

Cauliflower (Larissa F1) Response to Media Composition and Liquid Organic Fertilizer under Limited Land Condition in Bogem, Sidoarjo

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Abstract

Background: Cauliflower (*Brassica oleracea* L.) is a highly valued horticultural vegetable commodity. Previous research on the application of Jimmy Hantu LOF on cauliflower has focused on the polybag planting system with a single type of media, whereas this study focuses on the variation in planting medium composition (soil, goat dung, and burnt husks) in conjunction with LOF concentration. This method is expected to provide more thorough information regarding the interaction between growing media and liquid organic fertilizer as a strategy to boost cauliflower productivity in limited land settings. **Methodology:** The research was carried out at Sidoarjo, East Java. Polybags with various liquid organic fertilizer compositions and dosages were used in this research. The study used a completely randomized factorial design with two treatment factors: the kind of planting media (three treatment levels) and the concentration of liquid fertilizer (four treatment levels). **Findings:** There was a significant interaction between the soil composition treatment goat manure: burnt husks (1:1:1) (M2) and the content of liquid organic fertilizer 14 ml/L (P3) when compared to the control treatment. The treatment resulted in a 34.42 % difference in the height of cauliflower plants and a 44.93 % difference in the number of leaves. The results show that combination of planting medium soil: goat manure: burnt husk (1:1:1) (M2) with the application of 14 ml/L of Jimmy Hantu liquid organic fertilizer is the most successful treatment. **Contribution:** These findings provide scientific evidence on the synergistic effect of planting media composition and liquid organic fertilizer concentration, offering a valuable reference for optimizing sustainable *B. oleracea* cultivation in limited land conditions

Keywords: Burned Husk; Cauliflower; Goat Manure; Larissa; Liquid Organic Fertilizer



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INTRODUCTION

Cauliflower (*Brassica oleracea* L) is one of the horticultural commodities belonging to the cabbage family (Cruciferae) originating from Europe. Cauliflower contains calories, protein, fat, carbs, calcium, phosphorus, iron, vitamins A, B1, C, and water. Public awareness of nutritional needs continues to increase. One approach is to consume fresh vegetables like cauliflower, which can increase demand for cauliflower and provide benefits for consumers, producers, and society. Cauliflower productivity in Indonesia, based on data from the Central Statistics Agency, has seen a significant decline (Sari et al., 2020). According to Central Statistics Agency (2024) cauliflower productivity was 203,385 tons, in 2022 it was 192,121 tons, and in 2023 it was 175,073 tons. Alwita (2019) Ensuring food availability for all citizens is a priority of national policy. As a country with a large population, Indonesia faces the challenge of meeting the food needs of its people. One of the main obstacles is the decreasing agricultural land area each year.

Research by Rarizy et al., (2023) shows that demonstrated combining goat manure with Hantu liquid organic fertilizer (LOF) improves cauliflower (*Brassica oleracea* L.) growth and production. The best treatment was achieved at a dose of 6 kg/plot of goat manure with 1 ml/L of Hantu LOF, which was able to increase plant height, number of leaves, diameter, and flower weight. However, this study was still limited to one type of growing medium with variations in LOF dosage. This study offers novelty by exploring variations in growing medium composition combined with different concentrations of Jimmy Hantu LOF. This approach is expected to yield the optimal treatment combination to support cabbage productivity in a polybag system on limited land.

According to Nugraha et al., (2021) research results, Jimmy Hantu liquid organic fertilizer applied to pakcoy plants (*Brassica rapa* L.) with 5 treatment units (treatment concentrations LOF A = control/without Jimmy Hantu LOF, B = 2 ml/L, C = 4 ml/L, D = 6 ml/L, E = 8 ml/L), the results showed that the treatment with a concentration of 8 ml/L of Jimmy Hantu LOF had an effect on the growth and yield of pakcoy plants. This study refers to the results of Rarizy et al., (2023) and Nugraha et al., (2021) as a basis, with modifications in the form of increasing the LOF dose to explore its effect on the growth and yield of cauliflower.

Compared to other cabbage varieties, these two varieties usually originate from subtropical regions, requiring a very specific climate and more difficult planting methods for optimal growth and production. Cauliflower requires a specific climate for its growth, namely cool air, plenty of water, and humid conditions (Siswantoro & Qomariyah, 2021). Developments over time have led to shifts or changes in varieties toward those desired by consumers. Along with this, several commercial vegetable seed producing countries have produced the latest superior varieties. Cauliflower plants have several varieties. One variety suitable for planting in lowlands is the Larissa F1 variety (Winarti et al., 2023).

The conversion of agricultural land into residential areas not only has a negative impact on the environment but also reduces the potential productivity of the land. The use of polybags in farming is one of the alternative solutions (Setiawan, 2018). This method offers various benefits such as flexibility in soil composition, optimized space utilization, and efficient fertilizer application (Irwansyah, 2022). According to Tarigan et al. (2024) optimal productivity of cabbage plants heavily depends on good growth. This can be achieved through proper fertilization strategies, using both organic and inorganic fertilizers to ensure adequate nutrition and soil fertility. However, in crop cultivation, many farmers still rely on inorganic fertilizers as the primary nutrient source. The long-term application of inorganic fertilizers can lead to soil degradation, such as compaction and reduced productivity (Dasri et al., 2020).

The application of organic fertilizers has been recognized not only as a means to reduce reliance on inorganic fertilizers but also as an effective approach to mitigating the detrimental environmental impacts associated with chemical fertilizers. Through their use, the populations of soil microorganisms are promoted, which in turn play an essential role in nutrient availability and in enhancing the overall soil environment (Harefa & Lase, 2025). In this study, the influence of planting media composition and the concentration of Jimmy Hantu liquid organic fertilizer on the growth and yield performance of cauliflower (*Brassica oleracea* L.) was examined. The novelty of this research is reflected in the integration of diverse planting media with the application of liquid organic fertilizer under a polybag cultivation system, thereby generating more comprehensive scientific insights into the interaction of these factors as a potential strategy to optimize cauliflower productivity under conditions of limited land availability.

METHOD

Research Location

The research was conducted on Jalan Kavling Saimbang Amaliah, Bogem, Sidoarjo, East Java with an altitude of 5 meters above sea level and temperature at the research was 32 - 34°C. The research began in November 2024 - March 2025.

Tools and Materials

The materials used in this study were soil, goat manure, burned husk, Jimmy Hantu liquid organic fertilizer, Larissa variety cauliflower seeds, NPK fertilizer, water. The tools used in this study were polybags measuring 40 cm x 40 cm, picks, ruler, analytical scales, measuring tape, label paper, permanent marker, scissors, camera, stationery.

Data Collection

The environmental design in this research used a Factorial Complete Randomized Design with 2 treatment factors, namely the type of planting media consisting of

3 treatment levels and the concentration of liquid fertilizer consisting of 4 treatment levels. The treatment in this study is the result of a combination between factors of all treatment levels. Thus, in this study there were 3 x 4 combinations or 12 treatment combinations. Thus, in this experiment, there were 12 treatment combinations, each of which was three times repetition so that 36 total units research, each research unit had 3 samples so that there were 108 plants. The first factor is the type of planting media (M) which consists of 3 treatments:

M_0 = Soil

M_1 = Soil + goat manure (1 : 1)

M_2 = Soil + goat manure + burned husk (1 : 1 : 1)

And the second factor is the concentration of Liquid Organic Fertilizer (P) which consists of 4 treatments:

P_0 = 0 ml/liter (NPK)

P_1 = 10 ml/liter

P_2 = 12 ml/liter

P_3 = 14 ml/liter

Procedure

Land Preparation

Before starting to plant, the first step is to measure the land that will be used, using a measuring tape. This research was conducted in the yard of a house in Sidoarjo with an area of land used 9 m x 9 m. After that clearing the land of weeds so they don't interfere with plant growth.

Nursery

The prepared cauliflower seeds were soaked in water for 1 hour. This was done to accelerate germination and increase the proportion of seeds that were successfully germinated. The cauliflower seeds were sown regularly using small polybags measuring 6x8 cm, the medium using soil and sifted firecrackers in a ratio of 1: 1 by volume unit. After the seeds were planted, the seeds were placed in a place with shade and seed maintenance was carried out by watering every morning and evening. Seeds were planted for 21 days and transferred then to large polybags measuring 40 x 40 cm.

Polybag Planting Media Preparation

The soil used as planting media was cleaned of grasses, plant debris and roots and rocks. The poly bag used is 40 x 40 cm in size. Planting media consists of several mixtures, namely sifted soil, burned husk, goat manure. All media were mixed well according to the treatment, then put into polybags. The treatment given is using a volume unit using a bucket based on the ratio , namely M_0 = Soil, M_1 = Soil + goat manure (1: 1), M_2 = Soil + goat manure + burned husk (1: 1: 1) Before transplanting,

polybags that contain planting media, watered and allowed to stand for 1 week after which the next day can be used for planting cauliflower.

Planting

Cauliflower that is 21 days old can be transferred to a larger polybag that is 40 x 40 filled to $\frac{3}{4}$ full by compacting it using a blunt tool so that the soil is dense and does not experience cracks due to polybag transfers which can cause plant roots to break. This transfer is done in the afternoon so that the plants do not wilt and are watered. The seedlings used are healthy and have uniform growth.

Maintenance

Watering, weeding, fertilizing, and insect control are maintenance activities. Applying water twice per day, in the morning and evening, with a watering can or hose. Weeding is done once a week until the plants begin to flower by pulling out plants in the form of weeds so as not to interfere with the growth of cauliflower plants which can later occur nutrient competition. Thinning is done when there are new shoots on the stem of the cauliflower plant. Thinning is done using a knife by cutting the base of the shoots attached to the stem.

Pest and Disease Control

Pest and disease control is carried out in an integrated manner by keeping the land area clean and monitoring pests and diseases regularly and routinely. Plant pest control is carried out by applying Fenite insecticide 1 ml/L, while plant disease control is carried out using Antracol fungicide 1.5 g/L. Pesticide dosage used in accordance with the product label. Plant pest and disease control is carried out every time signs of pest and disease attack appear on the plants.

Table 1. Concentration of LOF Application on Cauliflower Plants

LOF Treatment	Day After Planting (DAP) and LOF Concentration (ml/liter)		
	7 and 14 DAP	21 and 28 DAP	35 and 42 DAP
P ₀ = 0 ml/liter	-	-	-
P ₁ = 10 ml/liter	100	150	200
P ₂ = 12 ml/liter	100	150	200
P ₃ = 14 ml/liter	100	150	200

Notes: DAP = Day After Planting; LOF = Liquid Organic Fertilizer

Fertilization Treatment

This study refers to the results of [Rarizy et al., \(2023\)](#) and [Nugraha et al., \(2021\)](#) as a basis, with modifications in the form of planting media composition and increased LOF dosage to explore their effects on the growth and yield of cauliflower. The treatment of Liquid Organic Fertilizer on cauliflower plants with a concentration of P₀ = 0 ml/liter (NPK) P₁ = 10 ml/liter, P₂ = 12 ml/liter and P₃ = 14 ml/liter. For the control dose of

NPK fertilizer used was 5 g/plant using a leaking system dissolved in 200 ml of water. Each dose of LOF was dissolved in a measuring cup containing 1 liter of water reduced by the amount of LOF concentration to be given. The way to give LOF is by sprinkling.

Replanting

Replanting is done as early as possible if there are damaged (unhealthy) or dead cauliflower seedlings with new plants, so that the dead and embroidered plants do not lag behind the growth of other plants.

Harvesting

The harvesting process is carried out at the age of about 60 DAP with harvesting criteria, namely the flower head must reach its maximum size. The most appropriate harvest time is morning or evening. Harvesting is done by removing the plant from the polybag and then cleaning the plant roots from the soil. Then the plants were weighed according to the parameters observed.

Data Analysis

The study was based on the results of trials that used analysis of variance with a Complete Randomized Design (CRD) two-factorial design. The F test (Analysis of Variance) was performed to assess the effects of treatment and interaction. Treatment was considered significant if the computed F was larger than the 5% table F, and insignificant if the calculated F was less than the 5% table F. If the analysis findings showed a significant effect, it was followed by a second test using the 5% Honest Significant Difference (HSD) test to evaluate the difference in effect between treatments. (Syamsuwirman & Sari, 2021). The following is the variance analysis of the data from the study's observations using the completely randomized design (CRD) refers to Sugito (2013):

$$Y_{ijk} = \mu + \alpha_i + \beta_j + (\alpha\beta)_{ij} + \epsilon_{ijk} \dots\dots\dots (1)$$

Description:

- Y_{ijk} = The results of observations for factor A level i, factor B level j, in the k-replication
 μ = General mean
 α_i = Effect of factor A at the i-th level
 β_j = Effect of factor B at the jth level
 $(\alpha\beta)_{ij}$ = Interaction between A and B at factor A level i, factor B level j
 ϵ_{ijk} = Experimental error for factor A at the i-th level, factor B at the j-th level in the kth replicate/group.

According to Sugito (2013) if the analyzed data shows a significant effect, it can be continued with the 5% BNJ test to compare all the treatments tried. The formula for the 5% Real Honest Difference (BNJ) test is as follows:

$$\text{HSD} = Q(p: \text{db error}) \times \sqrt{\frac{\text{KTG}}{\text{replication}}} \dots\dots\dots (2)$$

The BNJ equation for each treatment factor is as follows:

$$\text{HSD}\alpha \text{ Factor M} = Q(p: \text{db error}) \times \sqrt{\frac{\text{KTG}}{r \times P \text{ treatment}}} \dots\dots\dots (3)$$

$$\text{HSD}\alpha \text{ Factor P} = Q(p: \text{db error}) \times \sqrt{\frac{\text{KTG}}{r \times M \text{ treatment}}} \dots\dots\dots (4)$$

Notes:

- BNJ = Real Differences in Honest
- Q = Found at level Q
- α = Testing level
- p = Number of treatments
- db error = Free Degree of Error
- KTG = Central Square of Error
- r = number of replicates
- M = Treatment of planting media composition
- P = Treatment of Ghost LOF concentration

RESULTS AND DISCUSSION

Plant Height (cm)

The results of the variance analysis conducted at 42 and 49 days after planting (DAP) revealed that a significant interaction was observed between the concentration of liquid organic fertilizer and the type of planting media with respect to the height of cauliflower plants. A very significant effect on plant height from 21 to 49 DAP was demonstrated by the treatment of planting media composition. At 28 DAP, the height of cauliflower plants was significantly influenced by the concentration of liquid organic fertilizer, and this effect became more evident during the period between 35 and 49 DAP. The average plant height recorded at 42 and 49 DAP under different treatments of planting media composition and liquid organic fertilizer concentration is presented in Table 2.

According to Table 2, an increase in the average plant height was observed when the planting media composed of soil, goat manure, and burned husk in a 1:1:1 ratio was combined with a liquid organic fertilizer concentration of 14 ml/L (M2P3) at 42 and 49 DAP. It was further noted that the application of this treatment (M2P3) enhanced the height of cauliflower plants by 17.06% at 42 DAP and by 15.55% at 49 DAP in comparison to the control treatment, consisting of soil planting media (M0) with no liquid organic fertilizer (P0).

The mean plant height of cauliflower under different treatments of planting media composition and liquid organic fertilizer concentration is detailed in Table 3. As indicated in Table 3, the planting media composed of soil, goat manure, and burned husk (1:1:1) (M2) yielded the highest average plant heights at 21, 28, and 35 DAP, with

respective values of 6.78 cm, 8.79 cm, and 11.14 cm. In contrast, the lowest mean plant height at the same stages (21, 28, and 35 DAP) was recorded under the soil-only planting media treatment (M₀), with average values of 5.91 cm, 7.88 cm, and 10.15 cm, respectively. At 35 DAP, the variation in cauliflower plant height was influenced by the type of planting media applied, with the combination of soil, goat manure, and burned husk (1:1:1) (M₂) producing an increase of 9.75% compared to the soil-only media (M₀).

Table 2. Average Height of Cauliflower Plants Age 42 and 49 DAP Combination Treatment of Planting Media Composition and LOF Concentration

Treatment	Liquid Organic Fertilizer (P) (ml/liter)			
Composition of Planting Media (M)	0 ml/l (P ₀)	10 ml/l (P ₁)	12 ml/l (P ₂)	14 ml/l (P ₃)
Plant Height Age 42 DAP				
S (M ₀)	12.19 a	12.22 a	11.87 a	13.03 abcd
S:GM (1:1) (M ₁)	12.33 a	12.04 a	12.53 a	13.84 bcd
S:DM:BH (1:1:1) (M ₂)	12.60 ab	12.89 abc	14.09 cd	14.27 d
BNJ 5%	1.27			
Plant Height Age 49 DAP				
S (M ₀)	14.40 a	14.63 a	14.37 a	15.37 abc
S:GM (1:1) (M ₁)	14.96 ab	14.14 a	14.83 ab	16.13 bc
S:DM:BH (1:1:1) (M ₂)	14.87 ab	15.32 abc	16.51 c	16.64 c
BNJ 5%	1.33			

Notes: Numbers accompanied by the same letter indicate no significant difference in the 5% BNJ test; tn = not significantly different; DAP = Days After Planting

Table 3. Average Height of Coleslaw Plants in the Treatment of Planting Media Composition and Liquid Organic Fertilizer Concentration.

Treatment	Plant Height (cm)				
	DAP				
	7	14	21	28	35
Soil Media Composition (M)					
S (M ₀)	3.12	4.39	5.91 a	7.88 a	10.15 a
S:GM (1:1) (M ₁)	2.94	4.56	6.63 b	8.45 b	10.49 a
S:DM:BH (1:1:1) (M ₂)	3.40	4.86	6.78 b	8.79 b	11.14 b
BNJ 5%	tn	tn	0.36	0.55	0.46
Liquid Organic Fertilizer (P)					
0 ml/l (P ₀)	2.96	4.39	6.25	8.00 a	10.25 a
10 ml/l (P ₁)	3.03	4.34	6.30	8.20 ab	10.28 a
12 ml/l (P ₂)	3.14	4.64	6.51	8.43 ab	10.56 a
14 ml/l (P ₃)	3.49	5.04	6.69	8.87 b	11.30 b
BNJ 5%	tn	tn	tn	0.70	0.58

Notes: Numbers accompanied by the same letter indicate no significant difference in the 5% BNJ test; tn = not significantly different; DAP = Days After Planting

The treatment of liquid organic fertilizer 14 ml/l (P₃) at the age of 28 and 35 DAP has the highest average plant height of 8.87 cm and 11.30 cm. The lowest average plant height is the treatment of 0 ml/l (P₀) at the age of 28, and 35 DAP which is 8.00 cm and 10.25 cm. The height of the cauliflower plants increased by 10.24% when the concentration of liquid organic fertilizer was 14 ml/l (P₃) as opposed to 0 ml/l (P₀).

Number of Leaves (strands)

The analysis of variance at 42 DAP revealed that a significant interaction was detected between planting media composition and liquid organic fertilizer concentration on the leaf number of cauliflower plants. Leaf number was significantly influenced by the planting media composition at 21 DAP, whereas highly significant effects were observed at 28, 35, 42, and 49 DAP. In contrast, a highly significant effect on the leaf number of cauliflower was exerted by the concentration of liquid organic fertilizer specifically at 42 and 49 DAP.

The mean number of cauliflower leaves under different treatments of planting media composition and liquid organic fertilizer concentration at 42 DAP is provided in Table 4. As demonstrated in Table 4, the highest leaf number was obtained from the combined treatment of soil, goat manure, and burned husk (1:1:1) with a liquid organic fertilizer concentration of 14 ml/L (M₂P₃).

Table 4. Average number of leaves of cauliflower aged 42 DAP in the treatment of a combination of the composition of planting media and the concentration of liquid organic fertilizer

Composition of Planting Media (M)	Liquid Organic Fertilizer (P) (ml/liter)			
	42 DAP			
	0 ml/l (P ₀)	10 ml/l (P ₁)	12 ml/l (P ₂)	14 ml/l (P ₃)
S (M ₀)	14.56 a	14.78 ab	16.67 abcde	16.22 abcd
S:GM (1:1) (M ₁)	16.11 abc	15.89 abc	15.67 ab	16.89 bcde
S:DM:BH (1:1:1) (M ₂)	15.89 abc	18.00 cde	18.25 de	18.39 e
BNJ 5%	2.29			

Notes: Numbers accompanied by the same letter indicate no significant difference in the 5% BNJ test; tn = not significantly different; DAP = Days After Planting

In Table 4. It is also known that there is an increase in the number of leaves of cauliflower plants by the treatment of planting media composition of soil: goat manure: burned husk (1:1:1) and concentration of liquid organic fertilizer 14 ml/l (M₂P₃). 26.34% compared to the composition of soil growing media (M₀) and concentration of liquid organic fertilizer 0 ml/l (P₀) (M₀P₀).

The average number of cauliflower leaves under different planting media compositions and liquid organic fertilizer concentrations is presented in Table 5. The treatment with a planting medium composed of soil, goat manure, and burned husk in a 1:1:1 ratio (M₂) produced the highest average number of leaves at 21, 28, 35, 42, and 49 days after planting (DAP), with values of 8.97, 11.64, 14.72, 17.63, and 20.14 leaves,

respectively. In contrast, the lowest averages were observed in the soil-only medium (M₀), with 8.17, 10.47, 12.72, 15.56, and 18.03 leaves at the same time intervals. By 49 DAP, the M₂ treatment showed an increase of 11.72% in leaf number compared to the M₀ treatment.

The application of liquid organic fertilizer had a highly significant effect on leaf number at 42 and 49 days after planting (DAP). The highest averages were recorded in the 14 ml/l treatment (P₃), with 17.17 and 20.56 leaves, respectively, while the lowest values were observed in the control (P₀, 0 ml/l), with 15.52 and 17.78 leaves. At 49 DAP, the P₃ treatment increased leaf number by 13.32% compared with P₀. This finding indicates that increasing the concentration of liquid organic fertilizer promotes vegetative growth in cauliflower, likely through improved nutrient availability and uptake efficiency. Similar trends have been reported in previous studies, where organic fertilizer application enhanced leaf proliferation and overall plant vigor due to its role in supplying essential macro- and micronutrients in readily available forms.

Table 5. Average number of leaves of cauliflower plants in the treatment of planting media composition and concentration of liquid organic fertilizer

Treatment	Number of Leaves (strands)						
	DAP						
	7	14	21	28	35	42	49
Soil Media Composition (M)							
S (M ₀)	3.25	5.69	8.17 a	10.47 a	12.72 a	15.56 a	18.03 a
S:GM (1:1)	3.14	6.00	8.19 ab	10.53 a	13.06 a	16.14 a	18.75 a
(M ₁)	3.31	6.44	8.97 b	11.64 b	14.72 b	17.63 b	20.14 b
S:DM:BH (1:1:1) (M ₂)							
BNJ 5%	tn	tn	0.87	0.78	0.87	0.73	0.88
Liquid Organic Fertilizer (P)							
0 ml/l (P ₀)	3.22	5.63	8.00	10.41	12.93	15.52 a	17.78 a
10 ml/l (P ₁)	3.15	6.15	8.22	10.85	13.44	16.22 ab	18.67 ab
12 ml/l (P ₂)	3.22	6.00	8.56	10.96	13.70	16.86 bc	19.30 bc
14 ml/l (P ₃)	3.33	6.41	8.89	11.30	13.93	17.17 c	20.15 c
BNJ 5%	tn	tn	tn	tn	tn	0.94	1.12

Notes: Numbers accompanied by the same letter show no significant difference in the 5% BNJ test; tn = not significantly different; DAP = Days After Planting

Stem Diameter (cm)

The analysis of variance revealed that there was no significant interaction between the planting media composition and the concentration of liquid organic fertilizer on the stem diameter of cauliflower plants. The mean stem diameter observed under the combined treatments of planting media composition and liquid organic fertilizer concentration is summarized in Table 6. As presented in Table 6, the planting

media composition exerted a significant influence on stem diameter at 35 and 42 days after planting (DAP), and a highly significant effect was detected at 49 DAP. Similarly, the concentration of liquid organic fertilizer showed a significant effect on stem diameter at 35 and 42 DAP, with a highly significant effect observed at 49 DAP.

The planting media composition of soil: goat manure: burned husk (1:1:1) (M2) produced the highest stem diameters at 35, 42, and 49 days after planting (DAP), with mean values of 6.87 cm, 8.93 cm, and 11.09 cm, respectively. In contrast, the lowest stem diameter values were recorded in the treatment using only soil as the planting medium (M0), with averages of 6.21 cm, 7.97 cm, and 9.69 cm at 35, 42, and 49 DAP, respectively. At 49 DAP, the stem diameter of cauliflower plants grown in the soil: goat manure: burned husk (1:1:1) medium (M2) increased by 14.44% compared to those grown in the soil-only medium (M0).

Table 6. Average Stem Diameter of Cauliflower Plants in the Treatment of Planting Media Composition and Liquid Organic Fertilizer Concentration

Treatment	Stem Diameter (cm)						
	DAP						
	7	14	21	28	35	42	49
Soil Media Composition (M)							
S (M ₀)	1.25	2.76	3.60	4.87	6.21 a	7.97 a	9.69 a
S:GM (1:1) (M ₁)	1.21	3.02	3.91	5.10	6.61 ab	8.23 a	10.15 a
S:DM:BH (1:1:1) (M ₂)	1.23	2.88	3.80	5.19	6.87 b	8.93 b	11.09 b
BNJ 5%	tn	tn	tn	tn	0.62	0.81	0.81
Liquid Organic Fertilizer (P)							
0 ml/l (P ₀)	1.23	2.96	3.76	4.98	6.30 a	7.99 a	9.81 a
10 ml/l (P ₁)	1.23	2.70	3.66	4.91	6.39 ab	8.20 ab	10.10 a
12 ml/l (P ₂)	1.21	2.91	3.78	5.06	6.43 ab	8.21 a	10.14 a
14 ml/l (P ₃)	1.26	2.98	3.90	5.27	7.13 b	9.10 b	11.18 b
BNJ 5%	tn	tn	tn	tn	0.79	1.03	1.03

Notes: Numbers accompanied by the same letter indicate no significant difference in the 5% BNJ test; tn = not significantly different; DAP = Days After Planting

Table 6 further demonstrates that the application of liquid organic fertilizer exerted a significant effect on stem diameter at 35 and 42 days after planting (DAP), and a highly significant effect at 49 DAP. The treatment with a liquid organic fertilizer concentration of 14 ml/L (P3) yielded the highest stem diameter measurements, recording values of 7.13 cm, 9.10 cm, and 11.18 cm at 35, 42, and 49 DAP, respectively. In contrast, the lowest stem diameters were observed in the treatment with 0 ml/L of liquid organic fertilizer (P0), which resulted in average values of 6.30 cm, 7.99 cm, and 9.81 cm at the same growth stages. At 49 DAP, the stem diameter of cauliflower plants

treated with 14 ml/L of liquid organic fertilizer (P3) exhibited an increase of 13.96% compared to those receiving 0 ml/L (P0).

Days to Flower Appearance (day)

The analysis of variance results indicated that there was no significant interaction between the planting media composition and the concentration of liquid organic fertilizer on the days to flowering of cauliflower plants. However, the treatment of planting media composition exerted a highly significant effect on the flowering response of cauliflower. In contrast, the application of liquid organic fertilizer concentration showed no significant influence on the onset of flowering across the observation period. The mean values for the days to flowering of cauliflower plants under the respective treatments of planting media composition and liquid organic fertilizer concentration are presented in Table 7.

Table 7 illustrates that the planting media composition of soil: goat manure: burned husk (1:1:1) (M2) produced the highest mean value for days to flowering, recorded at 69.92 DAP. In contrast, the treatment with soil planting media alone (M0) resulted in the lowest mean value of 64.17 DAP. This finding indicates an increase in the days to flower initiation of cauliflower plants under the soil: goat manure: burned husk (1:1:1) (M2) composition by 8.96% compared to the soil-only planting media (M0). On the other hand, the application of liquid organic fertilizer concentrations did not exert a significant effect on the days to flowering of cauliflower plants.

Table 7. Average Days to Flower Appearance of Coleslaw Plants in the Treatment of Planting Media Composition and Liquid Organic Fertilizer Concentration

Treatment	Days to Flower Appearance (DAP)
Soil Media Composition (M)	
S (M ₀)	64.17 a
S:GM (1:1) (M ₁)	68.42 b
S:DM:BH (1:1:1) (M ₂)	69.92 b
BNJ 5%	4.00
Liquid Organic Fertilizer (P)	
0 ml/l (P ₀)	65.85
10 ml/l (P ₁)	67.19
12 ml/l (P ₂)	67.44
14 ml/l (P ₃)	69.52
BNJ 5%	tn

Notes: Numbers accompanied by the same letter indicate no significant difference in the 5% BNJ test; tn = not significantly different; DAP = Days After Planting

Plant Wet Weight (grams)

The results of the variance analysis indicated that there was no significant interaction between planting media composition and liquid organic fertilizer concentration on the wet weight of cauliflower plants. However, the treatment of

planting media composition exerted a significant effect, and similarly, the concentration of liquid organic fertilizer significantly influenced the wet weight of cauliflower plants. The mean wet weight of cauliflower plants under the respective treatments of planting media composition and liquid organic fertilizer concentration is presented in Table 8. Table 8 further shows that the planting media composition of soil: goat manure: burned husk (1:1:1) (M₂) yielded the highest mean wet weight, recorded at 737.50 g. In contrast, the treatment with soil planting media alone (M₀) resulted in the lowest mean wet weight of 573.33 g. These findings demonstrate an increase in the wet weight of cauliflower plants under the soil: goat manure: burned husk (1:1:1) (M₂) composition by 28.63% compared to the soil-only planting media (M₀).

The treatment of liquid organic fertilizer at a concentration of 14 ml/l (P₃) gave the highest average of 719.07 grams and the lowest average of 612.04 grams. There was an increase in the wet weight of cauliflower plants by the concentration of liquid organic fertilizer 14 ml/l (P₃) by 17.48% compared to the treatment of liquid organic fertilizer concentration 0 ml/l (P₀).

Table 8. Average Wet Weight of Cauliflower Plants in the Treatment of Planting Media Composition and Concentration of Liquid Organic Fertilizer

Treatment	Plant Wet Weight (grams)
Soil Media Composition (M)	
S (M ₀)	573.33 a
S:GM (1:1) (M ₁)	634.31 a
S:DM:BH (1:1:1) (M ₂)	737.50 b
BNJ 5%	79.26
Liquid Organic Fertilizer (P)	
0 ml/l (P ₀)	612.04 a
10 ml/l (P ₁)	616.48 a
12 ml/l (P ₂)	645.93 ab
14 ml/l (P ₃)	719.07 b
BNJ 5%	101.11

Notes: The numbers accompanied by the same letter show no significant difference in the 5% BNJ test.

Plant Flower Weight (grams)

Variance analysis confirmed that the interaction between planting media composition and liquid organic fertilizer concentration did not significantly affect the flower weight of cauliflower plants. In contrast, both factors individually produced highly significant effects: planting media composition strongly influenced flower weight, and liquid organic fertilizer concentration likewise had a highly significant role. The detailed average flower weights across treatments of planting media and fertilizer concentration are provided in Table 9.

Table 9 demonstrates that the treatment involving the planting media composition of soil, goat manure, and burned husk in a 1:1:1 ratio (M₂) produced the

highest mean flower weight, reaching 336.81 grams. In contrast, the treatment using soil planting media alone (M0) yielded the lowest average flower weight of 224.86 grams. At 49.78 %, the increase in flower weight per plant achieved under the soil:goat manure:burned husk (1:1:1) composition (M2) was markedly higher compared to the treatment with soil planting media alone (M0).

The treatment of liquid organic fertilizer gave the highest average yield of 300.19 grams and the lowest average of 259.26 grams in the treatment of liquid organic fertilizer concentration of 14 ml/l (P₃). There was an increase in flower weight per plant of cauliflower plants by liquid organic fertilizer concentration of 14 ml/l (P₃) by 15.78 % compared to the treatment of liquid organic fertilizer concentration of 0 ml/l (P₀).

Table 9. Average Weight of Flowers on Planting Media Composition Treatment and Liquid Organic Fertilizer Concentration

Treatment	Plant Flower Weight (grams)
Soil Media Composition (M)	
S (M ₀)	224.86 a
S:GM (1:1) (M ₁)	255.56 b
S:DM:BH (1:1:1) (M ₂)	336.81 c
BNJ 5%	28.18
Liquid Organic Fertilizer (P)	
0 ml/l (P ₀)	259.26 a
10 ml/l (P ₁)	261.85 a
12 ml/l (P ₂)	268.33 ab
14 ml/l (P ₃)	300.19 b
BNJ 5%	35.95

Notes: Numbers accompanied by the same letter indicate no significant difference in the 5% BNJ test.

Diameter of Flower Plant (cm)

The results of the analysis of variance showed that there was no significant interaction in the treatment of planting media composition and concentration of liquid organic fertilizer on the diameter of cauliflower flowers in the observation. The average flower diameter of cauliflower plants in the treatment of planting media composition and concentration of liquid organic fertilizer is presented in Table 10.

Table 10 illustrates that the treatment of planting media composition exerted a significant influence on the diameter of cauliflower flowers, whereas the concentration of liquid organic fertilizer did not show a significant effect during the observation period. The planting media composition consisting of soil, goat manure, and burned husk in a 1:1:1 ratio (M2) produced the highest mean flower diameter of 14.18 cm. Conversely, the treatment with soil planting media alone (M0) resulted in the lowest average flower diameter of 13.26 cm. This indicates an increase of 6.9% in the flower diameter of cauliflower plants under the M2 treatment compared to the M0 treatment. Meanwhile,

the application of liquid organic fertilizer concentration did not significantly influence the timing of flower appearance.

Table 10. Average Diameter of Flowers on Planting Media Composition and Liquid Organic Fertilizer Concentration Treatments

Treatment	Plant Flower Diameter (cm)
Soil Media Composition (M)	
S (M ₀)	13.26 a
S:GM (1:1) (M ₁)	13.18 ab
S:DM:BH (1:1:1) (M ₂)	14.18 b
BNJ 5%	0.92
Liquid Organic Fertilizer (P)	
0 ml/l (P ₀)	10.25
10 ml/l (P ₁)	10.34
12 ml/l (P ₂)	9.87
14 ml/l (P ₃)	10.16
BNJ 5%	tn

Notes: Numbers accompanied by the same letter indicate no significant difference in the 5% BNJ test; tn= not significantly different

Plant Flower Height (cm)

The results of the variance analysis indicated that there was no significant interaction between planting media composition and liquid organic fertilizer concentration on the flower height of cauliflower plants. However, planting media composition exerted a highly significant effect on flower height, whereas liquid organic fertilizer concentration did not significantly influence this parameter. The mean flower heights of cauliflower plants under the different treatments of planting media composition and liquid organic fertilizer concentration are presented in Table 11.

Table 11 further shows that the planting media composition consisting of soil, goat manure, and burned husk in a 1:1:1 ratio (M₂) produced the highest average flower height of 10.18 cm, while the treatment using soil planting media alone (M₀) resulted in the lowest mean value of 9.26 cm. This reflects an increase of 9.93% in the flower height of cauliflower plants grown in the M₂ planting media compared to those grown in the M₀ treatment. Moreover, the concentration of liquid organic fertilizer did not significantly affect the timing of flower appearance in cauliflower plants.

Table 11. Average Height of Flowers on Planting Media Composition and Liquid Organic Fertilizer Concentration Treatments

Treatment	Plant Flower Height (cm)
Soil Media Composition (M)	
S (M ₀)	9.26 a
S:GM (1:1) (M ₁)	9.64 ab

Treatment	Plant Flower Height (cm)
S:DM:BH (1:1:1) (M ₂)	10.18 b
BNJ 5%	0.55
Liquid Organic Fertilizer (P)	
0 ml/l (P ₀)	7.38
10 ml/l (P ₁)	7.37
12 ml/l (P ₂)	7.21
14 ml/l (P ₃)	7.13
BNJ 5%	tn

Notes: Numbers accompanied by the same letter indicate no significant difference in the 5% BNJ test; tn= not significantly different

Root Wet Weight (grams)

The results of the variance analysis revealed that there was no significant interaction between planting media composition and liquid organic fertilizer concentration on the wet root weight of cauliflower plants during the observation period. Nevertheless, the treatment of planting media composition had a significant effect on the wet root weight of cauliflower plants, whereas the concentration of liquid organic fertilizer did not produce a significant influence on this parameter. The mean wet root weights of cauliflower plants under the different treatments of planting media composition and liquid organic fertilizer concentration are presented in Table 12.

Table 12. Average Root Wet Weight of Cauliflower Plants in the Treatment of Planting Media Composition and Liquid Organic Fertilizer Concentration

Treatment	Root Wet Weight (grams)
Soil Media Composition (M)	
S (M ₀)	24.58 a
S:GM (1:1) (M ₁)	25.42 a
S:DM:BH (1:1:1) (M ₂)	28.61 b
BNJ 5%	3.82
Liquid Organic Fertilizer (P)	
0 ml/l (P ₀)	19.17
10 ml/l (P ₁)	18.89
12 ml/l (P ₂)	20.14
14 ml/l (P ₃)	20.42
BNJ 5%	tn

Notes: Numbers accompanied by the same letter indicate no significant difference in the 5% BNJ test; tn= not significantly different

Table 12. shows that the treatment of planting media composition of soil: goat manure: burned husk (1:1:1) (M₂) gives the highest average yield of 28.61 grams. While the treatment of soil planting media composition (M₀) gave the lowest average result of

24.58 grams. There was an increase in the wet weight of the roots of cauliflower plants by the composition of planting media soil: goat manure: burned husk (1:1:1) (M₂) by 16.39% compared to the treatment of soil planting media composition (M₀). The treatment of liquid organic fertilizer did not significantly affect the days to flower appearance of cauliflower plants.

Harvest Index (grams)

The results of the variance analysis indicated that there was no significant interaction between planting media composition and liquid organic fertilizer concentration on the harvest index of cauliflower plants. However, the treatment of planting media composition exerted a significant effect on the harvest index, whereas the concentration of liquid organic fertilizer showed no significant influence on this parameter during the observation period. The mean harvest index values of cauliflower plants under the different treatments of planting media composition and liquid organic fertilizer concentration are presented in Table 13.

Table 13 further shows that the planting media composition consisting of soil, goat manure, and burned husk in a 1:1:1 ratio (M₂) yielded the highest mean harvest index of 0.48 grams, while the soil planting media alone (M₀) produced the lowest average value of 0.40 grams. This reflects an increase of 20% in the harvest index of cauliflower plants under the M₂ treatment compared to the M₀ treatment. Meanwhile, the application of liquid organic fertilizer concentration did not significantly affect the harvest index of cauliflower plants.

Table 13. Average Harvest Index of Cauliflower Plants in the Treatment of Planting Media Composition and Concentration of Liquid Organic Fertilizer

Treatment	Harvest Index (grams)
Soil Media Composition (M)	
S (M ₀)	0.40 a
S:GM (1:1) (M ₁)	0.41 b
S:DM:BH (1:1:1) (M ₂)	0.48 c
BNJ 5%	0.05
Liquid Organic Fertilizer (P)	
0 ml/l (P ₀)	0.32
10 ml/l (P ₁)	0.32
12 ml/l (P ₂)	0.31
14 ml/l (P ₃)	0.33
BNJ 5%	tn

Notes: Numbers accompanied by the same letter indicate no significant difference in the 5% BNJ test; tn= not significantly different

DISCUSSION

Effect of Combination Treatment of Planting Media Composition and Liquid Organic Fertilizer on Cauliflower Plants (*Brassica oleracea* L.)

The combined treatment of planting media composition and liquid organic fertilizer demonstrated a significant interaction effect on plant height and leaf number. This interaction influenced plant height between 42 and 49 days after planting (DAP), while its effect on leaf number was evident at 42 DAP. The most favorable outcome was observed under the combination of soil: goat manure: burned husk (1:1:1) (M2) as the planting medium and a liquid organic fertilizer concentration of 14 ml/L (P3). This result can be attributed to the sufficient nutrient availability provided by both the planting medium and the liquid organic fertilizer, which together were able to fulfill the growth and developmental requirements of cauliflower plants.

Optimal growing media greatly influence the success of cauliflower cultivation. Soil serves as a source of nutrients, a rooting medium, and a structural support for plants. However, in polybag cultivation, pure soil has several drawbacks, such as poor aeration and tendency to compact. Therefore, soil is combined with other organic materials to improve its physical properties ([Fanadillah et al., 2023](#)). Goat manure contains macro and micro nutrients such as nitrogen (N), phosphorus (P), and potassium (K), which are essential for vegetative growth and flowering processes ([Anggia & Vinarti, 2023](#)). Charcoal or charred husks have a light and porous structure, thereby improving aeration and drainage in the growing medium. Charcoal also helps stabilize moisture levels and reduce the risk of root diseases caused by excessive moisture. Additionally, charcoal contains silica (Si), which can strengthen plant tissues ([Anjarwati et al., \(2017\)](#)). The composition of the growing medium, consisting of soil, goat manure, and charcoal, forms an optimal medium where the soil retains nutrients and provides structure, goat manure enriches nutrients and enhances fertility, and charcoal improves physical structure and aeration. This combination supports nutrient uptake, enabling cabbage plants to grow well.

The results of the POC usage study indicate that higher concentrations of POC administered can yield favorable outcomes for plant height and leaf count parameters. The nutrient content of this POC is as follows: N 6.3%, P 6%, K 14%, Na 0.22%, Cu 0.05%, Fe 0.68%, Mn 0.02%, Zn 0.01%, Cd < 0.01%, Pb 0.21 ppm. Additionally, the fertilizer contains GA3 at 98.37 ppm, GA5 at 107.08 ppm, GA7 at 131.46 ppm, Auxin IAA at 56.35 ppm, and Cytokinin (Kinetin at 128.04 ppm and Zeatin at 106.45 ppm). Hormones such as gibberellin, auxin, and cytokinin help accelerate flowering, bud formation, and resistance to flower or fruit drop ([Attarsach, 2022](#)).

According to [Gustia & Rosdiana \(2020\)](#), goat manure is characterized by a high nitrogen (N) content, while the addition of burned husks in the planting media composition further enriches the nutrient supply necessary for plant growth and development. Nitrogen plays a pivotal role in supporting vegetative growth and is essential for chlorophyll formation. As highlighted by [Zeni et al., \(2023\)](#), plants achieve

optimal growth and development when nutrients are supplied in sufficient amounts and in a form readily absorbed by the roots. Once absorbed, these nutrients are utilized in various metabolic processes, which are particularly critical during the early stages of plant growth. Consequently, to ensure the fulfillment of nutrient requirements, the supplementation of liquid organic fertilizer (LOF) is necessary as an additional nutrient source.

The combination of soil: goat manure: burned husk (1:1:1) (M₂) and liquid organic fertilizer concentration of 14 ml/l (P₃) can increase the availability of nutrients in the vegetative phase, thus supporting plant development in the generative phase. One of the nutrients that plays an important role in increasing flower weight is potassium (K), because this element functions in stimulating the flower formation process to increase plant yield. In addition to potassium, other macronutrients contained in liquid organic fertilizer also contribute to the increase in plant flower weight (Utami & Hariyono, 2022). According to Sudirman et al., (2022) the fulfillment of high and quite complete nutrients at optimal amounts facilitates metabolic processes during the vegetative phase, thus contributing to better growth and higher yields of cauliflower plants.

According to Taufik et al., (2020) The flowering period is an important generative phase in the life cycle of cauliflower (*Brassica oleracea* L.) that determines the formation of the crop (flower head) as the main harvest. However, this phase is highly susceptible to disruption caused by plant pests, one of which is the cabbage looper. According to Kusumadewi et al., (2021) cabbage looper infestations during the vegetative phase and approaching the generative phase can cause significant delays in flowering. Caterpillars feed on the plant's leaf tissue, which serves as the source of photosynthesis. A reduction in effective leaf area leads to a decrease in the plant's ability to produce carbohydrates and energy required for the transition to the generative phase. As a result, the plant experiences physiological stress that delays the emergence of flowers.

This study reinforces Nugraha et al., (2021) findings, which show that LOF dosage has a significant effect on plant growth. However, unlike Rarizy et al. (2023) study, which emphasizes the use of manure, this study combines planting media composition with varying LOF dosages, thereby providing new insights into the interaction of these two factors on the growth and yield of cauliflower. Thus, this study fills a gap in the limited research on the combination of growing media and LOF in cauliflower cultivation systems. The results showed that the combination of soil + goat manure + burned husks (1:1:1) produced the highest cauliflower weight, namely 336.81 g/plant, while the best LOF concentration at 14 ml/L reached 300.19 g/plant. This value is still lower than the results of Rarizy et al., (2023), which reached 415 g/plant with the use of 6 kg/plot of goat manure. This difference is thought to be due to the relatively lower nutrient availability in the research medium. Nevertheless, the results of this study support the findings of Nugraha et al., (2021) that increasing the LOF concentration can promote plant growth and yield up to the optimal dose, thus

indicating that the combination of organic media and LOF can increase cauliflower productivity, although it still has the potential to be improved with higher fertilizer doses. This study has several limitations that need to be considered. The experiment was only conducted at one location, so the environmental and soil conditions observed may not necessarily represent other areas with different agroclimatic characteristics. The scale of the experiment was also limited, so the results obtained may not fully reflect broader conditions.

In addition, environmental factors such as temperature, humidity, and light intensity could not be fully controlled, which may have affected plant growth and yield. This study also used only one variety of cauliflower (*Brassica oleracea* L.), so the findings may not be generalizable to other varieties with different genetic traits.

Effect of Planting Media Composition on Cauliflower Plants (*Brassica oleracea* L.)

The application of planting media composed of soil, goat manure, and burned husk in a ratio of 1:1:1 (M2) exhibited a positive influence on multiple growth and yield parameters, including plant height from 21 to 49 days after planting (DAP), number of leaves from 21 to 49 DAP, stem diameter at 35 DAP, days to flowering, plant fresh weight, flower diameter per plant, root fresh weight, and harvest index. Specifically, the treatment with the soil:goat manure:burned husk (1:1:1) (M2) composition resulted in an average plant height of 17.73 cm, an average number of leaves of 18.06, and an average stem diameter of 8.88 cm

This can be caused by a combination of soil, manure and fireclay that can meet the nutritional needs of plants. The combination of soil, manure and firecracker can provide the N element needed by plants to stimulate vegetative growth in plants. In this case, the addition of firecrackers in the treatment increased the N content in the soil media, because the N content in goat manure was 0.7% and in firecrackers was 0.73% so that with the addition of N nutrient content also increased. According to [Inti et al., \(2021\)](#) stated that manure is a source of N, P, and K which is important for the vegetative phase of plants because it improves soil structure, aeration, and provides energy for soil microbes.

Nitrogen (N) is a macronutrient that plays a crucial role in the synthesis of chlorophyll, which is essential for the photosynthetic process in plants. Consequently, nitrogen is required in substantial amounts and is often regarded as a limiting nutrient for plant growth ([Izzah et al., 2024](#)). Beyond contributing nutrients within the integrated composition of soil-based planting media, the incorporation of compost and goat manure enhances the physical, chemical, and biological properties of the soil. As highlighted by [Krisnawati et al., \(2021\)](#), organic fertilizers play a fundamental role in improving these properties. From a physical perspective, soil structure is modified and enriched with higher carbon content, thereby promoting plant growth, stimulating soil aggregation, and improving both permeability and aeration. Chemically, the use of organic matter enhances the soil's cation exchange capacity (CEC), which is critical for efficient nutrient

absorption. Biologically, organic amendments support an increase in beneficial microbial populations that facilitate the decomposition of organic material. However, in the present study, the days to flowering were delayed due to pest and disease infestations, which induced stress in the plants and subsequently influenced the flowering process (Firrizqi et al., 2024).

Goat manure has a high content of macro nutrients, one of which is phosphorus (P) which plays an important role in the generative phase of plants. Phosphorus contributes to accelerating the process of flowering and fruit formation, and plays a role in increasing energy reserves in seeds. The availability of phosphorus in optimal amounts can improve aspects of plant reproduction, including an increase in the total mass of flowers, the number of fruits produced, and the number of seeds per plant (Hartati & Rachman, 2022).

The treatment of soil: goat manure: burned husk (1:1:1) (M₂) on the wet weight of the roots of cauliflower plants gave a positive effect by producing the highest average of 28.61 grams. The addition of firecrack media to the combination of planting media is very good for increasing the N uptake of cauliflower plants. Burned husk has a high carbon (C) content that makes this planting medium loose and good for the growth of cauliflower plant roots. The advantage of adding fireclay to soil media is its use in improving soil properties so that fertilization becomes more effective. Burned husk planting media can bind nutrients well so that plants can absorb the nutrients in the liquid organic fertilizer (Pratiwi et al., 2017).

The treatment of soil: goat manure: burned husk (1:1:1) (M₂) on the wet weight of the plant gives a positive influence by producing the highest average of 737, 26 grams. According to Ramli (2022) states that the use of appropriate planting media can affect root growth for the application of water and nutrients needed by plants so that it can affect the wet weight of plants. Overall plant growth can be influenced by the availability of water in the planting media. The more water available for plants will also affect the wet weight of plants.

The treatment of soil media composition: goat manure: burned husk (1:1:1) gives a good effect on the parameters of plant flower diameter, plant flower weight, plant flower height. This is due to the nutrients available in the planting media, more due to the provision of goat manure and the addition of firecrackers to provide sufficient nutrients for plants. According to Winarti et al., (2023), nutrients that influence the flowering of cauliflower plants are phosphorus (P) and potassium (K). Goat manure and burned husk have high phosphorus (P) and potassium (K) nutrients. Phosphorus (P) is essential for flower formation, crop formation, and root growth. Phosphorus deficiency can cause stunted crop growth and small crops. Potassium (K) also plays a role in stimulating flowering and the formation of quality crops (Aulia & Suntari, 2023).

The planting media composition treatment of soil: goat manure: burned husk (1:1:1) (M₂) gave good results on harvest index. Harvest index measurement serves to show the distribution of assimilate between biomass and the whole plant. The harvest index of cauliflower in the treatment of planting media composition of soil: goat manure:

burned husk (1:1:1) had a significant effect and produced the highest harvest index with an average of 0.48 grams. According to [Putra et al., \(2023\)](#) that plants that have a high harvest index can provide high potential seed yields.

Effect of Liquid Organic Fertilizer on Cauliflower Plants (*Brassica oleracea* L.)

The application of liquid organic fertilizer concentration demonstrated a positive effect on several growth parameters, including plant height at 28 to 42 days after planting (DAP), leaf number at 42 DAP, stem diameter at 35 and 42 DAP, as well as plant fresh weight and flower weight per plant. Among the treatments, the most favorable response was observed at the concentration of 14 ml/L of liquid organic fertilizer. This positive effect can be attributed to the ability of liquid organic fertilizer to enhance the availability of essential nutrients required for the growth and development of cauliflower plants. Nutrients in the available form will be absorbed more quickly by plants to be used in metabolic processes so that they will respond to plants. According to [Safitri & Yandri \(2021\)](#) Jimmy Hantu Liquid Organic Fertilizer is a liquid organic fertilizer that contains macro and micro nutrients such as Nitrogen (N), Calcium (Ca) and Iron (Fe) which stimulate vegetative growth of plants, especially stems, leaves and branches. Liquid organic fertilizer also contains growth regulators (auxin, gibberellins and cytokinins) which are useful for accelerating seed development, root growth, tuber propagation and are useful for the vegetative phase or plant growth.

The treatment of liquid organic fertilizer concentration of 14 ml/l gave a positive response to the weight of cauliflower. This is because liquid organic fertilizer significantly increases the flower weight of cauliflower plants because the nutrients given through the roots are well absorbed by plants. Liquid organic fertilizer Jimmy Hantu has relatively high levels of P and K nutrients. This is in accordance with [Mutia et al., \(2024\)](#) one of the nutrients provided by liquid organic fertilizer in giving a positive response to the weight of cauliflower is phosphorus (P) and potassium (K). The nutrient phosphorus (P) functions for the formation of proteins and new cells as well as to help accelerate the growth of flowers, fruits and seeds. Potassium can function to facilitate the transportation of carbohydrates and plays an important role in cell division and affects the formation and growth of cauliflower.

CONCLUSION

The study demonstrated that the combination of planting media and Liquid Organic Fertilizer (LOF) significantly influenced the growth and yield of cauliflower (*Brassica oleracea* L.). The optimal treatment was obtained from the combination of soil + goat manure + burned husks (1:1:1) with a LOF concentration of 14 ml/liter. This combination produced good results across several observed parameters, including plant height, number of leaves, stem diameter, days to flowering, plant fresh weight, flower weight per plant, flower height, flower diameter, root fresh weight, and harvest index.

However, this study faced several limitations. The experiment was conducted at a single location with limited scale, and environmental factors such as temperature, humidity, and light intensity could not be fully controlled. In addition, only one cauliflower variety was used, which may restrict the generalizability of the findings. Therefore, further research involving multiple locations, larger experimental scales, and different varieties is recommended to validate and broaden the applicability of these results.

REFERENCES

- Alwita, F. (2019). *The Effect of Urea and Mol (Local Microorganisms) Fertilizer Application on the Growth and Production of Cabbage Plants*. Thesis. Faculty of Agriculture. University of Muhammadiyah North Sumatra. Retrieved February 24Th, 2025. [***In Indonesian language***]
- Anggia, and Vinarti. (2023). The Effect of Applying Biofertilizer and Goat Manure on the Growth and Production of Cabbage (*Brassica oleracea* L.). *Jurnal Agriyan: Journal of Agrotechnology, Unidayan*, 9(2), 2808–8077.
- Anjarwati, H., Waluyo, S., and Purwanti, S. (2017). The Effect of Media Type and Goat Manure Dosage on the Growth and Yield of Green Mustard (*Brassica rapa* L.). *Vegetalika*, 6(1), 35–45.
- Attarsach, A. (2022). The Effect of Cow Manure and POC Jimmy Hantu (Superior Plant Hormone) on the Growth and Production of Deli Honey Guava (*Syzygium aqueum*). Thesis. Study Program of Agrotechnology. University of Muhammadiyah North Sumatra. Retrieved March 2, 2023. [***In Indonesian language***]
- Aulia, A. H., and Suntari, R. (2023). The Effect of Goat Manure and N, P, K Fertilizer Application on Soil Chemical Properties, P Uptake, Growth, and Production of Green Mustard (*Brassica juncea* L.) in Tulangan District, Sidoarjo Regency. *Journal of Soil and Land Resources*, 10(2), 499–507.
- Statistics Indonesia. (2024). *Cauliflower Productivity 2023*. Retrieved April 18, 2025, from <https://www.bps.go.id/id/statistics-table/3/VFV4MmQxaG9kakZrVUdWeEx6aDFUMnN6WmpocVp6MDkjMw==/produksi-tanaman-sayuran-dan-buah---buah-an-semusim-m-enurut-jenis-tanaman--2024.html?year=2024>. Accessed on 24Th May 2025 [***In Indonesian language***]
- Dasri, M. F., Susilaningsih, S. E. P., and Zamroni. (2020). The Effect of Planting Media Composition and Types of Manure on the Yield of Cauliflower (*Brassica oleraceae var botrytis* L.) in Polybags. *Agroust Scientific Journal*, 4(2), 104–116.
- Fanadillah, Y., Idris, M., and Rahmadina. (2023). The Effect of Rice Husk Ash and Goat Manure on the Vegetative Growth of Red Lettuce (*Lactuca sativa* var. *crispa*) in a Wall Planter Bag System. *BEST Journal (Biology Education, Science and Technology)*, 6(2), 920–926.

- Gustia, H., and Rosdiana, R. (2020). The Combination of Planting Media and the Addition of Liquid Organic Fertilizer on the Growth and Production of Chili Plants. *Agroscience and Technology Journal*, 4(2), 70–78.
- Harefa, D. N., and Lase, N. K. (2025). Soil Microbes as the Key to Sustainable Organic Farming: A Literature Review. *Hydroponics: Journal of Agricultural Science and Technology in Plant Science*, 2(1), 102–108.
- Hartati, T. M., and Rachman, I. A. (2022). The Effect of Goat Manure Fertilizer on the Growth and Yield of Caisim (*Brassica campestris*) Plants in Inceptisol. *Agro Bali: Agricultural Journal*, 5(1), 92–101.
- Inti, M., Nurhidayat, E., Juwita Anggraini, D., Hidayat, N., Nurhuda, M., Makmum Rokim, A., Rizqi azharry Rohmadan, A., Rohana Setyaningsih, I., Cahyo Setiawan, N., Wicaksana, Y., and Maryani, Y. (2021). Study on the Effect of Manure and Phosphate Guano Application on Potassium Uptake in Green Bean Plants (*Vigna radiata* L). *Agros Agricultural Journal*, 23(1), 44–52.
- Irwansyah, C. (2022). *The Effect of Various Biopesticides in Suppressing Pests and the Application of Various Bioactivators*. Thesis. Study Program of Agrotechnology. Riau Islamic University. Retrieved February 24, 2023. [In Indonesian language]
- Izzah, A. F., Fuskhah, E., and Budiyanto, S. (2024). Response to Growth and Production of Chicken Plant (*Brassica oleracea* L.) at Various Doses of Nitrogen and Nanosilicas. *Agrotropika Journal*, 23(2), 203–211.
- Krisnawati, K., Apriliani Dwi Rahayu, A., and Setiawan, O. (2021). Utilization of Organic Fertilizer and Hydrogel to Support Mimba Growth in Sumbawa, West Nusa Tenggara. *Faloak Forestry Research Journal*, 5(2), 103–117.
- Kusumadewi, R. F., Yustiana, S., and Nasihah, K. (2021). Effectiveness of Lemongrass Extract on the Mortality of Armyworms (*Spodoptera litura*) on Cabbage Plants (*Brassica oleracea*) in the Laboratory. *JRPD (Journal of Basic Education Research)*, 1, 7–13.
- Mutia, Z., Rahmatan, H., Program, W., Biology, S. P., and Usk, F. (2024). Effectiveness of Various Concentrations of Liquid Organic Fertilizer from Eggshells and Coconut Water on Tomato Growth. *Scientific Journal of Biology Education Students FKIP USK*, 9(1), 40–48.
- Nugraha, F. A., Abdullah, R., and Aisyah, I. (2021). The Effect of Liquid Organic Fertilizer Concentration on the Growth and Production of Pakcoy Mustard Greens (*Brassica rapa* L.) Nauli F1 Variety. *Procedia of Engineering and Life Science*, 1(1), 1–10.
- Putra, A. N., Suparno, and Samudi. (2022). The Effect of POC Nutrient Concentration and Planting Media Types on Red Onion (*Allium cepa* L.) Productivity. *Journal of Plant Science Research*, 1(2), 9–20.
- Pratiwi, N. E., Simanjuntak, B. H., and Banjarnahor, D. (2017). The Effect of Growing

Medium Mixtures on the Growth of Strawberry Plants (*Fragaria vesca* L.) as Vertical Garden Ornamental Plants. *Agric*, 29

Ramli, N. (2022). The Effect of Growing Medium Composition on the Growth and Yield of Kailan (*Brassica oleraceae* var. alboglabra). *Jurnal Penelitian Agrosamudra*, 9 (1), 29–38.

Rarizy, I., Savitri, and Bustami. (2023). The Effect of Manure Dosage and Hantu Liquid Organic Fertilizer Dosage on the Growth and Yield of Cabbage (*Brassica oleracea* L.). *Agriflora*, 7(1), 59–71.

Safitri, L., and Yandri, H. (2021). The Effect of Phonska NPK Mixture and Hantu Liquid Organic Fertilizer on Pakcoy Production in a Solid Medium Hydroponic System. *Integrated Agriculture Journal*, 9 (1), 95–104.

Sari, V. K., Ma'rufah, S., and Rusdiana, R. Y. (2020). Utilization of Vinasse as Liquid Organic Fertilizer to Improve the Growth and Yield of Cabbage (*Brassica oleracea* var. Botrytis L.). *Journal of Applied Agricultural Research*, 20 (1), 18 - 24.

Setiawan, S. (2018). The Effect of Chromolaena Odorata Compost and Corn Waste on the Growth of Several Flowering Cabbage Cultivars (*Brassica oleraceae* L.) in Red-Yellow Podsolik Soil. *E-Journal Equilibrium Management*, 1(1), 21 - 34.

Siswanto, R., and Qomariyah, S. N. (2021). *Identification of Cauliflower (Brassica oleracea) Distribution Channels at the Ngoro Agribusiness Sub-Terminal in Jombang Regency*. Theses of Faculty of Agriculture, KH. A. Wahab Hasbullah University. diakses pada tanggal 24 May 2025 [**In Indonesian language**]

Sudirman, Nurdalila, and Sumiahadi, A. (2022). The Effect of Various Solid Organic Fertilizers on the Growth and Production of Cauliflower (*Brassica oleracea* var. botrytis L.). *Journal of Precision Agriculture*, 6(2), 161–174.

Sugito, Y. (2013). *Research Methodology*. Universitas Brawijaya Press. Retrieved March, 3 2023. [**In Indonesian language**]

Tarigan, S. R. K. M., Rusmarini, U. K., and Setyorini, T. (2024). The Effect of Chicken Manure and P Fertilizer on the Growth and Yield of Cauliflower (*Brassica oleracea* L. var. botrytis). *AGROISTA: Journal of Agrotechnology*, 8 (1), 46–52.

Taufik, M., Cahyadi, B., Tarigan, E. D. br, and Razali, M. (2020). Biopesticide for overcoming caterpillar pests on cabbage plants (*Brassica oleracea* L.). *Journal of Saintech Transfer*, 3(1), 43–51.

Utami, E., and Hariyono, K. (2022). The Effect of Potassium and Gibberellin on the Growth and Yield of Cabbage Plants (*Brassica oleraceae* L. var botrytis). *Journal of Agricultural Sciences*, 20(2), 124–134.

Winarti, S., Alpian, A., Jaya, H. P., and Suriani, M. (2023). Response of Flowering Cabbage Plants (*Brassica oleracea*) to the Application of Multi KP Fertilizer on Ultisol. *AgriPeat*, 24(1), 41–49.

Firrizqi, Y. A., Dermiyati, D., Arif, S., & Niswati, A. (2024). The Effect of Liquid Organic Fertilizer and Compost Application on the Respiration and Carbon Biomass of Soil Microorganisms During the Growth of Red Onion (*Allium ascalonicum* L.) Plants. *Jurnal Agrotek Tropika*, 12(3), 700–708.

Zeni, R. N., Delita, K., and Karterin, D. (2023). The Effect of Various Growing Media and Concentrations of Liquid Organic Fertilizer on the Growth and Production of Chili Plants (*Capsicum frutescens* L.). *Agriwana Journal Vol.*, 1(1), 10–21.

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