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Increasing the Growth and Production of Purple Eggplant (*Solanum melongena* L.) by Providing Liquid Organic Fertilizer (POC) from Market Waste Enriched with Maja Fruit

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Abstract

Eggplant is widely appreciated as a food source across all levels of society and is among the most popular dishes in various communities. Therefore, the growth and production of eggplant require fertilizers to supply essential nutrients. Fertilizer materials can utilize potential waste, such as market waste. To increase the phosphorus content in liquid organic fertilizer, it can be enriched with maja fruit. Liquid organic fertilizer derived from market waste, consisting of vegetables and fruits, contains high levels of nitrogen, which is a fundamental component of protein and chlorophyll in plants. The purpose of this study was to determine the effect of applying liquid organic fertilizer (POC) made from market waste enriched with maja fruit on the growth and production of purple eggplant (*Solanum melongena* L.). The experimental research employed a Non-Factorial Completely Randomized Design (CRD). The treatments were as follows: A0 – no POC application; A1 – POC concentration of 100 ml per liter of water; A2 – POC concentration of 200 ml per liter of water; and A3 – POC concentration of 300 ml per liter of water. The results showed significant effects on flowering and harvest age. The treatment that produced the best results across all parameters was A2, which involved applying market waste POC enriched with maja fruit at a concentration of 200 ml per liter of water. However, this treatment did not significantly affect plant height (cm), fruit weight per plant (grams), or the number of fruits per plant. The liquid organic fertilizer produced contains high levels of essential nutrients, such as boron (B) and iron (Fe), which accelerate the generative phase, including flowering, thereby advancing the plant's harvest age. Reason: The text was revised to improve clarity, coherence, and technical accuracy. Grammar, punctuation, and spelling errors were corrected. Vocabulary was enhanced for better readability and precision, and sentence structure was refined to ensure a smooth flow and a professional tone appropriate for scientific writing.

Keywords: Horticultural Crops, Organic Waste, Productivity, Utilization

1. Introduction

Eggplant (*Solanum melongena* L.) is a vegetable whose fruit is commonly used as a food ingredient. It is a popular food source enjoyed by people across all levels of society and features frequently on various menus. Purple eggplants are rich in nutrients, particularly vitamin A and phosphorus. Additionally, eggplant offers several health benefits, including the prevention of hypertension, reduced cholesterol levels, anti-inflammatory properties, potential cancer-prevention benefits, and support for healthy digestion.

In general, eggplant production in Kuantan Singingi Regency remains relatively low due to low soil fertility. The region is characterised predominantly by Red Yellow Podzolic soil (PMK), which has a low pH that can lead to excessively high levels of aluminium (Al), iron (Fe), and manganese (Mn), potentially toxic to plants. This soil type is typically deficient in essential macronutrients such as nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), and magnesium (Mg), as well as micronutrients like zinc (Zn), molybdenum (Mo), copper (Cu), and boron (B). Additionally, it has a low organic matter content. One effective method to improve PMK soil conditions is fertilisation, particularly with organic materials such as

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liquid organic fertilisers. The application of liquid organic fertilizer aims to enhance soil physical, chemical, and biological properties and increase nutrient availability. It functions by supplying both macro- and micronutrients, thereby improving soil chemical properties (Sari et al., 2023). A key advantage of liquid organic fertilizer is its ability to address nutrient deficiencies and provide nutrients quickly and efficiently. This fertilizer is produced from unused organic materials, such as market waste and maja fruit.

Market waste is a source of problems that can pollute the surrounding environment, producing unpleasant odors that can damage the environment. Properly managed market waste can be an effective way to mitigate this problem and produce something more useful and valuable: as raw material for liquid organic fertilizer (POC) made from market waste enriched with maja fruit.

Liquid organic fertilizer derived from market waste, such as vegetables and fruits, contains a high amount of nitrogen, a building block of protein and chlorophyll in plants. Liquid organic fertiliser provides both micro- and macronutrients, serving as an additional source of nutrition for plants. Furthermore, it can improve soil structure and nutrient content, positively impacting plant growth (Fitriani et al., 2020). To increase the phosphorus content of liquid organic fertilizer, market waste can be enriched with maja fruit.

Maja fruit is one example of a plant whose existence is underappreciated. In Kuantan Singingi Regency, maja fruit is often found along the banks of the Kuantan River. Maja fruit has benefits, such as a high phosphorus content, making it suitable for use as a fruit fertilizer to increase the productivity of cultivated plants. Adding maja fruit to liquid organic fertilizer made from market waste is an effective way to increase phosphorus content, improve fermentation, and produce higher-quality liquid organic fertilizer. The resulting liquid organic fertiliser can provide significant benefits for plant growth, especially by increasing phosphorus availability, making it a viable option. Processing market waste and maja fruit into liquid organic fertiliser not only reduces waste but also produces a product that is beneficial for agriculture, has economic value, and is environmentally friendly.

Market waste in the form of vegetables and fruit is very good as a raw material for fertilizer because it comes from wet organic material that is easily decomposed and rich in the nutrients plants need. Liquid organic fertilizer from market waste contains nutrients such as Minerals, Nitrogen (N), Phosphorus (P), Potassium (K), Calcium (Ca), Iron (Fe), Sodium (Na), Magnesium (Mg), and B12 (Rahmah et al., 2014).

According to (2020), vegetable waste has a water content of 88.78%, a pH of 7.68, and a C/N ratio of 33.56. After becoming liquid organic fertilizer, it has a nutrient content of 1% N, 1.98% P, 0.85% K, C/N ratio of 30, Total Solid of 34.78%, Chemical Demand Oxygen (COD) of 2386 mg.L-1, Biogas of 13 ml, and pH of 5.55.

Some vegetable waste that can be used as Liquid Organic Fertilizer (POC) is green beans which contain 0.18% N, 0.077% P and 0.15% K. Green mustard waste contains the nutrients Nitrogen (N) 0.13%, Phosphorus (P) 0.058%, Potassium (K) 0.17%, Calcium (Ca) 0.006% and Magnesium (Mg) 0.012% (Setyaningsih *et al.*, 2018) .

According to Karyanto *et al.*, (2022) the levels of C-Organic, N, P and K in liquid organic fertilizer from 3 variations of vegetable waste namely kale, mustard greens and spinach with a fermentation time of 25 days produce liquid organic fertilizer from kale vegetable waste having levels of C-organic (9.50%), N (1.69%), P (2.45%) and K (2.74%) from spinach vegetable waste having levels of C-organic (13.65%), N (3.06%), P (3.18%) and K (3.32%) from mustard green waste having levels of C-organic (16.21%), N (3.45%), P (3.84%) and K (4.44%). Liquid fertilizer from spinach vegetable waste and mustard green waste for C-Organic, N, P and K parameters has fulfilled the regulation of the Minister of Agriculture No. 70 / Permentan / SR.140 / 10/2011 while kale vegetable waste has not fulfilled the regulation of the Minister of Agriculture No. 70/Permentan/SR. 140/10/2011.

The application of liquid fertiliser derived from fruit and vegetable waste significantly affects peanut plant growth and yield. The effective fertilizer concentration is 250 mL.L-1 of water producing the best plant height with an average value of 20.93 cm, the best flowering age of 33 days, the best average root length of 4.49 cm and the best average pod weight with a value of 22.77 grams, while the concentration of 200 mL.L-1 of water produces the best average number of seeds with a value of 340.25 seeds (Thamrin *et al.*, 2019).

The novelty in previous research was the addition of maja fruit. Maja fruit has a high P content of 80.2483 mg/L, making it suitable for use as a fruit fertilizer, which increases the productivity of cultivated plants (Rismayani, 2013).

Maja fruit is beneficial for plant growth because maja fruit contains alkaloid compounds, which contain nitrogen elements, where this nitrogen element is very necessary for the plant growth process.

Applying liquid organic fertilizer made from vegetable and fruit market waste significantly improves plant growth and yields optimal results. This demonstrates that market waste can serve as a primary ingredient in liquid organic fertilizer. Maja fruit, with its high phosphorus content, is an alternative additive for liquid organic fertilizer production, yielding a high-quality product.

This study aims to determine the effect of providing liquid organic fertilizer (POC) from market waste enriched with maja fruit on the growth and production of purple eggplant (*Solanum melongena* L.) plants.

2. Material and Methods

2.1. Place and Time

This research was conducted in Kampung Baru Sentajo Village, Sentajo Raya District, Kuantan Singingi Regency, Riau Province, coordinate points -0 ° 00'-1 ° 00' South Latitude and 101 ° 02'-101 ° 55' BT, 400 masl. Analysis of the POC content of market waste enriched with maja fruit was conducted at the Central Plantation Services Laboratory in Pekanbaru. The study lasted five months, from October 2024 to February 2025.

2.2. Tools and Materials

The tools used are a machete, bucket, baby bag, label, meter, watering can, measuring cup, writing tools, rope, bucket, analytical scales, handsprayers, sieves, hoes, drums, and scissors. while the materials used are market waste, maja fruit, purple eggplant seeds of the Reza variety, dolomite, buffalo manure fertilizer, EM4, NPK pearl fertilizer, ZA, white KNO3, KCL, rice washing water, brown sugar, curacron and WP SACO-P fungicide.

2.3. Research Methods

Data analysis used a Non-Factorial Completely Randomised Design (CRD) with 4 treatment levels. Each treatment was repeated 3 times, resulting in 12 experimental units. Each experimental unit consisted of 4 plants and 3 were used as sample plants. The total number of plants was 48. The treatment levels used were: A0: Without providing market waste POC enriched with maja fruit, A1: Providing market waste POC enriched with maja fruit at a concentration of 100 ml/liter, A2: Providing market waste POC enriched with maja fruit at a concentration of 200 ml/liter, A3: Providing market waste POC enriched with maja fruit at a concentration of 300 ml/liter.

The research data were tabulated and statistically analyzed using Analysis of Variance (ANOVA). If the calculated F-value was greater than the table F-value, a further Honestly Significant Difference (HSD) test was conducted at the 5% level. Excel was used to process the research data.

2.4. Research Implementation

2.4.1. Making Liquid Organic Fertilizer

The manufacture of liquid organic fertilizer refers to the modified research by Susanti (2015). The manufacture of market waste POC enriched with maja fruit by preparing the necessary tools and materials. Prepare market waste in the form of vegetables and fruit as much as 60 kg and maja fruit 9 kg, vegetable waste and maja fruit chopped into smaller parts so that it is easy to decompose, then put into a drum and add 150 liters of water. Then add 30 litres of rice-washing water, 1,500 CC of EM4, and 3,000 grams of brown sugar. After all the ingredients are mixed, stir for 5 minutes until evenly combined. Then close the container tightly and then ferment for 30 days. Mature POC is indicated by the color changing to yellowish brown and has a distinctive aroma like the smell of tape or does not smell bad and pungent. During the fermentation period, the liquid organic fertilizer is stirred for 5-10 minutes at 3-day intervals to promote oxygen exchange. After 30 days of fermentation, the market waste POC is mature and ready to use. Liquid organic fertilizer made from market waste, enriched with ripe maja fruit, was analyzed for nutrient content at the Central Plantation Services Pekanbaru laboratory. The flowchart for producing POC is as follows:

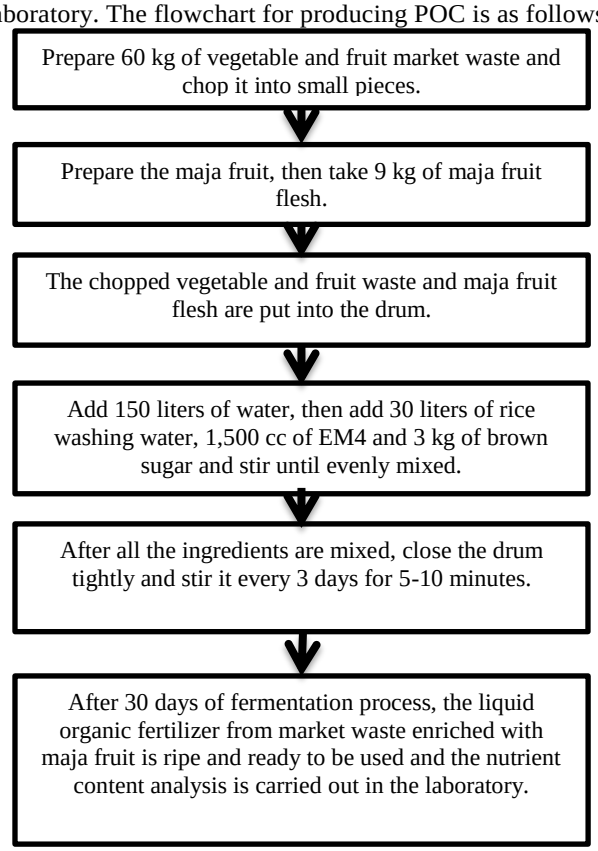

Figure 1. Research flow diagram

2.4.2. Site Preparation

Preparation of the research site involved clearing the land of plant remains with a machete and a hoe.

2.4.3. Plot Creation

The plots were 160 cm x 120 cm, with a plot height of 30 cm and a spacing of 50 cm between plots. Twelve plots were created, each containing four plants.

2.4.4. Liming

Liming is done 2 weeks before planting to neutralize acidic soil pH. According to Basuki and Sari (2020), the dolomite dose is 2 tons/ha, or the equivalent of 384 grams per plot. Dolomite is applied by sprinkling it on the beds.

2.4.5. Application of Organic Fertilizer

The organic fertilizer applied is buffalo manure, applied a week before planting. It is sprinkled over the plot and then mixed thoroughly into the soil. The recommended fertilizer dosage is 20 tons/ha, or the equivalent of 3,840 grams/plot .

2.4.6. Label Installation

Labeling was performed before planting and according to the treatment to facilitate treatment administration and observation. The labels used measured 10 x 5 cm. Labels were placed according to the research *layout* .

2.4.7. Seed Sowing

Seeding is done in baby bags with topsoil. The baby bags used measure 5 cm x 6 cm. The planting medium that has been placed in the baby bags is watered sufficiently. Planting is done by soaking the seeds first for about 10-15 minutes to separate the good seeds (sinking) from the bad seeds (floating) and speed up the germination process. After that, plant the seeds in baby bags by making planting holes and inserting one seed per hole. The medium is kept moist and placed in sunlight until it has 2-4 true leaves.

2.4.8. Planting

Seedlings are planted approximately 30 days after sowing and have 2-4 true leaves in the holes provided. Then insert the seedlings, still intact and with the soil intact, one per hole. Planting distances between plants are 80 cm x 60 cm.

2.4.9. Application of POC Treatment

The application of market waste POC enriched with maja fruit is carried out by diluting the solution first with concentrations A0: Without POC, A1: 100 ml/liter of water (100 ml of POC dissolved in 1 liter of water). A2: 200 ml/liter of water (200 ml of POC dissolved in 1 liter of water). A3: 300 ml/liter of water (300 ml of POC dissolved in 1 liter of water).

POC is administered by pouring a solution diluted with water onto the growing medium around the plant using a 250 ml measuring cup per plant (Susanti, 2015). According to Cahya *et al.,* (2024), the treatment is administered a week after planting at intervals of once a week until the harvest period 60 days after planting, resulting in 9 applications.

2.4.10. Inorganic Fertilization

Inorganic fertilization using recommended fertilizers for purple eggplant seeds of the Reza Bintang Asia variety, namely NPK Mutiara, ZA, white KNO3, and KCL. The fertilizer was applied by pouring and applying it to the plants at a volume of 250 ml per plant.

2.4.11. Plant Maintenance

Plant maintenance includes watering, replanting, weeding and hilling, installing stakes, controlling pests and diseases and harvesting.

2.5. Observation Parameters

Observation parameters include plant height (cm), age of flower emergence (days), harvest age (days), number of fruits per plant and weight of fruit per plant (grams).

3. Results and Discussion

Based on the results in Table 1, the nutrient content of liquid organic fertiliser from market waste enriched with maja fruit remains relatively low and has not been meet the standards for liquid organic fertiliser outlined in the 2019 decree of the Minister of Agriculture of the Republic of Indonesia concerning the minimum technical requirements for organic fertiliser, biological fertiliser, and soil conditioner.

Table 1. Results of Nutrient Content Analysis of Liquid Organic Fertilizer (POC) from Market Waste Enriched with Maja Fruit.

Test Parameters	Result Value	Unit	Testing Method
C-Organic	0.72	%	*IKP-15.2 (Gravimetry)*
Total N	0.06	%	*IKP-15.3 (Titrimetry)*
Total $P_2 0_5$	0.04	%	*IKP-15.4 (Spectrophotometry)*
Total $K_2 0$	0.15	%	*IKP-15.5 (Flamephotometry)*
Total Mg	0.005	%	*IKP-15.6(AAS)*
Total Ca	0.019	%	*IKP-15.7 (AAS)*
Total B	5.33	Mg/kg	*IKP-15.8 (Spectrophotometry)*
Total Cu	0.11	Mg/kg	*IKP-15.9 (AAS)*
Total Fe	14.3	Mg/kg	*IKP-15.9 (AAS)*
Total Mn	1.27	Mg/kg	*IKP-15.9 (AAS)*
Total Zn	0.65	Mg/kg	*IKP-15.9 (AAS)*
C/N Ratio	12.0	-	*Calculation*

***** Plantation Service Laboratory Test Results

3.1. Plant Height (cm)

Based on the observation data on the height parameters of purple eggplant plants, after conducting Analysis of Variance, it was shown that the treatment of Liquid Organic Fertilizer (POC) from market waste enriched with maja fruit had no significant effect on plant height. Based on further BNJ tests at the 5% level, the average height of purple eggplant plants can be seen in Table 2.

From the data in Table 2, it was found that administering Liquid Organic Fertiliser (POC) from market waste enriched with maja fruit resulted in the highest plant height in treatment A2, namely 117.56 cm. The shortest plant height was in treatment A0, at 102.00 cm. The ineffectiveness of the POC enriched with maja fruit in treating market waste was due to several factors, including environmental conditions, inadequate nutrient absorption,

and the low concentration of fertiliser applied to the plants. When compared with the description of the Reza Bintang Asia variety, namely 100-120 cm. Observations of plant height in this study were made until the age of 91 days after planting, so that the height of the purple eggplant plants reached the desired height.

Table 2. Average Results of Purple Eggplant Plant Height (cm)

Treatment	Average (cm)
A0 : Without Providing POC for Market Waste	102.00 ± 2.219
A1: Providing Market Waste POC with a concentration of 100 ml/liter of water	114.33 ± 3.686
A2: Providing Market Waste POC with a concentration of 200 ml/liter of water	117.56 ± 0.888
A3: Providing Market Waste POC with a concentration of 300 ml/liter of water	110.00 ± 5.872
Family Card: 5.72%	

Description: Data is the average of 3 sample plants per plot with 3 replications.

Treatment A2 produced the highest plant height, at 117.56 cm. This is because the nutrients supplied to the plants at appropriate concentrations support maximum growth. In accordance with the opinion of Schroth *et al.* (2003), plants that receive nutrients in the optimum amount and at the right time will grow and develop optimally. Setiawan *et al.* (2023) stated that sufficient and available nutrients are essential for meristem cell division (new cells), which can cause plants to grow taller as they age.

Treatment A0 resulted in a shorter plant height of 102.00 cm. This is because the plants were not treated with POC, so their nutrient needs were not met. This can cause poor growth, as nutrients are not supplied optimally, leading to stunted cells. This is in accordance with the opinion of Syahputra *et al. (2015): N-total PMK soil shows a very low amount, around 0.018% - 0.09*%. This is influenced by the low organic carbon content of the soil, due to leaching, evaporation into the air, and transport during harvest.

Treatments A1 and A3 produced shorter plant heights than treatment A2. This is due to the provision of POC at lower and higher concentrations, with less or more nutrients, resulting in growth that is less than optimal. This is in accordance with the opinion of Sutedjo (2010) who stated that the growth of a plant will not grow optimally if the nutrient content is less than what is needed by the plant. According to the opinions of Sutedjo and Kartasapoetra (2001), the provision of incorrect nutrients, excessive or insufficient provision, and inappropriate provision can cause death in cultivated plants or the emergence of new disease symptoms, resulting from physical damage to the soil.

Purwati (2013) stated that the function of liquid organic fertilizer is to provide nutrients to plants and soil, and that it contains a complete range of macro- and micro-nutrients that can enhance plant growth. The high nutrient concentration in liquid organic fertilizer, especially Fe (14.3 mg/kg), enables plants to respond well, resulting in optimal plant height.

According to Yolanda *et al.* (2020), Fe is a crucial nutrient for plants, aiding chlorophyll synthesis; it plays a vital role in energy transfer, is a component of several enzymes and proteins, and is involved in plant respiration, metabolism, and nitrogen fixation. Fe activates several enzymes and is a component of proteins that can stimulate the growth of different plant leaves in height, length, and width.

The increase in height growth of purple eggplant plants from 1 WAP to 13 WAP is shown in Figure 2.

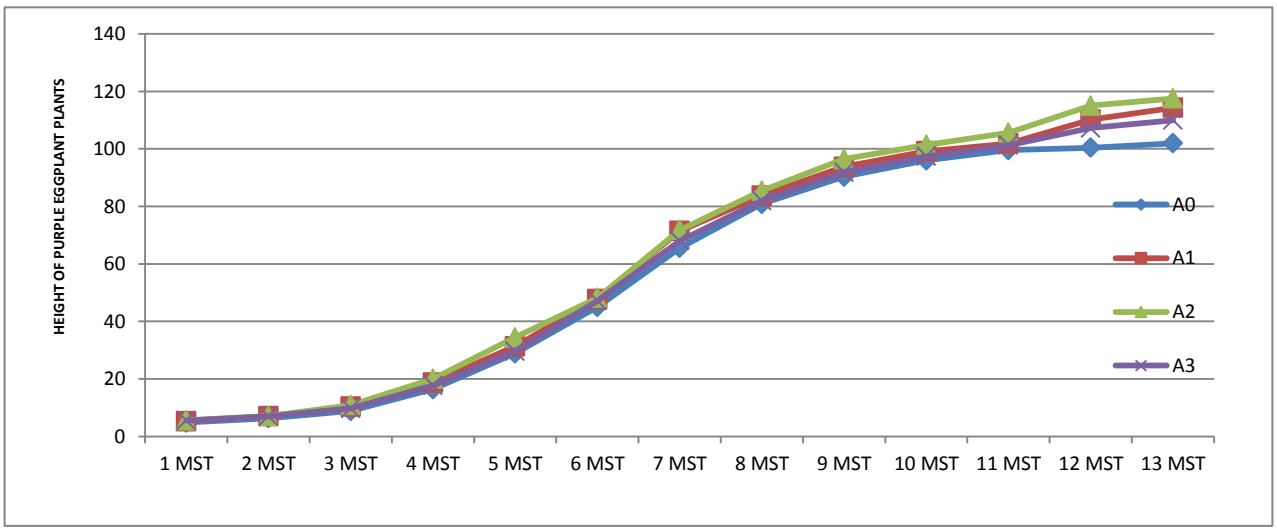

Figure 2. Graph of the growth of purple eggplant plants with the treatment of market waste POC enriched with maja fruit.

The image above shows an increase in purple eggplant plant growth with the treatment of market waste POC enriched with maja fruit. In observations of plant height from 1 to 4 weeks after planting, plant growth has not differed between the various POC treatments. Differences in plant height growth have begun to appear at 5 to 13 weeks after planting. In the measurement of plant height depicted in the graph, the plant height with the highest yield is in treatment A2, while the plant height with the shortest yield is in treatment A0. The description above shows that plant growth rate is determined by the amount of fertilizer provided and the appropriate, balanced concentrations.

The results of this study, when compared with Erlambang's (2017) study, which used biofertilizer on purple eggplant plants of the Mustang F1 variety, showed that the red arrow obtained the highest plant height at 91 days after planting, namely 76.44 cm. In this study, the height of purple eggplant plants of the Reza variety from Asia at 91 days after planting was 117.56 cm. So the plant height in this study was higher by 43.12 cm. This means that Liquid Organic Fertilizer (POC) enriched with maja fruit provides good plant height growth because Liquid organic fertilizer (POC) from market waste enriched with maja fruit contains nutrients needed by plants.

3.2. Flowering Age (days)

Based on the observation data on the flowering age parameters of purple eggplant plants, after conducting a Variance Analysis, it was shown that the treatment with Liquid Organic Fertiliser (POC) from market waste enriched with maja fruit had a significant effect on the flowering age parameters. The average flowering age of purple eggplant plants after being tested with BNJ at the 5% level is shown in Table 3.

Table 3. Flowering Age of Purple Eggplant Plants (days)

Treatment	Average (day)
A0 : Without Providing POC for Market Waste	31.11 ± 0.777 c
A1: Providing Market Waste POC with a concentration of 100 ml/liter of water	27.33 ± 0.881 ab
A2: Providing Market Waste POC with a concentration of 200 ml/liter of water	26.44 ± 0.444 a
A3: Providing Market Waste POC with a concentration of 300 ml/liter of water	29.56 ± 0.968 bc
Family Card: 5.72%	**BNJ = 3.20**

Description: The numbers in the rows followed by the same lowercase letters are those that are not significantly different according to the BNJ follow-up test at the 5% level.

The treatment with the fastest flowering age was A2, at 26.44 days. This treatment was not significantly different from A1, which was 27.33 days. However, treatment A1 was not significantly different from treatment A3 (29.56 days), and treatment A3 was not significantly different from treatment A0. However, treatment A2 was significantly different from both A0 and A3. The longest flowering period was in treatment A0, at 31.11 days.

The fastest flowering age was found in treatment A2, namely 26.44 days. When compared with the description criteria for purple eggplant plants of the Reza variety, namely 30-32 days. This shows that the flowering age in the study was earlier than described. This is because the nutrients supplied to the plants at appropriate concentrations support maximum growth. The influence of the flowering age in this study was due to several factors, such as the content of market waste POC enriched with maja fruit, such as Phosphorus: 0.04%, Potassium: 0.15%, Boron: 5.33 mg/kg, Fe: 14.3 mg/kg and Mn: 1.27 mg/kg and environmental factors.

The rapid flowering age is due to the influence of market waste POC enriched with maja fruit, which provides the nutrients plants need to optimise vegetative growth and accelerate generative growth, marked by the appearance of flowers. According to Schroth *et al. (2003), plants that receive nutrients in the optimal* amount and at the right time will grow and develop optimally.

The longest average flowering time was observed in the A0 treatment, at 31.11 days. This was because in the A0 treatment without the provision of market waste POC enriched with maja fruit, so that growth was hampered and less than optimal, because the plants grew without getting additional nutrient intake from outside, only utilizing the nutrients available in the soil, so that the plant's need for nutrients could not be met. This is in accordance with the opinion of Sutedjo (2010) that the growth of a plant will not grow optimally if the nutrient content is less than what is desired by the plant.

Treatments A1 and A3 had longer flowering times than treatment A2. This is because lower POC concentrations result in insufficient nutrient supply for plants, while higher POC concentrations given to plants with more nutrients can cause suboptimal growth, leading to decreased growth during the flowering phase. Because administering concentrations exceeding a certain limit can cause reduced or delayed plant growth. Consequently, plant growth in treatments A1 and A3 took longer, especially during the flowering phase. The opinion supports this.

Kuswandi *et al.* (2021) said that if nutrients are insufficient in a plant, the growth of the plant will be hampered.

The results of this study, when compared with previous research according to Ramadhan and Sabli, (2024), which used POC lamtoro leaves and NPK rainbow fertilizer on purple eggplant plants of the Yumi F1 variety, produced the fastest flowering age in the combination of P3N3 treatment:

with 50 ml/L POC and 9.375 grams/plant NPK rainbow with the fastest flowering age of 32.67 hst. When compared with this study, which reported the fastest flowering age of 26.44 hst. So the flowering age in this study was faster with a difference of 6.23 hst. This is because the POC market waste enriched with maja fruit contains sufficient boron to accelerate plant flowering and provides micro- and macro-nutrients needed by plants.

According to Hadisuwito and Sukamto (2012), liquid organic fertiliser must be applied at the same concentration or dosage as applied to plants. Excessive dosages can actually cause wilting symptoms in plants. Market waste organic fertilizer enriched with maja fruit contains 5.33 mg/kg of boron, which can accelerate flowering. According to Wulan and Bintoro (2021), boron plays a role in regulating plant water requirements, forming fibres and seeds, and stimulating the ageing process, thereby increasing flowering and yields. Boron plays a role in stimulating flowering and seed formation because it is a microelement related to auxin hormone metabolism.

3.3. Harvest age (days)

Based on the observation data on the harvest age parameters of purple eggplant plants, after conducting a Variance Analysis, it was shown that providing Liquid Organic Fertiliser (POC) from market waste enriched with maja fruit had a significant effect on the harvest age parameters. The average harvest age of purple eggplant plants after testing at a 5% BNJ level is shown in Table 4.

Table 4. Harvest Age of Purple Eggplant Plants (days)

Treatment	Average (day)
A0 : Without Providing POC for Market Waste	62.89 ± 1,543 b
A1: Providing Market Waste POC with a concentration of 100 ml/liter of water	55.00 ± 1.018 a
A2: Providing Market Waste POC with a concentration of 200 ml/liter of water	53.78 ± 0.888 a
A3: Providing Market Waste POC with a concentration of 300 ml/liter of water	58.67 ± 2,333 ab
Family Card: 4.67%	**BNJ = 6.27**

Description: The numbers in the rows followed by the same lowercase letters are those that are not significantly different according to the BNJ follow-up test at the 5% level.

The treatment with the fastest harvest age was A2 (53.78 days); this treatment was not significantly different from A1 (55.00 days) or A3 (58.67 days). However, treatment A3 was not significantly different from treatment A0 (62.89 days), whereas treatments A1 and A2 were significantly different from A0. The longest harvest age was in treatment A0, which was 62.89 days. The harvest age in the study ranged from 53 to 62 days, whereas the description criteria for the harvest age of purple eggplant plants, the Reza variety from Bintang Asia, were 60–62 days. This shows that the harvest age is faster than the description.

Treatment A2 yielded the fastest harvest age, at 53.78 days, compared to other treatments. This is because treatment A2 provides the nutrients plants need, resulting in optimal growth and a faster harvest age. The use of market waste POC enriched with maja fruit in the soil provides additional nutrients for plants, including macro- and micro-nutrients. Meeting plant nutrient needs will optimise growth and development, ultimately leading to a faster harvest age. According to Schroth *et al.* (2003), plants that receive nutrients in the optimum amount and at the right time will grow and develop optimally. Lingga and Marsono (2013) stated that the availability of nitrogen, phosphorus, and potassium in sufficient quantities in plant metabolism will affect the harvest age of the plant.

Treatment A0 provided the longest observed harvest age, namely 62.89 days. This occurred because the plants in treatment A0 were not given Liquid Organic Fertilizer (POC) from market waste enriched with maja fruit, so that growth was slower and the plants grew without getting additional nutrient intake from outside and only utilized the nutrients available in the soil so that the plant's need for nutrients could not be met. This is in accordance with the opinion of Sutedjo (2010), who stated that the growth of a plant will not grow optimally if the nutrient content is less than what is needed by the plant.

Treatments A1 and A3 showed longer harvest age than treatment A2, namely 53.78. This is due to the provision of POC with a lower concentration given to plants, the plants will lack nutrients, while the provision of POC with a higher concentration given to plants with more nutrients can make plants experience less than optimal growth and can cause plant growth results to decrease compared to treatment A2, so that the harvest age of plants in treatments A1 and A3 is longer.

This is in accordance with Sutedjo's (2010) opinion, which states that a plant will not grow optimally if nutrient content is below its requirements. Suseno (2004) stated that plants with excess nutrients will have their metabolic processes disrupted, resulting in stunted growth of other parts of the plant. According to Hadisuwito and Sukamto (2012), the application of liquid organic fertiliser must be adjusted to the concentration or dosage applied to the plant. Applying excessive doses can cause wilting in plants.

This study yielded the fastest harvest age at 53.78 days after planting. This compares favourably with previous research by Nazari et al. (2023), which yielded the fastest harvest age of 57.90 days after planting with banana peel POC. This indicates that the harvest age in this study was earlier and that the application of market waste POC enriched with maja fruit provided sufficient nutrients for

the plants, enabling them to grow well and accelerate fruit ripening.

The harvest age of a plant is also influenced by the speed or slowness of its flowering age. This is caused when the nutrient conditions in the plant are optimal. Plant metabolism is determined by the availability of nutrients, especially nitrogen, phosphorus, and potassium, in sufficient quantities, which affects plant growth and development and impacts the flowering and harvest ages. According to Elisa (2017), the faster the flowering, the earlier the harvest age of the plant, because the formation and ripening processes occur earlier, with the same time span for ripening, compared to plants that flower later.

3.4. Number of Fruits Per Plant (fruit)

Based on the observation data on the parameters of the number of fruits per purple eggplant plantation, after conducting the Analysis of Variance, it was shown that the treatment of providing Liquid Organic Fertilizer (POC) from market waste enriched with maja fruit had no significant effect on the parameters of the number of fruits per plantation. The average number of fruits per purple eggplant plantation after testing at the 5% BNJ level is shown in Table 5.

Table 5. Number of Fruits from Purple Eggplant Plants (fruit)

Treatment	Average (fruit)
A0 : Without Providing POC for Market Waste	9.33 ± 1.170
A1: Providing Market Waste POC with a concentration of 100 ml/liter of water	12.11 ± 1.059
A2: Providing Market Waste POC with a concentration of 200 ml/liter of water	14.33 ± 0.192
A3: Providing Market Waste POC with a concentration of 300 ml/liter of water	10.89 ± 1.457
Family Card: 16.01%	

The treatment that gave the best results was treatment A2, namely 14.33 fruits. While the least was in treatment A0, namely 9.33 fruits. The ineffectiveness of the market waste POC treatment enriched with maja fruit was due to various factors, including environmental conditions, inappropriate nutrient absorption, and the low concentration of fertiliser applied to the plants. When compared with Reza Bintang Asia's description of 20-25 purple eggplant varieties, this shows that the number of fruits produced per plant in this study has not reached that range. This is because the nutrients contained in the market waste POC enriched with maja fruit provided cannot meet the plants' needs, and purple eggplant plants were harvested only 7 times before the last fertilisation period, based on fertiliser recommendations from Bintang Asia.

The application of Liquid Organic Fertiliser (POC) to the A2 treatment produced the highest number of fruits compared to the other treatments. This is because the concentration applied to the plants was sufficient or appropriate for optimal growth. Liquid organic fertiliser can improve soil fertility and provide the nutrients plants need to produce fruit. The high number of fruits produced in the A2 treatment is due to the nutrient content of the liquid organic fertilizer, which is enriched with maja fruit, such as phosphorus.

The relatively small number of fruits was found in the A0 treatment, namely 9.33 fruits, this was because the plants in this treatment were not given Liquid Organic Fertilizer (POC) from market waste enriched with maja fruit, so that growth was slower. The plants grew without getting additional nutrient intake from outside and only utilized the nutrients available in the soil, so that the plant's need for nutrients was not met and would affect the number of fruits produced. According to Dwidjoseputro (2007), if a plant lacks fertiliser nutrients, its growth rate will be slow and not optimal for plant production.

Treatments A1 and A3 yielded fewer fruits than treatment A2. This is because the lower POC concentration applied to the plants was insufficient to meet their needs, stunting plant growth and reducing the number of fruits produced. Meanwhile, higher POC concentrations, or exceeding a certain limit, applied to plants with more nutrients resulted in suboptimal growth.

According to Kuswandi *et al.* (2021), if the nutrients are insufficient for the needs of a plant, the growth of the plant will be hampered. Low nutrient intake will lead to suboptimal plant growth and development, ultimately resulting in reduced fruit production. This is in accordance with Sutedjo's (2010) opinion, which states that a plant will not grow optimally if the nutrient content is below what it needs. Furthermore, the opinion of Sutedjo and Kartasapoetra (2001) added that the wrong provision of nutrients, excessive or insufficient provision, and untimely provision can cause the death of cultivated plants or the emergence of new disease symptoms caused by physical damage to the soil. The results of this study, when compared with those of Ramadhan et al. (2025), showed the highest number of fruits per plant, namely 7.37, with the bamboo shoot POC treatment at a concentration of 125 ml/1 L of water. Meanwhile, this study produced the highest number of fruits in treatment A2, namely 14.33 fruits. So this study produced more fruit. This shows that the market waste POC enriched with maja fruit has met the needs, encouraging the growth and development of purple eggplant plants.

3.5. Fruit Weight per Plant (grams)

Based on the observation data on the fruit weight parameters of purple eggplant plantations, after conducting Analysis of Variance, it was shown that the treatment of

Liquid Organic Fertilizer (POC) from market waste enriched with maja fruit had no significant effect on the fruit weight parameters of the plantations. The average fruit weight of purple eggplant plantations after being tested with BNJ at the 5% level is shown in Table 6.

Table 6. Weight of Purple Eggplant Fruit (grams)

Treatment	Average (Gram)
A0 : Without Providing POC for Market Waste	808,776 ± 126,619
A1: Providing Market Waste POC with a concentration of 100 ml/liter of water	1201.11 ± 9.686
A2: Providing Market Waste POC with a concentration of 200 ml/liter of water	1313.00 ± 194.599
A3: Providing Market Waste POC with a concentration of 300 ml/liter of water	1107.56 ± 14.733
Family Card: 18.20%	

The treatment with the best results was treatment A2, at 1,313.00 grams. The lowest yield was found in treatment A0, at 808.776 grams. The ineffectiveness of the market waste POC treatment enriched with maja fruit was due to several factors, including environmental conditions, inadequate nutrient absorption, and the low concentration of fertiliser applied to the plants.

The treatment that gave the best results among the others was A2, with 1313.00 grams, equivalent to 27.3 tons/ha. This shows that in PMK soil, applying organic fertiliser increases plant production because it improves soil properties, specifically nutrient availability. The provision of market waste POC enriched with maja fruit can provide sufficient nutrients for plants; therefore, the provision of POC at the appropriate concentration can meet soil nutrient needs, thereby stimulating plant growth.

Treatment A2 produced the highest fruit weight compared to other treatments. Compared to Reza's purple eggplant variety, which is 4-5 kg per plant, the analysis data show that the average fruit weight per plant does not meet the criteria described. This is because fruit weight was measured only 7 times in this study, up to the last fertilisation period recommended by Bintang Asia, which is 95 days. If the production results were weighed until the last harvest, it is possible that the fruit weight observations per plant would reach the description.

In the A0 treatment, the lowest fruit weight per plant was 808.776 grams, equivalent to 16.8 tons/ha. This is because the A0 treatment was not given market waste POC fertiliser enriched with maja fruit, so the plants lacked nutrients for vegetative and generative growth and only utilised the nutrients available in the soil, which were not sufficient to meet the nutrient needs and affected the weight of the fruit produced. The results of this study, when compared with the research of Ramadhan *et al.* (2025), with the provision of bamboo shoot POC, gave the highest results at a concentration of 2.5% bamboo shoot POC or 25 ml/1 L of water with a result of 636.06 grams, in this study produced more fruit weight was produced, namely 1313.00 grams/plant. This shows that the nutrients in market waste POC can meet the nutrient requirements for the growth and development of purple eggplant plants, resulting in optimal results.

Treatment A1, which is 1201.11 grams equivalent to 25 tons/ha, and A3, which is 1107.56 grams equivalent to 23 tons/ha, showed lower fruit weight than treatment A2, which is 1313.00 grams equivalent to 27.3 tons/ha. This is because the provision of POC with a lower concentration has not been able to meet the nutrient needs of purple eggplant plants and the provision of POC with a higher concentration given to plants with more nutrients makes the plants experience less than optimal growth because the provision exceeds a certain limit makes the plants susceptible to disease and the plants become stunted. This is in accordance with the opinion of Sutedjo (2010) that the growth of a plant will not grow optimally if the nutrient content is less than what is needed by the plant. According to Hadisuwito and Sukamto (2012), the provision of liquid organic fertiliser must take into account the concentration or dosage applied to the plant. Excessive dosage can cause wilting symptoms in plants.

4. Conclusion

Based on the research results, it can be concluded that market waste and maja fruit can be used as raw materials to produce liquid organic fertilizer beneficial for agriculture. The liquid organic fertiliser derived from market waste enriched with maja fruit significantly affects flowering time, reducing it to 26.44 days, and harvest time, reducing it to 53.78 days. However, it does not have a significant effect on plant height, the number of fruits per plant, or fruit weight per plant. The best treatment in this study for all parameters is A2.

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