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Effect of Liquid Organic Fertilizer (POC) and NPK Fertilizer Dosage on the Growth and Yield of Cherry Tomato Plants (Solanum Lycopersicum Ver)

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Abstract
One of the critical factors in increasing agricultural productivity is efficient and environmentally friendly nutrient management. This study aims to determine the effect of the combined dose of liquid organic fertilizer (POC) and NPK fertilizer on the growth and yield of cherry tomato plants (Solanum lycopersicum var. cerasiform). The research was conducted in the Mekarjaya Village research field, Gantang District, Indramayu Regency, West Java, at an altitude of ±36 m above sea level, from June to September 2025. The experiment used a Group Randomized Complete Block (RAK) factorial design with two factors: POC concentration (10, 20, and 30 ml/L) and NPK fertilizer dose (100, 200, and 300 kg/ha), yielding nine treatment combinations, each repeated three times. The observed variables included plant height, stem diameter, number of leaves, root components, number of fruits, fruit weight per plant, fruit weight per plot, and fresh weight of leaves and stems. The data were analyzed using ANOVA, followed by the Scott-Knott test at the 5% level, and Pearson's correlation analysis. The results showed that the combination of POC and NPK fertilizer had a significant effect on most growth parameters and the yield of cherry tomatoes, especially during the medium to late vegetative phase. The best combination was obtained from the treatment of POC 20 ml/L and NPK 200 kg/ha, which produced the highest fruit weight—1.78 kg per plant and 14.27 kg per plot, equivalent to 35.7 tons ha^{-1}. In addition, plant height and number of leaves at 28–35 HST showed a clear to very strong correlation with fruit weight per plot. Thus, the combination of POC 20 ml/L and NPK 200 kg/ha is recommended to optimally and sustainably increase the growth and yield of cherry tomatoes.

Keywords: cherry tomatoes, liquid organic fertilizers, npk, growth, crop yield

INTRODUCTION

National agricultural development is a strategic sector that plays a vital role in supporting food security, improving farmers' welfare, and fostering sustainable national economic growth. One of the important factors in increasing agricultural productivity is efficient and environmentally friendly nutrient management. Proper fertilization, both organic and inorganic, is a primary strategy in sustainable agricultural development to maintain soil fertility and increase crop yields (Sari et al., 2019).

Cherry tomatoes (Solanum lycopersicum var.) are annual horticultural crops that have high economic and nutritional value because they contain vitamin A, vitamin C, potassium, and antioxidants such as lycopene. In addition to having a relatively short growth cycle, tomato plants are also highly sensitive to soil conditions and climate, making the accuracy of fertilizer type and dosage a determining factor for production success (W. C. Putri et al., 2024).

The demand for cherry tomatoes continues to increase in line with the growing trend of healthy food consumption, both for fresh use, processed ingredients, and export market needs. Despite their great market potential, cherry tomato productivity at the farmer level remains unstable and has tended to decline in recent years, particularly in tropical lowland regions. According to Sita and Hadi (2016), the decline in tomato production is influenced by a reduction in harvest area and decreased crop productivity. Wijayanti and Susila (2013) added that environmental conditions and plant growth are closely related to the ability of tomato plants to produce fruit.

One of the main factors affecting the low productivity of cherry tomatoes is suboptimal nutrient management. Unbalanced fertilization can reduce nutrient absorption efficiency and negatively affect vegetative growth and yield formation. Liquid organic fertilizer (POC) is a fertilizer in the form of a solution resulting from the decomposition of organic matter that contains macro-, micro-, and bioactive nutrients, improving the physical, chemical, and biological properties of the soil. Meanwhile, NPK fertilizer is a compound inorganic fertilizer containing nitrogen (N), phosphorus (P), and potassium (K), which play important roles in supporting vegetative growth, flowering, and fruit filling.

Fertilizer application needs to consider not only the type but also the correct concentration and dosage. Excessive NPK fertilizer can reduce soil fertility, while doses that are too low can inhibit plant growth (Cahyono, 2012). Therefore, the combination of liquid organic fertilizer and NPK fertilizer is a promising approach because POC improves soil conditions and microbial activity, while NPK supplies macronutrients rapidly.

Various previous studies have shown that combining liquid organic and inorganic fertilizers can increase the growth and yield of cherry tomato plants (Wulansari et al., 2021; Muthohharoh et al., 2024). However, information on optimal combination doses, particularly in low-lying tropical rice fields, remains limited. Ganttar District, Indramayu Regency, has suitable land and climate potential for cherry tomato cultivation, but productivity remains suboptimal due to unstandardized fertilization practices.

Given these conditions, research is needed to assess the effectiveness of combining liquid organic fertilizer with NPK fertilizer on the growth and yield of cherry tomato plants. This study is expected to produce recommendations for efficient, applicable, and sustainable fertilization doses to support increased cherry tomato productivity and farmers' welfare in low-lying tropical areas, especially in Ganttar District.

Efficient and sustainable fertilization management has become a central focus in modern horticultural research, particularly for high-value vegetable crops such as cherry tomato (Solanum lycopersicum var. cerasiforme). Previous studies consistently report that inorganic fertilizers, especially NPK, play a key role in enhancing vegetative growth, flowering, and fruit filling due to their rapid nutrient availability. However, excessive or imbalanced NPK application has been associated with declining soil quality and reduced nutrient-use efficiency.

Conversely, liquid organic fertilizers (POC) have been widely recognized for their ability to improve soil physical, chemical, and biological properties, stimulate microbial activity, and enhance nutrient absorption efficiency. Several studies demonstrate that POC application can improve plant height, leaf number, and yield components, although its nutrient release is relatively slow and often insufficient when applied alone.

This study introduces several significant novel contributions to the scientific literature on integrated fertilization of cherry tomatoes. First, it empirically identifies the optimal combination dose of liquid organic fertilizer (POC) 20 ml/L and NPK fertilizer 200 kg/ha specifically for open-field conditions in tropical lowlands. The majority of previous studies on organic–inorganic fertilizer combinations for cherry tomatoes were conducted in greenhouses or highland areas, so their dose recommendations are not necessarily applicable to agroecosystems such as rice fields in Ganttar District, Indramayu. Second, the analytical approach used goes beyond conventional evaluation by integrating Pearson correlation analysis to quantify the dynamic relationship between vegetative growth parameters (plant height and number of leaves) and fruit yield at different growth phases (21, 28, and 35 DAP). This integration revealed that the correlation became significant and strong in the mid to late vegetative phase (28–35 DAP), providing statistical evidence that vegetative growth in this phase is a key predictor of yield accumulation—an aspect rarely explored quantitatively in similar studies.

Recent research trends emphasize integrating organic and inorganic fertilization as a sustainable approach to balance rapid nutrient supply with long-term soil health. Studies on cherry tomatoes and other horticultural crops report positive synergistic effects of POC–NPK combinations on growth and yield. Nevertheless, most existing studies focus on general yield responses, greenhouse conditions, or single growth stages, with limited attention to dose optimization, lowland tropical field conditions, and the linkage between vegetative growth dynamics and yield formation.

RESEARCH METHOD

This study employs a field experiment method because it aims to test the effect of fertilization treatments on the growth and yield of cherry tomato plants directly under real conditions. The experiment was conducted at the Research Land, Mekarjaya Village, Ganttar District, Indramayu Regency, West Java, at an altitude of ±36 m above sea level.

The experimental design used was a Group Random Design (RAK) with a factorial pattern consisting of two factors: the concentration of liquid organic fertilizer and the dose of NPK fertilizer. The treatments comprised nine combinations of POC (10, 20, and 30 ml/L) and NPK (100, 200, and 300 kg/ha) doses, each replicated three times, resulting in 27 experimental plots. Each plot measured 2 m × 2 m with a planting distance of 40 cm × 80 cm. NPK fertilization was applied twice—at planting and 14 days after planting (HST)—while POC was applied co-corically at 7 and 14 HST. Cultivation activities included land preparation, seedling production, planting, plant maintenance, and harvesting in accordance with cherry tomato cultivation standards.

The observed variables included growth and yield components, namely plant height, stem diameter, number of leaves, root volume, number of fruits per plant, fruit weight per plant, and fruit weight per plot. The observation data were analyzed using analysis of variance (ANOVA) based on the RAK model. If a significant difference between treatments was found at the 5% level, it was followed by the Scott-Knott grouping test. In addition, Pearson's correlation analysis was conducted to determine the relationship between growth components and yield in cherry tomato plants. All statistical analyses were carried out to obtain objective and scientific conclusions regarding the effectiveness of the combination of POC and NPK on the growth and yield of cherry tomatoes.

RESULTS AND DISCUSSION

This study introduces several novel contributions to the current body of knowledge:

1. Optimal Dose Identification. It identifies a specific, empirically validated optimal combination of liquid organic fertilizer (20 ml/L) and NPK fertilizer (200 kg/ha) that maximizes cherry tomato yield under open-field, lowland tropical conditions.
2. Growth–Yield Correlation Approach. Unlike many previous studies, this research integrates Pearson correlation analysis to quantitatively demonstrate strong to very strong relationships between vegetative growth parameters (plant height and leaf number at 28–35 HST) and fruit yield per plot.
3. Stage-Specific Nutrient Effect Analysis. The study highlights that the effectiveness of combined fertilization is phase-dependent, with the most pronounced effects occurring during the medium to late vegetative stages, providing a more dynamic understanding of nutrient response.
4. Context-Specific Evidence. The research provides site-specific fertilization recommendations for low-altitude tropical rice-field ecosystems, which are underrepresented in existing cherry tomato fertilization literature.

Supporting Observations

The soil analysis results showed that the research land had medium to high soil fertility. These conditions support the soil's ability to retain nutrients during cherry tomato growth. Plant pest organisms (OPT) and relevant climatic factors were controlled so as not to significantly interfere with the experimental results. Rainfall during the study period was relatively low to moderate and did not cause prolonged inundation after drainage improvements were made. Watering adequately met the plants' water needs, especially during the flowering and fruit formation stages. The favorable climatic conditions and effective water management supported yield formation, indicating that the observed differences in cherry tomato growth and yield were primarily due to the combined effects of POC and NPK fertilizers rather than environmental factors.

Key Observations

Plant Height

Table 1. Effect of Liquid Organic Fertilizer and NPK Fertilizer on Cherry Tomato Plant Height at the Age of 21, 28 and 35 HST

Yes	Treatment	Plant Height (cm)		
		21 HST	**28 HST**	**35 HST**
1	A = POC 10 ml/liter and NPK Fertilizer 100	42.67 A	60.33 to	79.67 A
2	B = POC 10 ml/liter and NPK Fertilizer 200	44.33 A	60.33 to	82.67 b
3	C = POC 10 ml/liter and NPK Fertilizer 300	41.67 A	61.00 to	78.67 A
4	D = POC 20 ml/liter and NPK Fertilizer 100	44.67 to	61.67 b	81.33 ab
5	E = POC 20 ml/liter and NPK Fertilizer 200	45.33 A	65.33 c	86.67 c
6	F = POC 20 ml/liter and NPK Fertilizer 300	43.67 A	64.67 A	79.67 A
7	G = POC 30 ml/liter and NPK Fertilizer 100	41.33 A	61.67 b	80.33 A
8	H = POC 30 ml/liter and NPK Fertilizer 200	42.33 a	63.00 c	83.00 b
9	I = POC 30 ml/liter and NPK Fertilizer 300	42.33 a	63.33 A	80,00 b

Remarks: The average value followed by the same letter, does not differ significantly according to the Scott-Knott Advanced Test at the real level of 0.05.

Based on the observation results of cherry tomato plant height, the combination of liquid organic fertilizer (POC) and NPK fertilizer did not show a significant effect at 21 HST, as nutrients—especially nitrogen—were still in the dissolution phase and not yet optimally available to plants. Consequently, plant height growth remained relatively uniform across treatments. However, at 28 and 35 HST, the combination of POC and NPK exerted a significant effect on plant height as nutrient availability increased due to the POC mineralization process and the nitrogen supply from NPK. The combination of POC 20 ml/L and NPK 200 kg/ha (treatment E) consistently produced the highest plant height, indicating that this dosage effectively provided nitrogen and potassium to support cell division, stem elongation, and maximum vegetative growth of cherry tomatoes.

Research by Sakanti et al. (2024) shows that liquid organic fertilizers can improve the efficiency of nitrogen absorption from inorganic fertilizers, resulting in better vegetative growth. Meanwhile, Firmansyah et al. (2017) explained that the combination of liquid organic fertilizer and NPK increases the availability of macronutrients required for optimal plant height. This finding aligns with the characteristics of cherry tomatoes, which require a sufficiently high supply of N and K during the vegetative phase to support robust plant height development before entering the generative phase.

Rod diameter

Table 2. Effect of Liquid Organic Fertilizer and NPK Fertilizer on Stem Diameter of Cherry Tomato Plants at the Age of 21, 28 and 35 HST

Yes	Treatment	Rod Diameter (mm)		
		21 HST	28 HST	35 HST
1	A = POC 10 ml/litre and NPK 100 kg/ha	7.57 A	9.97 b	11.07 b
2	B = POC 10 ml/liter and NPK 200 kg/ha	7.27 A	8.80 A	9.70 A
3	C = POC 10 ml/litre and NPK 300 kg/ha	7.87 A	9.43 b	10.27 A
4	D = POC 20 ml/liter and NPK 100 kg/ha	7.90 A	8.87 A	9.87 A
5	E = POC 20 ml/liter and NPK 200 kg/ha	7.10 A	9.67 b	12.42 c
6	F = POC 20 ml/liter and NPK 300 kg/ha	9.13 c	9.63 b	11.00 b
7	G = POC 30 ml/liter and NPK 100 kg/ha	6.90 to	8.57 A	11.33 b
8	H = POC 30 ml/liter and NPK 200 kg/ha	9.29 c	9.18 b	10.43 A
9	I = POC 30 ml/liter and NPK 300 kg/ha	8.53 c	10.13 c	11.03 b

Remarks: The average value followed by the same letter, does not differ significantly according to the Scott-Knott Advanced Test at the real level of 0.05.

At the ages of 21 and 28 HST, the combination of liquid organic fertilizer (POC) and NPK fertilizer exerts a noticeable effect on the diameter of cherry tomato stems, but stem enlargement is not optimal because the plant is still focusing growth on stem elongation and root system development.

At the age of 35 HST, the effect of the combination of POC and NPK on the stem diameter is becoming clearer as the demand for potassium increases and the availability of nutrients from POC mineralization. The combination of POC 20 ml/l and NPK 200 kg/ha results in the highest stem diameter as it is able to provide the most suitable balance of nitrogen and potassium for cell wall formation and stem tissue strengthening. This is in line with research Idaryani Wahid, (2019) which states that the balance of N and K significantly increases the stem diameter and structural strength of the tomato plant. In addition, Firmansyah *et al.*, (2017) explains that organic fertilization combined with inorganic fertilizers is able to increase the physiological activity of plants and accelerate the formation of secondary tissues, thereby strengthening the stem structure in the advanced vegetative phase (W. Liu et al., 2022).

Number of Leaves

Table 3. Effect of Liquid Organic Fertilizer and NPK on the Number of Leaves of Cherry Tomato Plants at the Age of 21, 28 and 35 HST

Yes	**Treatment**	**21 HST**	**28 HST**	**35 HST**
1	A = POC 10 ml/litre and NPK 100 kg/ha	6.00 to 6.00 to	16.00 ab	30.33 ab
2	B = POC 10 ml/liter and NPK 200 kg/ha	6.33 A	15.67 A	28.67 A
3	C = POC 10 ml/litre and NPK 300 kg/ha	5.67 A	16.00 ab	31.00 ab
4	D = POC 20 ml/liter and NPK 100 kg/ha	7.00 to	17.67 bc	34.00 BC
5	E = POC 20 ml/liter and NPK 200 kg/ha	7.33 A	18.00 c	37,00 c
6	F = POC 20 ml/liter and NPK 300 kg/ha	6.00 to 6.00 to	15.67 A	28.33 A
7	G = POC 30 ml/liter and NPK 100 kg/ha	6.33 A	16.00 ab	29.00 to
8	H = POC 30 ml/liter and NPK 200 kg/ha	6.67 A	17.33 BC	33.67 BC
9	I = POC 30 ml/liter and NPK 300 kg/ha	6.00 to 6.00 to	15.33 A	27.00 to

Remarks: The average value followed by the same letter, does not differ significantly according to the Scott-Knott Advanced Test at the real level of 0.05

Based on Table 3, the combination treatment of liquid organic fertilizer (POC) and NPK fertilizer has no real effect on the number of cherry tomato leaves at the age of 21 HST because the availability of nitrogen is still low due to the non-optimal POC mineralization process and the plant is still prioritizing the growth of roots and early stems, but at the age of 28 and 35 HST the effect of treatment becomes evident as the availability of nutrients increases. in particular nitrogen, where the combination of POC 20 ml/l and NPK 200 kg/ha consistently produces the highest number of leaves, showing that in the intermediate to advanced vegetative phase, more complete POC mineralization and a stable supply of NPK are able to increase leaf formation, expand the area of photosynthesis, and support the vegetative growth of cherry tomatoes optimally.

Research (Sapphire) *et al.*, 2020) Explains that plants that have a better height will generally have a greater number of leaves due to an increase in the area of photosynthesis (Nandhini et al., 2025). This shows that in addition to high growth, the increase in the number of leaves is also in line with the increase in the photosynthesis process so that the formation of new leaves can take place more optimally (Elpawati *et al.*, 2015).

Number of Branches

Table 4. Number of Branches 35 HST

Yes	Treatment	Number of Branches 35 HST (branches)
1	A = POC 10 ml/litre and NPK 100 kg/ha	10.67 A
2	B = POC 10 ml/liter and NPK 200 kg/ha	11.00 to
3	C = POC 10 ml/litre and NPK 300 kg/ha	11.33 A
4	D = POC 20 ml/liter and NPK 100 kg/ha	12.00 b
5	E = POC 20 ml/liter and NPK 200 kg/ha	11.00 to
6	F = POC 20 ml/liter and NPK 300 kg/ha	11.33 A
7	G = POC 30 ml/liter and NPK 100 kg/ha	11.67 b
8	H = POC 30 ml/liter and NPK 200 kg/ha	10.33 to
9	I = POC 30 ml/liter and NPK 300 kg/ha	16.33 c

Remarks: The average value followed by the same letter does not differ significantly according to the Scott-Knott Advanced Test at the real level of 0.05

Based on Table 4, at the age of 35 HST, the combination of POC and NPK had a significant effect on the number of cherry tomato crown branches. Low POC dose treatment and an unbalanced nutrient combination result in fewer crown branches due to phosphorus limitation, whereas increasing the POC dose (20–30 ml/L) can increase the number of crown branches by mineralizing organic matter, improving nutrient availability and soil microbial activity.

The best treatment is demonstrated by a combination of POC 30 ml/L and NPK 300 kg/ha, which produces the highest number of crown branches, and potassium in a balanced manner to support meristematic activity and plant crown development. Research (Shafi & Sharif, 2019) explained that the availability of P from organic matter is related to the activity of humate compounds that are able to release P from the absorption complex so that the element P becomes more available to plants. Liquid organic fertilizer treatment that has been properly processed mineralization and gradual release of nutrients is able to support an increase in the number of crown branches of cherry tomato plants at the age of 35 HST (Nandhini et al., 2025).

Root Volume

Table 5. Analysis of the Influence of POC and NPK on Root Volume

Yes	Treatment	Root Volume (ml)
1	A = POC 10 ml/litre and NPK 100 kg/ha	28.33 A
2	B = POC 10 ml/liter and NPK 200 kg/ha	35,00 b
3	C = POC 10 ml/litre and NPK 300 kg/ha	33.33 b
4	D = POC 20 ml/liter and NPK 100 kg/ha	38.33 c
5	E = POC 20 ml/liter and NPK 200 kg/ha	23.33 a
6	F = POC 20 ml/liter and NPK 300 kg/ha	26.67 A
7	G = POC 30 ml/liter and NPK 100 kg/ha	36.67 c
8	H = POC 30 ml/liter and NPK 200 kg/ha	26.67 A
9	I = POC 30 ml/liter and NPK 300 kg/ha	31.67 ab

Remarks: The average value followed by the same letter, does not differ significantly according to the Scott-Knott Advanced Test at the real level of 0.05

Based on Table 5, the combination of liquid organic fertilizer (POC) and NPK fertilizer has a significant effect on root volume, where D (POC 20 ml/L + NPK 100 kg/ha) and G (POC 30 ml/L + NPK 100 kg/ha) treatments produce the highest root volume because optimal nutrient balance promotes the active development of the root system, while treatment with higher doses of NPK tends to result in lower root volume, This shows that a moderate dose of nitrogen and potassium, combined with POC, is able to improve soil structure, increase the activity of microorganisms, and encourage penetration and formation of root tissues so that nutrient absorption takes place more efficiently in the final phase of cherry tomato growth.

This is in line with the findings Choi, & L. Liu et al., (2020) which states that the application of a combination of liquid organic fertilizer and inorganic fertilizer can increase biological activity so that roots develop more easily and nitrogen absorption efficiency and strengthen root growth in horticultural plants.

Cherry Tomato Fruit Count

Table 6 shows that treatment with 20 ml/liter liquid organic fertilizer combined with 200 kg/ha NPK fertilizer yields more fruits per plant than other treatment combinations. This is in line with the theory in Chapter II, where several previous studies reported that a POC dose of 20 ml/liter was able to increase the formation of fruit and plant product components (Preliminary *et al.,* 2021). In addition, Chapter II also explains that the dose of NPK fertilizer of 200 kg/ha is able to increase generative growth such as the number of fruits in cherry tomato plants (Hussein & Al-Tufaili, 2023).

Table 6. Number of Cherry Tomatoes per Plant

Yes	Treatment	Number of Fruits per Plant
1	A = POC 10 ml/litre and NPK 100 kg/ha	146.94 to
2	B = POC 10 ml/liter and NPK 200 kg/ha	154.08 to
3	C = POC 10 ml/litre and NPK 300 kg/ha	151.02 A
4	D = POC 20 ml/liter and NPK 100 kg/ha	160.16 b
5	E = POC 20 ml/liter and NPK 200 kg/ha	181.63 c
6	F = POC 20 ml/liter and NPK 300 kg/ha	168.37 b
7	G = POC 30 ml/liter and NPK 100 kg/ha	145.92 A

Yes	Treatment	Number of Fruits per Plant
8	H = POC 30 ml/liter and NPK 200 kg/ha	174.50 c
9	I = POC 30 ml/liter and NPK 300 kg/ha	145.92 A

Remarks: The average value followed by the same letter, does not differ significantly according to the Scott-Knott Advanced Test at the real level of 0.05

Cherry Tomato Fruit Weight Per Plant and Per Plot

Table 7. Effect of Liquid Organic Fertilizer and NPK Fertilizer on Cherry Tomato Fruit Weight per Plants and per Fruit

Yes	Treatment	Fruit weight Per plant (kg)	Weight of fruit per square (kg)
1	A = POC10 ml/litre and NPK 100 kg/ha	1.44 A	11.52 A
2	B = POC 10 ml/liter and NPK 200 kg/ha	1.51 A	12.05 to
3	C = POC 10 ml/litre and NPK 300 kg/ha	1.48 A	11.87 b
4	D = POC 20 ml/liter and NPK 100 kg/ha	1.55 ab	12.37 ab
5	E = POC 20 ml/liter and NPK 200 kg/ha	1.78 c	14.27 c
6	F = POC 20 ml/liter and NPK 300 kg/ha	1.65 b	13.20 b
7	G = POC 30 ml/liter and NPK 100 kg/ha	1.43 to	11.44 a
8	H = POC 30 ml/liter and NPK 200 kg/ha	1.74 c	13.92 c
9	I = POC 30 ml/liter and NPK 300 kg/ha	1.43 to	11.47 to

Remarks: The average value followed by the same letter, does not differ significantly according to the Scott-Knott Advanced Test at the real level of 0.05

Based on Table 7, the combination of liquid organic fertilizer (POC) and NPK fertilizer had a significant effect on the weight of cherry tomatoes both per plant and per plot, where the E treatment (POC 20 ml/L + NPK 200 kg/ha) produced the highest fruit weight, which was 1.78 kg per plant and 14.27 kg per plot, and was significantly different from other treatments; These results show that the balance of nutrient availability, especially nitrogen and potassium, in the combination of doses is able to increase the process of photosynthesis, photocymate translocation, and fruit filling in the generative phase, thereby supporting the formation of more optimal cherry tomato yields.

This shows that NPK fertilization is also explained to be able to support the formation of yield components because the macronutrients provided are used by plants for the formation of generative yields Aulia *et al.*, (2024). This is in line with (Emphasis added) *et al.*, 2025) It states that the combination of organic and inorganic fertilizers is able to increase the weight of tomatoes by up to 20–35% through increased photosynthetic activity and nutrient absorption efficiency.

Fresh Weight of Leaves and Fresh Weight of Cherry Tomato Stems per Plant

Table 81. Effect of Liquid Organic Fertilizer and NPK Fertilizer on Fresh Leaf Weight and Weight Fresh Cherry Tomato Stems per Plant

Yes	Treatment	Fresh WeightRod per Plant (g)	Fresh Weight of Leaves per Plant (g)
1	A = POC 10 ml/litre and NPK 100 kg/ha	4.22 A	2.27 A
2	B = POC 10 ml/liter and NPK 200 kg/ha	4.14 to	2.22 A

Yes	Treatment	Fresh WeightRod per Plant (g)	Fresh Weight of Leaves per Plant (g)
3	C = POC 10 ml/litre and NPK 300 kg/ha	4.32 A	2.84 ab
4	D = POC 20 ml/liter and NPK 100 kg/ha	4.89 ab	2.98 ab
5	E = POC 20 ml/liter and NPK 200 kg/ha	6.15 b	3.48 b
6	F = POC 20 ml/liter and NPK 300 kg/ha	3.70 ab	2.56 A
7	G = POC 30 ml/liter and NPK 100 kg/ha	6.15 b	3.06 ab
8	H = POC 30 ml/liter and NPK 200 kg/ha	4.07 ab	2.37 A
9	I = POC 30 ml/liter and NPK 300 kg/ha	4.47 ab	2.56 A

Remarks: The average value followed by the same letter does not differ significantly according to the Scott-Knott Advanced Test at the real level of 0.05

Based on Table 8, the combination of 20 ml/L liquid organic fertilizer (POC) and 200kg/ha NPK fertilizer resulted in the highest fresh weight of cherry tomato plant stems compared to other treatments. This shows that the dose provides an optimal balance of nutrients to support vegetative growth. POC plays a role in increasing metabolic activity and plant tissue formation. (Hasniar *et al.*, 2022). Meanwhile, NPK fertilizer provides macronutrients that support cell division and elongation on stems and leaves, so that photosynthesis activities and vegetative tissue formation take place more efficiently and have an impact on increasing the fresh weight of cherry tomato plants. (Nandhini et al., 2025; Sakanti et al., 2024).

Analysis of the Correlation between Growth Components and Outcomes

Correlation between plant height and fruit weight per plot

Table 9. Correlation between plant height and fruit weight per plot Age (21 HST, 28 HST, and 35 HST)

Yes	Correlation Coefficients	Plant Height		
		21 HST	28 HST	35 HST
1	R	0,81	0,71	0,74
2	Category r	Very Powerful	Strong	Strong
3	r^2	0,652	0,503	0,549
4	Sig.	0,007	0,029	0,019
5	Conclusion	Real	Real	Real

The results of the correlation analysis showed that plant height at the ages of 21, 28, and 35 HST had a strong, positive relationship with fruit weight per plot. This relationship indicates that optimal vegetative growth is vital for supporting increased cherry tomato yields.

Plants with better heights generally have more developed crowns and leaf areas, so photosynthesis capacity increases and produces enough photosynthate to support the process of fruit formation and filling during the generative phase. (Hornyák *et al.*, 2022). This shows that plant height can serve as an effective morphological indicator of fruit yield per plot in cherry tomato plants.

Weraduwage *et al.*, (2015) Stating that the weight of plant fruits is very sensitive to environmental factors, such as light intensity and water availability, so morphological parameters do not always directly determine results, this study found that relatively optimal ecological conditions and a balanced fertilization regime significantly correlate with fruit weight per plot. This opinion is reinforced by Ncise et al., (2020) This states that plant responses to stress and genetic differences can affect the efficiency of photosynthesis and distribution to generative organs, so the relationship between vegetative growth and fruit yield can vary between conditions. In this study, the absence of environmental stress and balanced nutrient availability led to a consistent, real relationship between plant height and fruit weight per plot.

Correlation between the number of leaves and the weight of fruits per plot

Table 20. Correlation between the number of leaves and the weight of fruits per plot Age (21 HST, 28 HST, and 35 HST)

Yes	Correlation	21 HST	28 HST	35 HST
1	R	0,54	0,70	0,71
2	Category r	Medium	Strong	Strong
3	r²	0,296	0,490	0,509
4	Sig.	0,125	0,032	0,027
5	Conclusion	Not real	Real	Real

The results of this analysis showed that phase 28 HST and 35 HST had a real and strong relationship in predicting the weight of fruit per plot, with an influence contribution of 49.0% and 50.9%, respectively. This shows that as the plant ages, an increase in the number of leaves significantly increases the accumulation of assimilates that support the formation of fruit weight. However, in the initial phase of 21 HST, the relationship was unreal Sig. 0.125 with an influence of only 29.6%.

The insignificance of this relationship in the early phases can be caused by various factors, such as the efficiency of photosynthesis that does not increase in proportion to the number of leaves, environmental conditions that affect light absorption, or the ability of the leaves to produce fruit. This result corresponds to the explanation Lembo *et al.,* (2025) that the number of leaves is indeed related to photosynthesis capacity, and environmental conditions, so the correlation is not always significant.

The conditions at the beginning of this phase are also in line with the opinion Porter *et al*., (2019) Explaining that in the early stages an insignificant correlation can occur when other physiological variables or leaf quality (such as effective leaf area) may be more dominant than just the number of leaves in determining the final result.

Despite growing interest in integrated fertilization strategies, several gaps remain in existing research, which this study addresses:

1. Lack of Dose Optimization Studies. Previous research often confirms positive effects of organic–inorganic fertilizer combinations but does not clearly define optimal concentration–dose combinations that maximize yield efficiency.
2. Limited Lowland Tropical Field Evidence. Most studies are conducted in greenhouses or upland areas, leaving a gap in understanding fertilizer responses in lowland tropical agroecosystems, particularly rice-field conversion areas.
3. Insufficient Integration of Growth Indicators and Yield. Earlier studies tend to evaluate growth and yield separately, with minimal statistical linkage. There is a clear gap in studies that quantify the predictive role of vegetative growth parameters on yield outcomes.
4. Sustainability-Oriented Recommendations. There is limited empirical evidence supporting balanced fertilization strategies that simultaneously enhance productivity while reducing dependence on high inorganic fertilizer inputs.

CONCLUSION

Based on the results of the study, it can be concluded that the combination of liquid organic fertilizer (POC) and NPK fertilizer had a significant effect on most growth and yield parameters of cherry tomatoes, particularly during the medium to late vegetative phase. These parameters included plant height, stem diameter, number of leaves, root components, and yield components. The best combination was obtained in treatment E (POC 20 ml/L + NPK 200 kg/ha), which produced the highest fruit weight—1.78 kg per plant and 14.27 kg per plot, equivalent to 35.7 tons ha^{-1}—thus demonstrating the most effective increase in growth and yield of cherry tomatoes. In addition, a clear to strong correlation was observed between the vegetative growth components (plant height and number of leaves at 28–35 HST) and fruit weight per plot, indicating that vegetative growth in the mid to late phase plays an essential role in determining cherry tomato yield accumulation.

Based on these findings, this study contributes to sustainable horticultural science by presenting a data-driven, growth-linked, and location-specific fertilization strategy that integrates liquid organic fertilizer and NPK to optimize cherry tomato productivity.

Suggestion: It is recommended to apply a combination of liquid organic fertilizer (POC) and NPK fertilizer in balanced doses, as this approach has been proven to enhance nutrient availability and improve the growth and yield of cherry tomato plants. The application of these fertilizer combinations should be adjusted according to soil fertility conditions and plant growth phases to ensure more efficient nutrient absorption.

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