87	2.96	2.89
T2 - OHN	3.04	2.99	2.94	2.96	2.98
T3 - FPJ	3.01	2.96	2.95	2.87	2.95
T4 - FFJ	2.98	3.1	2.95	2.86	2.97
T5 - KAA	3.01	2.92	2.88	3.02	2.96

CV (%) = 2.26

Bulb Diameter in Single Bulb

The results of the multiplier onion single bulb (green) diameters for each treatment show that OHN has the biggest bulb diameter,

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measuring 1.27 cm. This suggests that this treatment is the most successful in encouraging single bulb growth in the green stage. With bulb diameters of 1.25 cm and 1.24 cm, respectively, KAA and FFJ demonstrate excellent efficacy in fostering single bulb growth. A modest rise in bulb diameter, measuring 1.20 cm, is also visible in FPJ. With a bulb diameter of just 1.14 cm, control is the treatment that is least effective at encouraging the growth of a single bulb during the green stage. According to the findings, KAA and FFJ treatments are closely trailed by the OHN treatment in terms of its ability to encourage single bulb diameter growth in the green stage. The control treatment is the least effective, but the FPJ treatment exhibits a moderate level of effectiveness. Regarding the single bulb (green type) multiplier onion, the bulb diameter was not significantly affected by the various foliar organic mixtures.

Table 7. Bulb diameter of green-type multiplier onion in single bulb (cm).

TREATMENTS	REPLICATION				MEAN
	I	II	III	IV	
T1 - Control	1.15	1.21	1.12	1.07	1.14
T2 - OHN	1.42	1.22	1.18	1.25	1.27
T3 - FPJ	1.19	1.25	1.23	1.12	1.20
T4 - FFJ	1.21	1.31	1.15	1.28	1.24
T5 - KAA	1.23	1.19	1.25	1.31	1.25

CV(%) = 5.87

Neck diameter

The neck diameter of green-type multiplier onions grown under controlled conditions and treated with various foliar organic mixtures is displayed in Table 8. FFJ has the biggest neck diameter at 0.60 cm, indicating that this treatment is the most successful in encouraging neck development in the green stage, based on the multiplier onion (green) neck diameters for each treatment. This is consistent with research by *Skimin et al.* (2017), who found that using FFJ increases auxin synthesis, a phytohormone that speeds up plant development. Neck diameters of 0.57 cm and 0.56 cm, respectively, are displayed by KAA and FPJ, demonstrating high efficacy in stimulating neck growth. At 0.55 cm, the control exhibits a slight rise in neck diameter. With a neck diameter of only 0.46 cm, OHN is the therapy that promotes neck growth in the green stage the least among the others. According to the findings, the FFJ treatment is most successful in encouraging the increase of neck diameter in the green stage, with the KAA and FPJ treatments coming in close second. The OHN treatment is the least effective, while the control treatment has a moderate level of effectiveness. The neck diameter (green type) of the multiplier onion was not considerably impacted by the various foliar organic mixtures.

Table 8. Neck diameter of green-type multiplier onion (cm).

TREATMENTS	REPLICATION				MEAN
	I	II	III	IV	
T1 - Control	0.36	0.53	0.67	0.63	0.55
T2 - OHN	0.34	0.48	0.42	0.59	0.46
T3 - FPJ	0.47	0.6	0.57	0.6	0.56
T4 - FFJ	0.5	0.64	0.61	0.65	0.60
T5 - KAA	0.46	0.62	0.61	0.58	0.57

CV(%) = 17.19

Yield

The average weight of 20 samples of multiplier onions (green type/grams) cultivated under controlled conditions and treated with various foliar organic mixtures is displayed in Table 9. FFJ exhibits the greatest average weight at 359.86 grams, indicating that this treatment is the most effective in raising the weight of multiplier onion samples. This information is based on the average weight of 20 samples of multiplier onions (green type/grams) for each treatment. This is consistent with research by Skimin et al. (2017), who found that using FFJ increases auxin synthesis, a phytohormone that speeds up plant development. The average weights of the OHN and Control treatments are 353.45 grams and 350.20 grams, respectively, demonstrating a significant degree of efficacy in raising sample weight. At 344.35 grams, KAA exhibits a substantial increase in weight. With an average weight of 340.05 grams, FPJ is the treatment that is least successful in raising the weight of multiplier onion samples among the other treatments. There was no significant difference in the average weight of 20 samples of multiplier onions (green type/grams) across the various foliar organic mixtures.

Table 9. Yield of 20 samples of green-type multiplier onion (grams).

TREATMENTS	REPLICATION				MEAN
	I	II	III	IV	
T1 - Control	460.40	289.80	293.80	356.80	350.20
T2 - OHN	407.40	343.40	286.40	376.60	353.45
T3 - FPJ	408.60	331.80	295.00	324.80	340.05
T4 - FFJ	323.22	370.20	335.60	410.40	359.86
T5 - KAA	350.20	287.80	319.60	419.80	344.35

CV(%) = 16.22

Bulb Type Multiplier Onion

Plant Height

The weekly plant height of bulb-type multiplier onions grown under controlled conditions and treated with various foliar organic mixtures is displayed in Table 10. From the first to the eighth week, the bulb-type multiplier onion grown under the farmers' practice (control) shows the highest average plant height. The multiplier onion can swiftly absorb nutrients that are abundantly available thanks to farmers' use of inorganic fertilizers. At maturity, KAA has the maximum plant height of 17.9 cm, exceeding the control. This suggests that when bulb-type multiplier onions reach maturity, KAA is the most efficient foliar organic treatment. According to the results, from the fifth week until the bulb-type multiplier onion reaches maturity, the plant height of every treatment declines.

Based on statistical analysis, the plant height of the bulb-type multiplier onion was not significantly impacted by the various foliar organic mixtures.

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Table 10. Plant height of bulb-type multiplier onion (cm)

TREATMENTS	7 DAP	14 DAP	21 DAP	28 DAP	35 DAP	42 DAP	49 DAP	56 DAP	MAT
T1 – Control	4.42	13.36	21.32	27.53	26.85	26.35	24.19	21.55	17.70
T2 – OHN	3.72	11.46	19.57	26.00	25.56	24.77	22.54	20.20	16.96
T3 – FPJ	3.54	10.84	19.27	26.15	25.58	25.30	23.75	20.80	17.28
T4 – FFJ	3.65	12.38	20.32	25.84	25.26	24.77	22.11	18.73	15.81
T5 - KAA	3.69	11.47	19.16	26.48	25.92	25.36	23.17	20.92	17.90
Statistical Inference	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*
CV(%)	15.81	17.32	10.33	7.65	7.93	7.37	8.59	9.31	8.46

Number of Leaves

The weekly leaf count of bulb-type multiplier onions produced under controlled conditions and treated with various foliar organic mixtures is displayed in Table 11. The Control treatment has the most leaves with 5.25 seven days after planting (DAP). This suggests that the farmers' use of inorganic fertilizers is most effective at encouraging leaf growth at this time. On the second week following planting, both the FFJ treatment and the control exhibit the largest number of leaves (11.5), suggesting that both the FFJ treatment and the farmers' use of inorganic fertilizer are equally successful at fostering leaf growth at 14 days after planting. Findings by Skimin et al. (2017) indicate that FFJ increases auxin synthesis, a phytohormone that speeds up plant development. With 13.25 leaves at 21 days post-planting, the FFJ treatment is the most successful in stimulating leaf growth. FPJ had the most leaves with 15.25, indicating that this treatment is the most successful in encouraging leaf growth at 28 days after planting. This is based on the quantity of leaves at 28 days after planting (bulb) for each treatment. With 15.25 leaves after 35 days post-planting, the FPJ treatment is the most successful in stimulating leaf growth. According to statistics, the number of leaves on a multiplier onion from the seventh to the thirty-fifth day after planting (DAP) was not significantly impacted by the various foliar organic mixtures.

FPJ had the most leaves at 14, which suggests that this treatment is the most successful in encouraging leaf growth at 42 days after planting, based on the number of leaves at 42 days after planting for each treatment. At a 5% level, the various foliar organic mixtures have a substantial impact on the multiplier onion's leaf count forty-two (42) days after planting (DAP). The FPJ treatment is the most effective in promoting leaf growth of bulb-type multiplier onions from 49th day up to maturity, as indicated by the highest number of leaves from 49th day up to maturity, based on the number of leaves at 49 days after planting (bulb) for each treatment. According to statistics, the various foliar organic mixtures had no noticeable impact on the multiplier onion's leaf count from day 49 of bulb-type multiplier onion maturity.

Table 11. Number of leaves of bulb-type multiplier onion

TREATMENTS	7 DAP	14 DAP	21 DAP	28 DAP	35 DAP	42 DAP	49 DAP	56 DAP	MAT
T1 – Control	5.25	11.50	12.75	14.50	14.25	11.75^{b}	9.00	8.00	6.25
T2 – OHN	4.25	10.25	11.50	13.75	13.50	12.25^{b}	8.50	7.25	6.25
T3 – FPJ	4.50	10.50	12.50	15.25	15.25	14.00^{a}	10.5	8.25	6.75
T4 – FFJ	4.25	11.50	13.25	14.50	13.75	12.50^{b}	9.25	7.75	6.50
T5 - KAA	5.00	10.75	12.25	14.00	14.00	12.50^{b}	9.50	8.00	6.50
Statistical Inference	*ns*	*ns*	*ns*	*ns*	*ns*	*	*ns*	*ns*	*ns*
CV(%)	21.6	12.65	14.41	8.69	5.55	6.95	9.47	8.22	10.01

Leaf length

The leaf length of a multiplier onion (bulb) produced under controlled conditions and treated with various foliar organic mixtures is displayed in Table 12. The Control treatment had the longest leaf length, measuring 18.19 cm, based on the multiplier onion (bulb) leaf length for each treatment. Good leaf lengths are displayed by FPJ and KAA, at 17.4 cm and 17.96 cm, respectively. The leaf length of OHN is 17.08 cm, suggesting a modest level of efficacy. Among the treatments, FFJ has the smallest leaf length (16.73 cm), yet it nevertheless promotes leaf growth. The longest leaves are seen in the control treatment, suggesting that the farmers' use of inorganic fertilizer promotes longer leaf length. Good leaf lengths are also shown by the FPJ and KAA treatments, indicating that they are successful in encouraging growth. While FFJ treatment is the least successful of the treatments, OHN treatment shows moderate effectiveness. The leaf length (bulb type) of the multiplier onion was not significantly impacted by the various foliar organic mixtures.

Table 12. Leaf length of bulb-type multiplier onion (cm)

TREATMENTS	REPLICATION				MEAN
	I	II	III	IV	
T1 - Control	17.9	18.7	15.75	20.4	18.19
T2 - OHN	15.35	17.8	16.75	18.4	17.08
T3 - FPJ	16	17	19.55	17.05	17.4
T4 - FFJ	18.05	17.15	14.95	16.75	16.73
T5 - KAA	17.8	16.95	16.9	20.2	17.96

CV(%) = 8.83

Number of bulbs

The number of multiplier onion (bulb) bulbs treated with various foliar organic mixtures and cultivated in controlled conditions is displayed in Table 13. FPJ has the greatest number of bulbs at 7.5, indicating that this therapy is the most successful in increasing bulb number, based on the number of bulbs (bulb) for each treatment. When it comes to bulb number promotion, FFJ and KAA both display seven bulbs, suggesting strong effectiveness. Control displays 6.75 lamps, which suggests a moderate level of efficacy. With 6.25 bulbs, OHN exhibits the fewest number of bulbs, indicating that it is the least successful therapy in increasing bulb number. According to the findings, the FPJ therapy seems to be the most successful in increasing bulb number, with the FFJ and KAA treatments following closely behind. Additionally, the control

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treatment shows a significant degree of efficacy in increasing bulb number. With the fewest bulbs observed, the OHN therapy has the lowest effectiveness among the treatments.

The quantity of multiplier onion bulbs (bulb type) was not significantly impacted by the various foliar organic mixtures.

Table 13. Number of bulbs of bulb-type multiplier onion

TREATMENTS	REPLICATION				MEAN
	I	II	III	IV	
T1 - Control	7	6	7	7	6.75
T2 - OHN	7	6	6	6	6.25
T3 - FPJ	8	8	7	7	7.5
T4 - FFJ	7	8	6	7	7
T5 - KAA	7	7	7	7	7

CV(%) = 7.94

Bulb Diameter in Clump

Table 14 presents the width of multiplier onion bulbs in clumps that were treated with different foliar organic combinations and grown under controlled conditions. The data on the clump (bulb) diameters of the multiplier onion indicate that the treatment with FPJ resulted in the largest bulb diameter, measuring 2.83 cm. This suggests that this treatment was the most effective in promoting bulb growth. FFJ has a bulb diameter of 2.84 cm, which is somewhat larger than FPJ and suggests a high level of effectiveness. OHN also shows a small increase in bulb diameter, measuring 2.76 cm. The bulb diameter of the Control is 2.73 cm, suggesting a moderate level of efficacy. Among the many treatments, KAA has the smallest bulb diameter of 2.71 cm, making it the least effective. According to the results, FFJ and FPJ appear to be the most effective therapies for promoting an increase in bulb diameter growth. The KAA treatment is the least efficacious, whereas the OHN and Control therapies also demonstrate moderate effectiveness. Based on these data, the growth of bulb diameter is greatly enhanced by fermented treatments, particularly FPJ and FFJ, while OHN and Control treatments only have a slight impact on bulb diameter growth. However, there is a need to enhance the effectiveness of KAA treatment in order to optimize its ability to stimulate the increase of bulb diameter.

The bulb diameter in a cluster of multiplier onions (bulb type) was not significantly affected by the different organic combinations applied to the leaves.

Table 14. Bulb diameter of bulb-type multiplier onion in clump (cm)

TREATMENTS	REPLICATION				MEAN
	I	II	III	IV	
T1 - Control	2.97	2.78	2.51	2.64	2.73
T2 - OHN	2.68	2.9	2.58	2.88	2.76
T3 - FPJ	2.74	3.09	2.74	2.74	2.83
T4 - FFJ	3.08	2.96	2.43	2.89	2.84
T5 - KAA	2.93	2.55	2.6	2.76	2.71

CV(%) = 7.29

Bulb Diameter in Single Bulb

Table 15 displays the diameter of multiplier onion bulbs when treated with various foliar organic mixtures and cultivated in controlled conditions. Among the treatments, the FFJ treatment exhibited the biggest bulb diameter of 0.83 cm in the single bulb stage of multiplier onion. This suggests that the FFJ treatment is the most successful in fostering the growth of a single bulb during this period. These results align with the research conducted by Skimin et al. (2017), which indicated that the utilization of FFJ stimulates the synthesis of auxin, a plant hormone that promotes plant development. The T2 treatment exhibits a bulb diameter of 0.80 cm, suggesting a high level of efficacy in stimulating the growth of individual bulbs. The control group has a bulb diameter of 0.77 cm, indicating a moderate level of effectiveness. The diameter of FPJ is 0.73 cm, indicating that it is less efficient than OHN and FFJ but more efficient than KAA. The therapy labeled KAA exhibits the smallest bulb diameter, measuring 0.72 cm, which suggests it has the lowest level of effectiveness compared to the other treatments. According to the findings, the FFJ therapy demonstrates the highest efficacy in enhancing the growth of single bulb diameter during the bulb stage, with the OHN treatment being a close second. The control treatment has a moderate level of effectiveness, whereas the FPJ treatment shows a somewhat lower level of effectiveness. The KAA therapy exhibits the lowest efficacy in stimulating bulb diameter expansion. The various foliar organic mixtures had no substantial impact on the bulb width of individual bulbs of multiplier onion.

Table 15. Bulb diameter of bulb-type multiplier onion in single bulb (cm)

TREATMENTS	REPLICATION				MEAN
	I	II	III	IV	
T1 - Control	0.93	0.71	0.69	0.74	0.77
T2 - OHN	0.81	0.95	0.64	0.81	0.8
T3 - FPJ	0.66	0.82	0.73	0.71	0.73
T4 - FFJ	1.02	0.79	0.67	0.82	0.83
T5 - KAA	0.86	0.57	0.72	0.72	0.72

CV(%) = 15.16

Yield

Table 16 displays the mean weight of 20 samples of multiplier onion (bulb type/grams) treated with various foliar organic mixtures and cultivated in a controlled environment. After analyzing the average weight of 20 samples of bulb-type multiplier onion for each treatment, it was found that the FFJ treatment had the highest average weight of 241.15 grams. This suggests that the FFJ treatment is the most successful in raising the weight of bulb-type multiplier onion samples. The average weights of OHN and FPJ are 233.00 grams and 232.55 grams respectively, demonstrating a significant increase in sample weight and confirming their great effectiveness. Control exhibits a substantial weight gain of 231.20 grams. The treatment labeled as KAA exhibits the lowest average weight, measuring at 227.00 grams. This suggests that it is the least effective among the treatments in terms of enhancing the weight of bulb-type multiplier onion samples. According to the findings, the FFJ treatment demonstrates the most efficacy in enhancing the average weight of bulb-type multiplier onion samples, with the OHN and FPJ treatments following suit. The control treatment has a modest level of

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effectiveness, whereas the KAA treatment is the least effective. The various foliar organic mixtures had no significant impact on the average weight of 20 samples of multiplier onion (bulb type/grams).

Table 17. Yield of 20 samples of bulb-type multiplier onion (grams)

TREATMENTS	REPLICATION				
	I	II	III	IV	MEAN
T1 - Control	283.20	228.60	216.60	196.40	231.20
T2 - OHN	259.00	261.80	183.00	228.20	233.00
T3 - FPJ	256.20	246.60	224.60	202.80	232.55
T4 - FFJ	238.00	258.40	215.80	252.40	241.15
T5 - KAA	240.80	214.60	208.40	244.20	227.00

CV(%) = 12.11

Conclusion

The study investigated the effects of different organic treatments (OHN, FPJ, FFJ, and KAA) on the growth and yield of multiplier "lasuna" onions, comparing them to the control which is the Farmers' Practice. The parameters measured included plant height, number of leaves, leaf length, bulb diameter, neck diameter, average weight of samples, and total weight. FFJ was the most effective across all growth and yield parameters, indicating its superiority in promoting growth and productivity in multiplier onions. OHN and FPJ also showed strong performance, making them viable alternatives to FFJ. While the control had relatively good performance in some parameters, it was generally outperformed by the organic treatments. KAA: This treatment showed mixed results, with lower effectiveness in several parameters, suggesting a need for further optimization.

Recommendations

Based on the findings of the study on the effects of various treatments on multiplier onion growth and yield, the following recommendations are made:

1. Farmers may use the organic concoctions as alternative for synthetic fertilizers.
2. Long term experiment is needed to further validate the effect of organic concoctions.
3. Evaluation of soil-microorganism activity is needed.
4. Testing of the organic concoctions to other onion varieties is recommended.
5. The determination of the best rate of application is likewise recommended.

Declaration of no conflict of interest

The author hereby declares no conflict of interest and this article is his original work.

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