



The Effect of Lamtoro Leaf POC and Tofu Liquid Waste on the Growth of Cayenne Chili (*Capsicum frutescens*)

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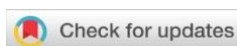
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Abstract

Background: Liquid organic fertilizer is a fermented solution of organic plant residues, animal and human feces containing nutrients. Lamtoro and tofu liquid waste contain N, P, K, Mg, and Ca, which are suspected to have the potential for liquid organic fertilizer to increase the growth of cayenne pepper (*C. frutescens*). This study aims to determine the effect of giving POC from lamtoro leaves and tofu liquid waste on the growth of cayenne pepper (*C. frutescens*). **Methods:** This study used a completely randomized design (CRD) with two replications. POC volume 1:1 consisted of two-liter lamtoro leaf extract and 2-liter tofu liquid waste. The first factor is the volume concentration of POC with the respective concentrations of V0: 0%, V1: 10%, V2: 20%, and V3: 30%. The second factor is the time of spraying POC T1: 3 days interval and T2: 6 days interval. Parameters measured included plant height (cm), number of leaves (strands), and plant fresh weight (g). **Results:** 20% volume (V2) with three-day intervals (T1) gave the best results for plant height (20.10 cm), number of leaves (7.00 leaves), and plant fresh weight (11.50 g). 0% volume (V0) with an interval of 6 days (T2) gave the lowest yield on plant height (6.35 cm), number of leaves (3.00 leaves), and fresh weight of plants (3.00 leaves). **Conclusions:** Application POC from lamtoro leaves and tofu liquid waste can potentially increase the growth of cayenne pepper (*C. frutescens*).

Keywords: *Capsicum frutescens*; Lamtoro leaves; Plant growth; POC; Tofu liquid waste.



Article history

Received: 19 Jun 2023

Accepted: 13 Aug 2023

Published: 31 Aug 2023

Publisher's Note:

BIOEDUSCIENCE stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Citation:

Andriyani, S., & Suparti. 2023. The Effect of Lamtoro Leaf POC and Tofu Liquid Waste on the Growth of Cayenne Chili (*Capsicum frutescens*). BIOEDUSCIENCE, 7(2), 231-241. doi: [10.22236/jbes/11885](https://doi.org/10.22236/jbes/11885)



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Introduction

Fertilizing with inorganic fertilizers containing chemicals can cause problems for the environment if used in the long term. The increasingly frequent application of inorganic fertilizers without the right dose can degrade soil fertility and change the soil's physical, biological, and chemical properties (Maghfoer, 2018). Chemicals such as cadmium and arsenic in inorganic fertilizers can increase cancer risk and adversely affect human brain development (Ilahi et al., 2021). Fertilization with organic fertilizer is better than inorganic fertilizer because organic fertilizer comes from natural materials from weathering the remains of living things, such as plants and animals, so it is safe to improve soil fertility (Yaser et al., 2023). Liquid organic fertilizer is an organic fertilizer in the form of a solution containing phosphorus, nitrogen, and potassium nutrients to increase plant growth (Kurniawan et al., 2017). Liquid organic fertilizer has several advantages, such as providing appropriate nutrients for plant needs which can be applied evenly. The concentration is easily adjusted to plant needs. It can overcome plant nutrient deficiencies by regulating their concentration (Pratiwi et al., 2019).

Lamtoro leaves, and tofu liquid waste is suspected of having the potential as liquid organic fertilizer. These materials are easily found around the house and are environmentally friendly. Lamtoro was chosen as an ingredient to make liquid organic fertilizer because it comes from a legume plant that is easily decomposed and provides nutrients that can accelerate plant growth (Rizqika et al., 2022). Lamtoro contains higher nutrients than other plants, especially N (Hidayat & Suharyana, 2019). Lamtoro leaves store various nutrients consisting of 1.31% Ca, 0.33% Mg, 2.06% K, 0.2% P, and 3.84% N so that it can be processed into liquid organic fertilizer that can optimize plant growth and fertilize the soil (Prakoso et al., 2018). Lamtoro is generally only used by the community as shade, erosion prevention, and animal feed. Processing lamtoro leaves into liquid organic fertilizer needs to be done so that its utilization is not in vain. According to research by Hidayat & Suharyana (2019), applying liquid organic fertilizer made from lamtoro leaves can increase plant height, number of leaves, and fresh weight of Bokchoy plants (*Brassica rapa L.*).

Tofu-making is one of the businesses that can produce liquid waste (Simbolon et al., 2022). Tofu liquid waste discharged into the river is not treated first, so it disturbs residents because it causes a foul smell and pollutes the surrounding environment. This problem can be overcome by recycling tofu liquid waste into liquid organic fertilizer, which is thought to be able to fertilize plants. Processing tofu liquid waste into organic fertilizer is an alternative solution to replace the use of inorganic fertilizers that are increasingly dependent. Tofu liquid waste stores various nutrients consisting of 5.803% C-Organic, 1.34% K₂O, 1.24% N, and 5.54% P₂O₅ (Salamati et al., 2022). Tofu liquid waste is thought to have the potential to be used as liquid organic fertilizer considering the nutrients it contains are needed for plant growth. Research by Saptorini et al. (2021) states that the application of liquid organic fertilizer from tofu liquid waste can increase plant height, number of leaves, and fresh weight of mustard plants (*Brassica chinensis L.*).

Cayenne pepper (*Capsicum frutescens*) is a type of vegetable that has a spicy taste and is liked by most Indonesian people. According to Aidah (2020), the content of endorphins in cayenne pepper acts as a natural pain reliever. The capsaicin content in cayenne pepper reduces calorie intake to increase fat burning in the human body. The content of folic acid, potassium, beta carotene, and vitamin B6 in cayenne pepper plays a role in preventing heart disease. The yearly decline in cayenne pepper productivity causes scarcity and increased prices, causing public distress. Chili productivity from 2014 to 2018 decreased from 5.71 tons/ha to 2.78 tons/ha (Erwandri, 2022). Chili's productivity must be increased to meet the community's increasing demand. Increasing the productivity of cayenne pepper needs to be done by increasing the growth of cayenne pepper plants supported by fertilizer. However, people's dependence on using inorganic fertilizers made from chemicals sometimes causes problems because they can pollute the environment. The use of organic fertilizers needs to be increased because the material is affordable, easy to obtain, and environmentally friendly. The use of lamtoro leaves as a liquid organic fertilizer has been studied on Bokchoy plants (*Brassica rapa L.*) (Hidayat & Suharyana, 2019), while the use of tofu liquid waste as a liquid organic fertilizer has been previously studied on mustard plants (*Brassica chinensis L.*) (Saptorini et al., 2021).

There has been no previous research on using a combination of lamtoro leaves and tofu liquid waste as a liquid organic fertilizer to improve cayenne pepper (*Capsicum frutescens*) plants. This study combines lamtoro leaves and tofu liquid waste into liquid organic fertilizer to increase the growth of cayenne pepper plants (*Capsicum frutescens*). In previous studies, it has been known that lamtoro leaves and tofu liquid waste each contain nutrients (phosphorus, nitrogen, potassium, magnesium, etc.) in complementary amounts, so it is thought to be able to increase the growth of cayenne pepper plants. This study was conducted to test the effect of lamtoro leaf POC and tofu liquid waste on the growth of cayenne pepper plants (*Capsicum frutescens*).

Methods

This research was conducted at the Green House of Biology Education, Faculty of Teacher Training and Education, University of Muhammadiyah Surakarta, from March to May 2023. The materials used in this study included cayenne pepper (*C. frutescens*) seeds, soil media, molasses, EM4, lamtoro leaves, and tofu liquid waste. This study used a Complete Randomized Design (RAL) with two repeats. The volume of 1:1 POC material consists of 2 liters of lamtoro leaf extract and 2 liters of tofu liquid waste. The first factor of POC volume concentration includes V0: 0 ml POC (0%), V1: 100 ml POC + 900 ml water (10%), V2: 200 ml POC + 800 ml water (20%), and V3: 300 ml POC + 700 ml water (30%) (Septirosya et al., 2019). The second factor of POC spraying time includes T1: 3-day interval and T2: 6-day interval (Daryanti et al., 2022). 4 x 2 treatment combinations produce 8 treatment combinations, namely V0T1 (0% POC; 3 days), V1T1 (10% POC; 3 days), V2T1 (20% POC; 3 days), V3T1 (30% POC; 3 days), V0T2 (0% POC; 6 days), V1T2 (10% POC; 6 days), V2T2 (20% POC; 6 days), and V3T2 (30% POC; 6 days). Two repetitions were carried out for 16 treatment combinations in this experimental design.

Procedure

The work procedure in this study began with preparing 1kg of lamtoro leaves, 2 liters of tofu liquid waste, 60 ml of molasses, 60 ml of EM4, and 3 liters of water. The ratio between EM4: molasses: water is 1: 1: 50 (Astuti et al., 2022). Make lamtoro leaf extract by blending 1 kg of lamtoro leaves with 2 liters of water until smooth and putting lamtoro leaf extract into a 25-liter jar. Making lamtoro leaf POC and tofu liquid waste is done by mixing 2 liters of lamtoro leaf extract and 2 liters of tofu liquid waste into a jar that contains 60 ml of molasses, 60 ml of EM4, and 1 liter of water, then tightly closing the jar, then fermenting the POC for 14 days (Pandi et al., 2023). POC fermentation can run perfectly for 14 days (Sugiono et al., 2022). Next, filter the POC and put it in a sprayer bottle with concentrations of 10%, 20%, and 30%, respectively. Seeding cayenne pepper seedlings is carried out by soaking seedlings for one night and selecting sunken seedlings for planting. Planting cayenne pepper seedlings in polybags filled with soil and husk charcoal in a ratio of 1: 1. The application of POC is carried out by spraying it on plants that have aged 14 days with a volume of 0%, 10%, 20%, and 30% at intervals of once every three days and once every six days. The application of POC by spray is better than by shaking (Nadhira & Berliana, 2017). Water feeding is carried out when the plant begins to dry. Parameters observed include plant height (cm), number of leaves (strands), and fresh weight of the plant (g). Plant height measurements are carried out weekly by measuring the base to the tip of the roots with a ruler. The number of leaves is calculated weekly by counting leaf blades growing. Fresh weight is obtained by weighing plants that have turned one month old with digital scales.

Data analysis

Data analysis in this study used the SPSS 20 program. The observation data were tested for normality and homogeneity, then continued with the Two-way ANOVA test at the 5% level to test the effect of each treatment on the growth of cayenne pepper plants (*C. frutescens*).

Result

The growth results of cayenne pepper (*C. frutescens*) plants after POC administration of lamtoro leaves and tofu liquid waste are presented in Table 1.

Table 1. The effect of treatment on the growth of cayenne pepper plants (*C. frutescens*).

Volume Concentration (V)	Day Interval (T)					
	Plant Height (cm)		Number of Leaves (strands)		Fresh Weight (g)	
	T1	T2	T1	T2	T1	T2
0% (V0)	8.85	6.35*	4.00	3.00*	5.00	3.00*
10% (V1)	19.00	13.00	7.00**	4.00	8.50	5.00
20% (V2)	20.10**	18.50	7.00**	4.00	11.50**	7.00
30% (V3)	19.50	15.50	5.00	3.00*	8.00	6.00

Remarks: (**) highest and (*) lowest

Table 1. shows that the difference in the treatment level of POC volume concentration (V) and the interval of spraying days (T) affected the growth of cayenne pepper plants. The effect of differences in volume concentration (V) of lamtoro leaf POC and tofu liquid waste on the growth of cayenne pepper plants is presented in Figure 1.

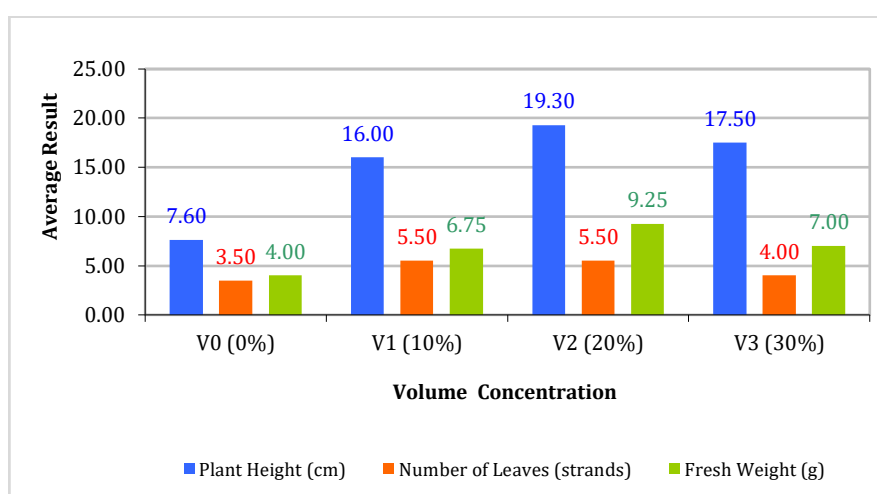


Figure 1. Histogram effect of volume concentration (V) on plant height parameters, number of leaves, and fresh weight of cayenne pepper plants.

Figure 1. shows that the application of lamtoro leaf POC and tofu liquid waste at a volume concentration of 20% (V2) obtained the best results on the average plant height (19.30 cm), number of leaves (5.50), and fresh weight of plants (9.25 g) while at a concentration of 0% (V0) obtained the lowest yield on the average plant height (7.60 cm), number of leaves (3.50) and fresh weight of plants (4.00 g). The effect of differences in day interval (T) of lamtoro leaf POC and tofu liquid waste on the growth of cayenne pepper plants is presented in Figure 2.

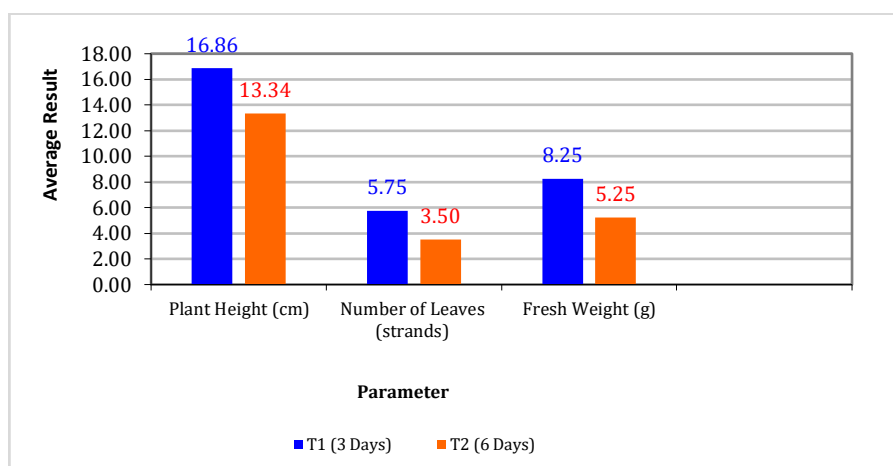


Figure 2. Histogram effect of day interval (T) on the meter plant height, number of leaves, and fresh weight of cayenne pepper plant.

Figure 2. shows that the application of lamtoro leaf POC and tofu liquid waste at 3-day intervals (T1) obtained the best results on the average plant height (16.86 cm), number of leaves (5.75), and fresh weight of plants (8.25 g) while at intervals of 6 days (T2) obtained the lowest results on average plant height (13.34 cm), number of leaves (3.50) and fresh weight of plants (5.25 g).

Effects of Treatment on Plant Height

Table 1. shows that the application of lamtoro leaf POC and tofu liquid waste at a volume concentration of 20% (V2) with a spraying interval of 3 days (T1) gave the best results on the height growth of cayenne pepper plants, which is 20.10 cm. Applying lamtoro leaf POC and tofu liquid waste at a volume concentration of 0% (V0) with a spraying interval of 6 days (T2) gave the lowest yield on the cayenne pepper plant height growth of 6.45 cm. According to Saptorini et al. (2021), giving tofu liquid waste POC to the high growth of mustard plants at a volume concentration of 20% gives the best results, while at a volume concentration of 0% gives the lowest results. According to Aranda et al. (2023), the POC treatment of tofu liquid waste at a volume concentration of 0% resulted in the lowest mustard plant height compared to other treatments. According to Daryanti et al. (2022), giving banana stem POC to the height growth of cayenne pepper plants at 3-day intervals gives the best results, while 6-day intervals give the lowest results.

Effects of Treatment on the Number of Leaves

Table 1. shows that the application of lamtoro leaf POC and tofu liquid waste at volume concentrations of 10% (V1) and 20% (V2) with a spraying interval of 3 days (T1) gave the best results on the growth of the number of leaves of cayenne pepper plants, which was as much as 7.00 strands. The application of lamtoro leaf POC and tofu liquid waste at volume concentrations of 0% (V0) and 30% (V3) with a spraying interval of 6 days (T2) gave the lowest results on the growth of the number of leaves of cayenne pepper plants, which was as much as 3.00 strands. According to Saptorini et al. (2021), giving tofu liquid waste POC to the growth of the number of mustard plant leaves at a volume concentration of 20% gives the best results, while a volume concentration of 0% gives the lowest results. According to Triadiawarman & Rudi (2019), giving Gamal leaf POC at 3-day intervals gives the best results on the growth of the number of mustard plant leaves.

Effects of Treatment on Plant Fresh Weight

Table 1. shows that the application of lamtoro leaf POC and tofu liquid waste at a volume concentration of 20% (V2) with a spraying interval of 3 days (T1) gave the best results on the fresh weight of cayenne pepper plants, which was 11.50 g. Applying lamtoro leaf POC and tofu liquid waste at a volume concentration of 0% (V0) with a spraying interval of 6 days (T2) gave the lowest result on the fresh weight of cayenne pepper plants, which was 3.00 g. According to Saptorini et al. (2021), applying tofu liquid waste POC to the fresh weight of mustard plants at a volume concentration of 20% gave the best results, while a volume concentration of 0% gave the lowest results. According to Dewi et al. (2022), POC treatment of lamtoro leaves at a volume concentration of 20% gave the highest yield on the average fresh weight of onion plants. According to Daryanti et al. (2022), giving banana stem POC to the fresh weight of cayenne pepper plants at 3-day intervals gave the best results, while 6-day intervals gave the lowest results.

Discussion

In the high parameters of cayenne pepper plants, the volume concentration of lamtoro leaf POC and tofu liquid waste 20% (V2) obtained the best results. The volume concentration of lamtoro leaf POC and tofu liquid waste 0% (V0) obtained the lowest

results. The amount of POC nutrients in lamtoro leaves and tofu liquid waste at a volume concentration of 20% (V2) is abundant. The nutrients needed by cayenne pepper plants are fulfilled, and the high growth of cayenne pepper plants runs faster. The amount of POC nutrients of lamtoro leaves and tau liquid waste at a volume concentration of 0% (V0) is very small, so cayenne pepper plants lack nutrients, resulting in the high growth of cayenne pepper plants running very slowly. This shows that the higher the POC volume of lamtoro leaves and tofu liquid waste, the more nutrients plants absorb, so the height growth of cayenne pepper plants increases. In line with [Hidayat & Suharyana \(2019\)](#), the higher the concentration of the volume of application of lamtoro leaf POC on Bokchoy plants, the more nutrients the plant receives so that plant height growth will run faster. Conversely, the lower the volume concentration of lamtoro leaf POC and tofu liquid waste, the less nutrients are absorbed by plants, so the higher growth rate of cayenne pepper plants is lower. According to [Aranda et al. \(2023\)](#), the treatment of tofu liquid waste POC at a volume concentration of 0% produces the lowest mustard plant height compared to other treatments because the availability of nutrients in tofu liquid waste POC is very small, so the nutritional needs of mustard plants are not met.

Nutrients influence the height of cayenne pepper plants in lamtoro leaf POC and tofu liquid waste in the form of nitrogen, phosphorus, and potassium elements. Nitrogen is the most influential nutrient in increasing plant height growth ([Jurhana et al., 2017](#)). Nitrogen can accelerate plant height gain because nitrogen stimulates plant growth, especially in the stem organs ([Pamungkas & Sumassageno, 2017](#)). The phosphorus element in tofu liquid waste POC functions to form ATP as the energy needed by plants in the process of enlargement and elongation of stem cells so that it can increase plant height. In contrast, the potassium element in tofu liquid waste POC activates enzymes during photosynthesis, producing photosynthesis products that can increase plant height ([Marian & Tuhuteru, 2019](#)). Nitrogen, phosphorus, and potassium elements from lamtoro leaf POC are needed by plants in physiological and metabolic processes, resulting in increased plant height ([Aulia, 2020](#)). Plant metabolism can work optimally when the concentration of lamtoro leaf POC volume applied to plants is increasing ([Septirosya et al., 2019](#)).

In the height parameter of cayenne pepper plants, applying lamtoro leaf POC and tofu liquid waste at three days (T1) gave the best results compared to the interval of 6 days (T2). This shows that the more often the interval of applying POC of lamtoro leaves and tofu liquid waste to plants, the faster the height growth of cayenne pepper plants. On the contrary, the rarer the interval of applying POC results in a slower rate of plant height increase because the nutrients absorbed by plants are very small, so their nutritional needs are not optimally met ([Leksono, 2021](#)). The approaching POC application interval causes plants to obtain nutrients contained in POC more often. Therefore, plants often given POC can grow more optimally than plants rarely given POC ([Hanum & Jazilah, 2021](#)). In line with [Muryanto's](#) research (2020), which states that the increasingly frequent application of POC results in more soil microbes decomposing organic matter into simple elements that are quickly absorbed by plants and fixation of nitrogen elements from the air will run perfectly so that the availability of micro and macronutrients can accelerate the process of plant growth. In addition, applying POC in increasingly frequent intervals can physically, chemically, and biologically support soil fertility.

In the parameters of the number of leaves of cayenne pepper plants, the volume concentration of lamtoro leaf POC and tofu liquid waste of 10% (V1) and 20% (V2) obtained the best results. This shows that applying lamtoro leaf POC and tofu liquid waste in sufficient volume concentration increased the growth of cayenne pepper leaves due to nutrients absorbed by cayenne pepper plants in sufficient quantities or as needed. [Febriani et al. \(2020\)](#) stated that the decomposition of nutrients carried out by microbes can run perfectly if the application of POC volume concentration is by plant needs so that it can increase the number of leaves. The volume concentration of lamtoro leaf POC and tofu liquid waste 0% (V0) and 30% (V3) obtained the lowest results on cayenne growth in the number of leaves of pepper plants. This shows that the application of lamtoro leaf POC and

tofu liquid waste in volume concentrations that are too low and too high results in the growth of the number of leaves of cayenne pepper plants is very low because the nutrients received by cayenne pepper plants are not following needs. The volume concentration of lamtoro leaf POC and tofu liquid waste that is too low causes very slow leaf growth, while the volume concentration of lamtoro leaf POC and tofu liquid waste that is too high causes the leaves to dry and fall off easily. In line with the research of [Lasmini et al. \(2017\)](#), which states that the application of POC must be made with the right dose so that wilting symptoms in plants can be prevented because too little dose of fertilizer can slow down the process of increasing the number of leaves while too much fertilizer dose can damage the leaf organs or the appearance of leaf forms such as burning during dry weather. According to [Hafiz et al. \(2020\)](#), the use of excessive doses of fertilizer can cause saturation of micro and macronutrients, resulting in the plant growth process not running perfectly.

The increase in the number of leaves of cayenne pepper plants goes hand in hand with the increase in plant height. [Istiqomah et al. \(2022\)](#) stated that an increase in the number of leaves is closely related to plant height gain. The increase in leaf growing points goes hand in hand with the increase in plant height, so the number of leaves that grow will also increase. According to [Thalib \(2019\)](#), the number of leaves increases caused by cell division, elongation, and differentiation. In addition, the increase in the number of leaves is influenced by nutrients in the POC of lamtoro leaves and tofu liquid waste in the form of nitrogen, magnesium, and potassium elements. The nitrogen element plays a role in forming chlorophyll needed during the photosynthesis process. The higher chlorophyll produced causes the leaves to absorb sunlight optimally, and photosynthesis results are accumulated throughout the plant body and increase the number of leaves ([Balgis et al., 2021](#)). The magnesium element acts as an enzyme activator in energy transport and distributes carbohydrates needed in photosynthesis, which is very influential in increasing the number of leaves ([Rodrigues et al., 2021](#)). The increase in the number of leaves due to photosynthesis is influenced by factors such as the intensity of sunlight, water, and temperature. The element potassium also influences the number of leaves. In line with research by [Sulham & Wulandari \(2019\)](#), which states that the presence of potassium elements maintains the number of leaves because it plays a role in strengthening leaves so that they do not fall off quickly and prevent a decrease in the number of leaves.

In the parameter of the number of leaves of cayenne pepper plants, applying lamtoro leaf POC and tofu liquid waste at three days (T1) gave the best results compared to the interval of 6 days (T2). This shows that the more frequent the interval of applying POC lamtoro leaves and tofu liquid waste to plants, the more the number of leaves of cayenne pepper plants increases. Conversely, the rarer the interval of application of POC lamtoro leaves and tofu liquid waste results in an increase in the number of leaves of cayenne pepper plants is less because the nutrients absorbed by plants are very less, so their nutritional needs are not optimal. In line with [Pandia's research \(2023\)](#), which states that differences in days of application of POC result in differences in the productivity of the number of leaves in plants. Application of POC in adjacent or frequent day intervals can increase the leaf formation rate.

Conversely, applying POC in distant or rare day intervals results in a slower leaf formation rate because plant nutrient needs are unmet. According to [Muningsih & Majing \(2018\)](#), the increasingly frequent application of POC causes plants to absorb nitrogen elements more often, increasing chlorophyll levels in the plant body. Increased chlorophyll levels in leaves make leaf color greener and increase photosynthesis results, accumulating throughout the plant body and increasing the number of leaves ([Muningsih & Majing, 2018](#)).

In the fresh weight parameter of cayenne pepper plants, the volume concentration of lamtoro leaf POC and tofu liquid waste 20% (V2) obtained the best results. The volume concentration of lamtoro leaf POC and tofu liquid waste 0% (V0) obtained the lowest results. The amount of POC nutrients in lamtoro leaves and tau liquid waste at a volume concentration of 20% (V2) is abundant. The nutrients needed by cayenne pepper plants

are fulfilled, and the fresh weight of cayenne pepper plants can increase. The amount of POC nutrients of lamtoro leaves and tau liquid waste at a volume concentration of 0% (V0) is very small, so cayenne pepper plants lack nutrients, resulting in very low plant fresh weight. This shows that the higher the concentration of lamtoro leaf POC volume and tofu liquid waste, the more nutrients plants absorb, so the fresh weight of cayenne pepper plants increases.

Conversely, the lower the volume concentration of lamtoro leaf POC and tofu liquid waste, the fewer nutrients the plant absorbs, so the fresh weight of cayenne pepper plants is lower. According to Dewi et al. (2022), applying lamtoro leaf POC at a volume concentration of 20% can supply nitrogen elements according to the plant's needs to carry out the growth process and increase the fresh weight of onion plants. According to Mahadi et al. (2023), applying tofu liquid waste POC in the control treatment (0%) obtained the lowest result on the average fresh weight of red lettuce plants. It was due to the application of POC from tofu waste in plants containing very few nutrients, so plants lacked nutrients.

The increase influences the fresh weight of cayenne pepper plants in plant height and number of leaves. In line with Marian & Tuhuteru's (2019) research, the increase in height and number of leaves in plants can affect the size of fresh weight. Pandia (2023) states that the increase in the number of leaves is directly proportional to the increase in the fresh weight of plants because leaves include plant organs that contain a lot of water. Therefore, the more the number of leaves produced, the higher the moisture content in the plant and the higher the fresh weight of the plant. Nutrients influence the increase in fresh weight in cayenne pepper plants in lamtoro leaf POC and tofu liquid waste in the form of phosphorus and potassium elements. In line with research by Fretis et al. (2022), which states that phosphorus elements greatly affect the increase in plant fresh weight because higher phosphorus elements can optimize the process of energy transfer and plant metabolism so that plant fresh weight also increases. According to research by Muldiana & Rosdiana (2017), the faster metabolic process increases plant fresh weight, and vice versa. The potassium element activates enzymes in the formation of carbohydrates needed in photosynthesis. Then the photosynthesis process produces a buildup of assimilate which can increase the fresh weight of plants (Fretis et al., 2022).

In the fresh weight parameters of cayenne pepper plants, applying lamtoro leaf POC and tofu liquid waste at 3-day intervals (T1) gave the best results compared to 6-day intervals (T2). This shows that the more frequent the interval of application of lamtoro leaf POC and tofu liquid waste on plants, the fresh weight of cayenne pepper plants also increases. Conversely, the rarer the interval of giving lamtoro leaf POC and tofu liquid waste, it will produce cayenne pepper plants that are less fresh. The nutrients plants absorb are much less, so their nutritional needs are not optimal. According to Leksono (2021), applying POC at long intervals results in lower plant fresh weight because the nutrients absorbed by plants are much less, so their nutritional needs are not optimal. According to Hanum & Jazilah (2021), the closer the interval of applying POC, the more plants get nutrients in POC so that these plants can grow more optimally compared to plants that are rarely given POC.

Conclusions

This study provides results that applying lamtoro leaf POC and tofu liquid waste can affect the growth of cayenne pepper (*C. frutescens*) plants, including plant height, number of leaves, and fresh weight of plants. The POC treatment of lamtoro leaves and V2T1 tofu liquid waste (volume concentration 20% with 3-day intervals) obtained the best results on all parameters. POC treatment of lamtoro leaves and tofu liquid waste V0T2 (volume concentration 0% with 6-day intervals) obtained the lowest results on all parameters. Processing lamtoro leaves and tofu liquid waste into POC is an alternative solution to replace dependence on inorganic fertilizers and handling industrial waste that pollutes the environment.

Acknowledgment

Thank you to the Head of the University of Muhammadiyah Surakarta Biology Education Laboratory, who has helped and provided facilities during the research. We would also like to thank the Tofu Industry Owner who has provided tofu liquid waste to be used as research material so that this research can run smoothly.

Declaration statement

The authors reported no potential conflict of interest.

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