JUATIKA
JURNAL AGRONOMI TANAMAN TROPIKA
VOL. 6 NO. 3 September 2024

DOI :https://doi.org/10.36378/juatika.v5i2.3140
eissn 2656-1727
pissn 2684-785X
Hal : 712 – 722

# Optimizing The Growth of Arabica Coffee (*Coffea arabica* L.) Typica Variety Seedlings through Planting Media Composition and Liquid Organic Fertilizer of Conch Eggs in Toraja

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**ABSTRACT**

This research investigates the impact of different planting medium compositions and the application of liquid organic fertilizer derived from golden apple snail eggs on Arabica coffee seedlings (*Coffea arabica* L.) growth of the Typica variety. Conducted over 12 weeks at the experimental garden of Toraja University, the study employed a Completely Randomized Design (CRD) featuring two primary factors: the composition of the planting medium (M1: topsoil, sand, pig manure in a ratio of 2:1:1; M2: topsoil, sand, pig manure in a ratio of 1:2:1; M3: topsoil, sand, pig manure in a ratio of 1:1:2) and the dosage of POC from golden apple snail eggs (K1: 100 ml/plant, K2: 200 ml/plant, K3: 300 ml/plant). The findings indicated that the planting medium's composition and POC dosage significantly influenced the coffee seedlings' height, leaf count, and stem diameter. The planting medium with a 1:1:2 ratio of topsoil, sand, and pig manure (M3) yielded the most favorable outcomes, achieving an average plant height of 18.06 cm, 4.54 leaves, and a stem diameter of 1.92 mm. Additionally, a 200 ml/plant dosage of POC from golden snail eggs (K2) resulted in a maximum plant height of 18.46 cm and an average leaf count of 4.57. and a stem diameter of 1.75 mm. The interaction between M3 and K2 (M3K2) produced the most significant results across all growth parameters, with a plant height of 24.67 cm, 5.33 leaves, and a stem diameter of 2.53 mm. This study underscores the importance of selecting suitable planting media and utilizing POC from golden snail eggs to enhance the growth of Arabica coffee seedlings, offering valuable insights for improving coffee cultivation practices through optimized media and organic fertilizer application.

Keywords: Arabica Coffee Seedlings of Typica Variety, Growing Media, Growth, POC Eggs, Production

## 1. INTRODUCTION

Arabica coffee (*Coffea arabica* L.), particularly the Typica variety, holds significant economic and social value in Indonesia. As one of the leading coffee-producing nations globally, Indonesia boasts prominent coffee cultivation regions, including Toraja in South Sulawesi (Limbong, 2022). Despite its reputation for high-quality coffee, Toraja's productivity levels remain relatively low compared to other regions such as Aceh and North Sumatra. According to data from 2021-2022. North Toraja Regency yielded 1.667 tons of coffee from an area of 9.600 hectares, while the national production reached 7.948 thousand tons, reflecting an 11% increase from the previous year (BPS, 2019).

The productivity of coffee is determined by various factors such as cultivation methods, soil fertility, post-harvest processing, and climatic conditions. An essential consideration is the choice of the appropriate planting substrate, which should supply the necessary nutrients, water, oxygen, temperature, and airflow required for ideal plant development. Frequently utilized planting substrates consist of topsoil, sand, and manure, which aid in enhancing the fertility and structure of the soil. This study aims to assess the efficacy of using a combination of planting media comprising topsoil, sand, and pig manure in different proportions for the cultivation of Typica variety Arabica coffee seedlings. Besides selecting planting media, applying fertilizer significantly impacts plant growth and development. Liquid organic fertilizer (POC) is on the rise among farmers, attributed to its numerous advantageous characteristics. According to Analianasari et al. (2022), golden apple snail eggs, typically regarded as pests, offer a promising potential source of POC due to their high nutrient content, including nitrogen, phosphorus, potassium, calcium, copper, and iron, in addition to containing growth hormones such as auxin and gibberellin. The presence of POC from golden apple snail eggs is anticipated to enhance the growth of Arabica coffee seedlings.

Prior investigations have documented the utilization of liquid organic fertilizer (POC) in cultivating Arabica coffee in Sukasada, Buleleng, and Bali, Indonesia (Kariada & Arsana, 2019). Additionally, the application of POC has been studied concerning Robusta coffee (*Coffea robusta* L.) (Lubis, 2021) and Meranti Liberica Coffee (Firdaus et al., 2023). This research also seeks to examine the viability of using gold snail eggs as a source of liquid organic fertilizer, which may serve as an effective strategy for mitigating pest populations while enhancing plant nutrition. Consequently, the study aspires to offer practical recommendations for coffee producers to boost their productivity while simultaneously addressing pest management and promoting sustainable agricultural methodologies. The outcomes of this research could facilitate future inquiries into the application of liquid organic fertilizers derived from diverse natural resources and their incorporation into eco-friendly farming practices.

## 2. MATERIAL AND METHODS

This study was conducted in the Baruppu District, specifically in Baruppu' Selatan Village, located in the North Toraja Regency, with geographical coordinates of -2.8023° South Latitude and 119.7545° East Longitude, and the research period spanned from April to June 2024. The primary objective of the investigation is to assess the impact of various compositions of planting media and the application rates of golden snail egg POC on the growth performance of Arabica coffee seedlings. The materials utilized in this research include Arabica Kepelan coffee seedlings, topsoil, sand, pig manure, golden snail egg POC, coconut water, granulated sugar, and water for irrigation purposes. The equipment employed consists of 25 × 30 cm polybags, hoes, shovels, watering cans, scales, ropes, 75% shade netting, bamboo poles, measuring tapes, vernier calipers, along with supplementary tools such as labels, buckets, knives, and measuring cups. The experimental design implemented was a **randomized block design (RAK)** incorporating two factors. The initial factor under consideration is the makeup of the planting medium, which includes a control group (M0) and three different combinations of fertilizer ratios (M1. M2. M3). The second element was the golden snail egg POC quantity, which included a control (K0) and three varying doses (K1. K2. K3). There were 16 treatment combinations, each replicated three times, resulting in 384 seedling units. The data obtained by observing plant growth, including measurements of height, leaf count, and dry weight, were analyzed using **analysis of variance (ANOVA).** In the event of a notable disparity, the study employed the **Least Significant Difference Test (LSD)** to ascertain the variance among the various treatments. This approach is intended to guarantee the validity of outcomes and the precise assessment of the appropriateness and dependability of the research.

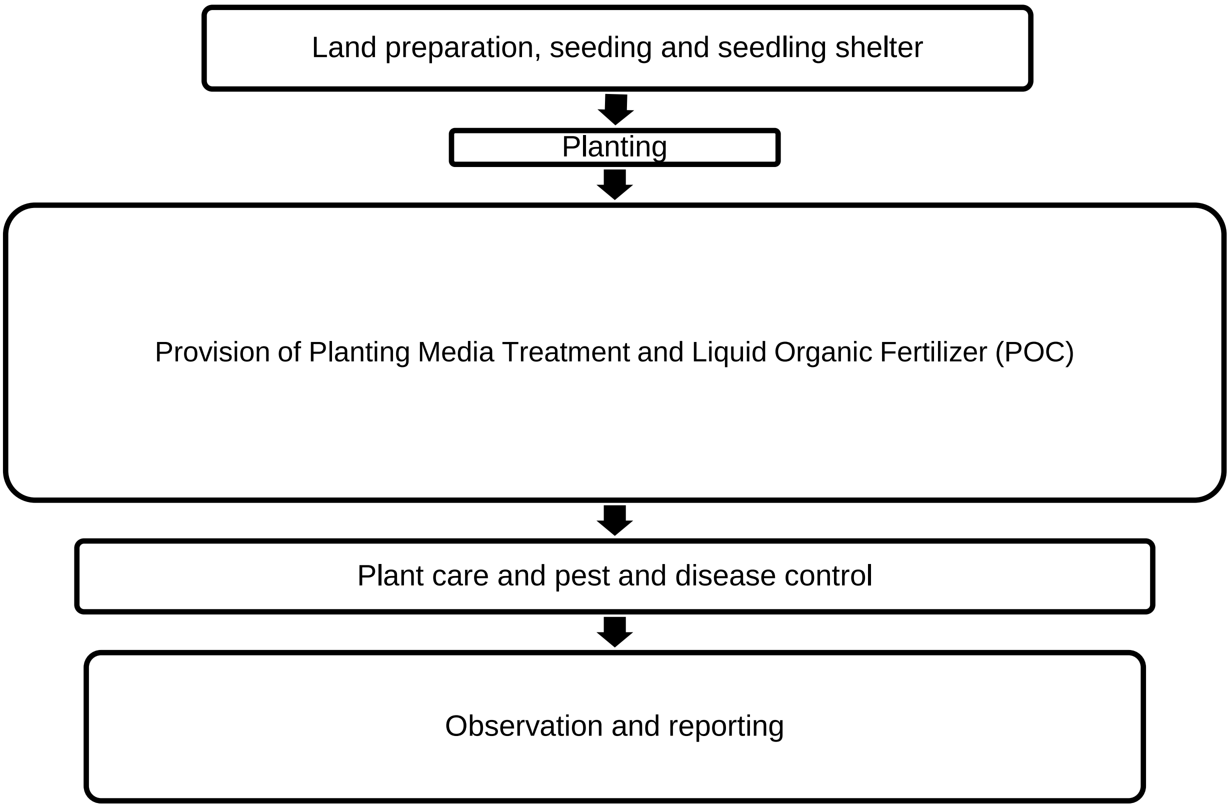


**Figure 1**. Research Implementation Flowchart

**2.1 Implementation Procedure**

This research involved a systematic approach to observing the growth of Arabica coffee seedlings. Seedling height was recorded weekly from three to twelve months post-planting, utilizing a ruler to guarantee precise measurements of vertical growth. At the twelve-month mark, a meticulous count of the leaves was conducted to determine the total leaf count, thereby offering insights into the vegetative progress of the plants. Additionally, stem diameter was assessed at a height 5 cm above the soil surface using a caliper, an essential metric for evaluating stem thickness and overall plant vitality. The leaf area was quantified by affixing the leaves to millimeter paper and calculating their dimensions at twelve months, yielding valuable information regarding leaf size and health status. The total biomass was determined by measuring plant dry weight following a 24-hour drying process in an oven at the twelve-month interval. Furthermore, root volume was assessed using a measuring cup after thoroughly washing the roots to remove any residual planting medium, providing insights into root system development. The length of the roots was measured from the base to the tip in a single measurement after twelve months, using a ruler to indicate the roots' capacity for absorption and exploration within the planting medium. All methodologies were executed with precision to ensure the reliability of the data, facilitating a comprehensive analysis of the growth and development of Arabica coffee seedlings throughout the study period.

## 3. RESULT AND DISCUSSION

### 3.1 Plant Height

Observation results at the age of 12 WAP showed that the composition of the planting media and the dose of POC of golden snail eggs significantly affected plant height.

**Table 1.** Plant Height at 12 WAP

| | M0 | M1 | M2 | M3 | Mean |
|---|---|---|---|---|---|
| K0 | 15.75 ± 0.01 a | 16.00 ± 0.01 ab | 14.42 ± 0.04 a | 14.92 ± 0.02 a | 15.27 ± 0.11 a |
| K1 | 14.58 ± 0.02 a | 16.08 ± 0.01 ab | 16.00 ± 0.01 ab | 15.25 ± 0.03 a | 15.48 ± 0.10 a |
| K2 | 16.25 ± 0.02 ab | 16.00 ± 0.01 ab | 16.92 ± 0.02 b | 24.67 ± 0.05 c | 18.46 ± 0.10 c |
| K3 | 14.92 ± 0.01 a | 15.58 ± 0.01 a | 16.83 ± 0.04 b | 17.42 ± 0.04 b | 16.19 ± 0.11 b |
| Mean | 15.38 ± 0.11 a | 15.92 ± 0.11 a | 16.04 ± 0.21 b | 18.06 ± 0.11 c | 16.35 |

Notes : Mean values followed by the same letter in columns and rows (a,b,c,d) are not significantly different at the BNJ 0.05 test level.

Table 1 illustrates that the M3 planting medium yielded the highest average plant height of 18.06 cm, whereas the K2 golden snail egg POC treatment resulted in an average plant height of 18.46 cm. Notably, the combination of M3 media with the K2 POC dose (M3K2) achieved the maximum plant height of 24.67 cm, which was statistically distinct from the other treatments.

Regarding plant height, applying POC at a dosage of 200 ml/plant (K2 treatment) led to the highest recorded height of 18.46 cm. This POC is rich in essential macronutrients, including nitrogen (N), phosphorus (P), and potassium (K), all of which are critical for optimal plant development. Nitrogen is vital for protein synthesis, phosphorus is integral to energy transfer and photosynthesis, and potassium is essential for tissue development and stem elongation. Furthermore, the golden snail egg POC is also enriched with growth hormones such as auxin and gibberellin, promoting growth and increasing plant height (Irawan & Bisono, 2019).

Sufficient water availability significantly impacts the growth of plants, particularly in terms of their height and the formation of meristem tissue at the apical meristem. The presence of a significant amount of organic matter in the media, as observed in the M3 treatment, is essential for maintaining the humidity of the media. This mechanism permits a continuous flow of water to carry vital nutrients and uphold the turgidity of plant cells. The increase in plant height is a result of both cell division and expansion, which are affected by the turgor of the cells. According to a recent study by Putra and colleagues (2021), using organic fertilizers with improved nutrient content has enhanced plant growth during the vegetative phase.

The interaction between M3K2 resulted in the tallest plant height measuring 24.67 cm, significantly different from the heights in the other treatments. The media composition, including organic matter derived from pig waste, significantly promoted plant growth by providing essential nutrients and effectively retaining water. This results in an ideal condition for growth, impacting the soil's moisture levels and water availability. Consequently, this condition facilitates the elongation of cells and the growth in height of the plant. Furthermore, the administration of POC golden snail eggs in a dosage of 200 ml per plant supplies essential nutrients, both macro and micro, along with growth hormones such as auxin and gibberellin, that contribute to enhanced plant growth and increased height (Steven cipta putra, 2022).

**3.2 Stem Diameter**

The findings from the analysis of stem diameter and its variability are detailed in Table 2. The data demonstrates that the combination of planting medium, the presence of golden snail eggs, and their interactions significantly influence stem diameter at the 12th month after seedling transplantation.

**Table 2.** Stem Diameter

| Treatment | M0 | M1 | M2 | M3 | Mean |
|---|---|---|---|---|---|
| K0 | 1.60 ± 0.02 a | 1.32 ± 0.01 a | 1.39 ± 0.01 a | 1.37 ± 0.01 a | 1.42 ± 0.01 a |
| K1 | 1.33 ± 0.02 a | 1.39 ± 0.01 a | 1.39 ± 0.01 a | 1.38 ± 0.01 a | 1.37 ± 0.01 a |
| K2 | 1.33 ± 0.01 a | 1.48 ± 0.02 a | 1.66 ± 0.01 a | 2.53 ± 0.03 b | 1.75 ± 0.01 b |
| K3 | 1.48 ± 0.02 a | 1.53 ± 0.02 a | 1.56 ± 0.01 a | 2.39 ± 0.03 a | 1.74 ± 0.01 b |
| Mean | 1.44 ± 0.01 a | 1.43± 0.01 a | 1.50 ± 0.01 b | 1.92 ± 0.01 b | |

Notes : Mean values followed by the same letter in columns and rows (a,b,c, d) are not significantly different at the BNJ 0.05 test level.

The BNJ test results for stem diameter at 12 MST indicated that the M3 media composition resulted in the highest stem diameter (1.92 mm), significantly different from M0 and M1. but not from M2. When combined with a dose of K2, the POC of golden snail eggs resulted in a noteworthy increase in stem diameter (1.75 mm), which was found to be significantly different from both K0 and K1 treatments but not from the K3 treatment. The highest stem diameter of 2.53 mm was observed in the interaction between M3 and K2. which was significantly different from the other treatments, except for the combination of M3 and K3.

The K2 treatment had the greatest stem diameter, measuring 1.75 mm. The increased stem diameter suggests that the golden snail egg POC facilitates faster cell division and growth due to the presence of nitrogen and potassium. Nitrogen expedites the process of protein synthesis in plants, whereas potassium promotes plant vitality and enhances resistance in plant stems. Gibberellin within the context of POC also contributes to the expansion of the stem's diameter, thereby increasing plants' overall strength and stability.

The analysis of stem diameter in the plant revealed notable variations across different treatments. The M3 treatment yielded the most substantial stem diameter, measuring 1.92 mm. This enhancement can be attributed to the optimal water availability in the M3 planting medium, enriched by the organic matter derived from pig waste. Adequate water supply is crucial for maintaining cell turgor, a critical factor in both cell division and enlargement (Lubnan Dalimoenthe, 2013).

Among the various interactions, the M3K2 combination exhibited the most favorable outcome, achieving a stem diameter of 2.53 mm. This increase in stem diameter indicates the beneficial influence of the golden snail egg POC on cellular processes related to division and growth. The potassium in POC plays a vital role in bolstering plant vigor, thereby contributing to increased stem circumference. This observation aligns with previous studies indicating that POC concentration can influence growth parameters, including seedling height and leaf count, although its impact on stem diameter may vary (Jatsiyah et al., 2020).

### 3.3 Leaf Size

The results of observations on leaf area and their variance prints are presented in Table 3, which shows that the composition of planting media and POC of gold snail eggs interaction had a very significant effect on leaf area at the age of 12 weeks after planting.

**Table 3.** Leaf Size

| Treatment | M0 | M1 | M2 | M3 | Mean |
|---|---|---|---|---|---|
| K0 | 17.37 ± 0.14 a | 18.69 ± 0.13 ab | 22.49 ± 0.17 b | 16.94 ± 0.11 a | 18.87 ± 0.11 a |
| K1 | 18.28 ± 0.12 ab | 21.05 ± 0.13 b | 18.28 ± 0.16 a | 22.31 ± 0.11 b | 19.98 ± 0.11 a |
| K2 | 16.73 ± 0.14 a | 22.58 ± 0.13 b | 21.07 ± 0.13 b | 27.26 ± 0.11 d | 21.91 ± 0.11 b |
| K3 | 22.84 ± 0.16 b | 22.44 ± 0.14 b | 22.28 ± 0.12 b | 23.23 ± 0.11 c | 22.70 ± 0.11 b |
| Mean | 18.80 ± 0.15 a | 21.19± 0.12 b | 21.03 ± 0.12 b | 22.44 ± 0.11 c | |

Notes : Mean values followed by the same letter in columns and rows (a,b,c, d) are not significantly different at the BNJ 0.05 test level.

The findings of the BNJ 0.05 test indicated that at 12 MST, the M3 media composition resulted in the highest leaf area (22.44 mm), which was statistically different from the leaf areas produced by other treatments. The point of comparison (POC) for golden snail eggs treated with a K2 dose also displayed a notable leaf area of 21.91 mm, significantly different from the K0 and K1 treatments but not from the K3 treatment. The presence of M3K2 resulted in the most excellent leaf area (27.26 mm), a statistically significant difference compared to the other interventions.

The K2 treatment yielded the most favorable results for leaf area, with a recorded measurement of 22.44 cm². The potassium content in the golden snail's egg masses contributes to enhancing plant vitality and promoting leaf growth and expansion. This liquid form of organic fertilizer enhances plants' uptake of essential nutrients, facilitating a rapid and efficient increase in leaf area. A greater surface area of leaves suggests an improved capacity for photosynthesis, conducive to the overall enhancement of plant growth and development (Meriatna et al., 2019).

The leaf area resulting from the M3 treatment was significantly greater than that of the other treatments, averaging 22.44 mm. An increased leaf area enhances a plant's capacity to capture sunlight, which is crucial for photosynthesis. Effective photosynthesis leads to the production of more assimilable compounds, thereby promoting overall plant development. The nitrogen content found in pig waste is vital for developing green foliage and contributes to elevated protein levels and heightened microbial activity in the soil (Thana & Tandirerung, 2018).

The interaction of M3K2 yielded the most substantial leaf area, measuring 27.26 cm². An optimal leaf area facilitates a more effective photosynthesis process; larger leaves correlate with increased photosynthate production. This, in turn, influences overall plant growth and other growth metrics, including plant height, stem diameter, and leaf area index (ILD) (Andika, 2020).

### 3.4 Dry Wet

The results of observations on dry weight and their variance prints are presented in Table 4, which shows that the composition of planting media and POC of gold snail eggs and their interactions significantly affect dry weight at the age of 12 weeks after planting.

The findings from the BNJ 0.05 test indicated that the M3 media composition resulted in the highest dry weight (0.81 g) at the age of 12 MST, demonstrating a significant difference compared to other treatments. Applying K2 to golden snail eggs resulted in a considerable increase in dry weight (0.70 g), which was noticeably distinct from the outcomes of other treatments. The dry weight of 1.12 g was observed due to the interaction of M3K2, which was found to be significantly different from the outcomes of other treatments.

The K2 treatment significantly increased plant dry weight, with the highest dry weight recorded at 0.70 grams. The increased dry weight suggests that the particulate organic carbon (POC) present in golden snail eggs is conducive to plant biomass growth. Gibberellin in POC facilitates the quickening of both the germination and growth phases, while additional nutrients like protein, phosphorus, and potassium assist in biomass creation.

**Table 4.** Dry Weight

| | M0 | M1 | M2 | M3 | Mean |
|---|---|---|---|---|---|
| K0 | 0.50 ± 0.03 a | 0.73 ± 0.03 a | 0.94 ± 0.05 b | 0.71 ± 0.05 a | 0.72 ± 0.04 b |
| K1 | 0.49 ± 0.02 a | 0.60 ± 0.02 a | 0.59 ± 0.02 a | 0.84 ± 0.06 a | 0.63 ± 0.03 a |
| K2 | 0.46 ± 0.01 a | 0.64 ± 0.03 a | 0.59 ± 0.02 a | 1.12 ± 0.08 c | 0.70 ± 0.04 b |
| K3 | 0.65 ± 0.03 a | 0.49 ± 0.01 a | 0.49 ± 0.01 a | 0.56 ± 0.04 a | 0.55 ± 0.01 a |
| Mean | 0.53 ± 0.02 a | 0.61 ± 0.02 b | 0.65 ± 0.02 b | 0.81 ± 0.02 c | |

Notes : Mean values followed by the same letter in columns and rows (a,b,c, d) are not significantly different at the BNJ 0.05 test level.

The analysis of plant dry weight revealed notable variations, with the M3 treatment yielding an average dry weight of 0.08 g. This increased dry weight associated with the M3 treatment suggests an enhancement in the soil's ability to retain water and facilitate plant nutrient uptake. The application of pig waste fertilizer has been shown to improve the soil's physical, chemical, and biological characteristics, thereby promoting enhanced plant growth (Dwilyana et al., 2023).

Among the various treatments, the interaction of M3K2 produced the most favorable outcomes, achieving an average dry weight of 1.12 grams. This elevated dry weight signifies a higher biomass, which is influenced by both environmental factors and the availability of nutrients. Additionally, the use of golden snail egg POC, rich in potassium, contributes to the development of new roots and enhances the photosynthetic process, further leading to an increase in plant dry weight (Jatsiyah et al., 2020).

### 3.5 Root Volume

The results of observations on root volume and their variance prints presented in Table 5 show that the composition of planting media and POC of gold snail eggs has a very significant effect on root volume at the age of 12 weeks after planting.

**Table 5.** Root Volume

| Treatment | M0 | M1 | M2 | M3 | Mean |
|---|---|---|---|---|---|
| K0 | 2.67 ± 0.05 a | 3.00 ± 0.07 a | 2.83 ± 0.05 a | 2.92 ± 0.02 a | 2.85 ± 0.03 a |
| K1 | 3.00 ± 0.04 a | 3.67 ± 0.06 a | 4.08 ± 0.04 b | 4.50 ± 0.04 b | 3.81 ± 0.03 b |
| K2 | 3.00 ± 0.04 a | 4.17 ± 0.02 a | 4.25 ± 0.02 b | 6.25 ± 0.05 c | 4.42 ± 0.03 c |
| K3 | 2.92 ± 0.03 a | 4.17 ± 0.02 a | 4.75 ± 0.02 b | 4.92 ± 0.03 b | 4.19 ± 0.03 c |
| Mean | 2.90 ± 0.03 a | 3.75 ± 0.03 b | 3.98 ± 0.03 b | 4.65 ± 0.03 c | |

Notes : Mean values followed by the same letter in columns and rows (a,b,c, d) are not significantly different at the BNJ 0.05 test level.

The findings from the BNJ 0.05 root volume assessment conducted at 12 weeks of age are presented in Table 5. the media composition designated as M3 yielded the highest average root volume of 4.65 ml, which was statistically distinct from the other treatments. The application of golden snail egg POC (K2) resulted in an average root volume of 4.42 ml, which was also significantly different from the other treatments, although it did not differ significantly from K3. Notably, the interaction between the media composition treatment and the golden snail egg POC (M3K2) achieved an average root volume of 6.25 ml, significantly different from all other treatments.

Among the treatments, K2 exhibited the most enormous root volume at 6.25 ml. Calcium in the POC is crucial for fostering a robust root system, thereby enhancing the plant's ability to absorb water and nutrients. An increased root volume indicates the plant's enhanced resilience to drought conditions, as it can effectively uptake more significant amounts of water and nutrients.

The volume and length of the plant roots in the M3 treatment also achieved the best results, with the most prominent root volume measuring 4.65 ml and the most extended root length measuring 10.33 cm. The pig manure's media composition provides adequate pore space for root growth and extension. Loose media has numerous pore spaces that support air circulation and water retention, which are essential for root respiration and the development of the root system. Air in the soil's pore spaces supplies O2 for root respiration and CO2 and N2 for various soil processes (Suhaila et al., 2013).

The interaction of M3K2 produced the highest root volume, which was 6.25 ml. A larger root volume indicates the plant's ability to absorb more water and nutrients from the soil. The phosphorus content in the snail egg liquid organic fertilizer stimulates root growth and strengthens the overall plant. The availability of nutrients such as N, P, and K in the liquid organic fertilizer supports the plant's ability to capture sunlight through photosynthesis and enhances overall plant health (Farhana & Wijaya, 2020).

### 3.6 Root Length

The results of observations on root length and their variance prints presented in Table 6 show that the composition of planting media and POC of gold snail eggs has a very significant effect on root length at the age of 12 weeks after planting.

**Table 6.** Root Length

| Treatment | M0 | M1 | M2 | M3 | Mean |
|---|---|---|---|---|---|
| K0 | 5.50 ± 0.05 a | 4.75 ± 0.03 a | 5.25 ± 0.05 a | 6.17 ± 0.05 b | 5.42 ± 0.05 a |
| K1 | 5.75 ± 0.05 a | 5.58 ± 0.05 a | 5.33 ± 0.05 a | 5.83 ± 0.05 a | 5.63 ± 0.05 a |
| K2 | 5.33 ± 0.05 a | 5.83 ± 0.05 a | 5.25 ± 0.05 a | 10.33 ± 0.09 c | 6.69 ± 0.06 b |
| K3 | 6.83 ± 0.06 a | 5.00 ± 0.05 a | 6.42 ± 0.05 a | 7.33 ± 0.06 b | 6.40 ± 0.06 b |
| Mean | 5.85 ± 0.05 a | 5.29 ± 0.05 b | 5.56 ± 0.05 a | 7.42 ± 0.05 c | |

Notes : Mean values followed by the same letter in columns and rows (a,b,c, d) are not significantly different at the BNJ 0.05 test level.

The results of the BNJ test at 0.05 for root length at 12 MST in Table 6 indicate that the media composition (M3) produced the most extended average root length of 7.42 cm, significantly different from the other treatments. Treating POC from golden apple snail eggs produced the most extended average root length (K2) of 6.69 cm, significantly different from treatments K1 and K0 but not significantly different from K3. The interaction between the media composition treatment and POC from golden apple snail eggs (M3K2) resulted in an average root length of 10.33 cm, significantly different from the other treatments.

Root length also increased with treatment K2. It is yielding the highest root length of 10.33 cm. A greater root length indicates that POC from golden apple snail eggs enhances the plant's root reach in the soil. Calcium and phosphorus in the POC support root development, allowing plants to utilize deeper resources, thereby promoting growth and resilience. Overall, POC from golden apple snail eggs at a dosage of 200 ml per plant has a significant and positive impact on the growth of Arabica coffee seedlings. This POC enhances plant height, stem diameter, leaf area, dry weight, root volume, and root length, owing to its nutrient and hormone content that supports optimal plant growth.

The results of the BNJ test at the 0.05 significance level revealed that treatment M3. which involved a media composition with a 1:1:2 ratio of topsoil, sand, and pig manure, yielded the best outcomes in terms of plant height, stem diameter, leaf area, dry weight, root volume, and root length. The tallest plant, measuring 18.06 cm, was achieved with treatment M3, significantly different from the other treatments. This is attributed to the more outstanding contribution of pig manure in the media composition. Pig manure not only enhances the nutrient content of the media but also helps maintain moisture in the root environment. This adequate moisture supports better root development, contributing to more optimal plant growth. Water plays a crucial role in plant life. As a raw material for photosynthesis, water acts as a reactant, a solvent for nutrients, and a transporter of photosynthesis products throughout the plant (Meriatna et al., 2019).

Overall, the media composition involving pig manure at a ratio of 1:1:2 has proven effective in supporting the growth of Arabica coffee seedlings of the Typica variety. This media improves the availability of nutrients and soil moisture and enhances soil structure, positively impacting root development and overall plant growth.

The M3K2 interaction yielded the most favorable outcomes regarding root length, achieving an average measurement of 10.33 cm. An increased root length signifies the plant's enhanced capacity to access water and essential nutrients within the soil. The nutrients derived from golden snail egg POC are crucial for fostering a robust root system, encompassing several factors, including root weight, root volume, and root-to-shoot ratio (Delory et al., 2017). In summary, the optimal combination of planting media was formulated at a ratio of 1:1:2. The application of 200 ml of golden snail egg POC per plant resulted in significant improvements across various growth parameters of Arabica coffee seedlings. The media, enriched with organic matter from pig waste, establishes a conducive growth environment, while the golden snail egg POC contributes vital nutrients and growth hormones that enhance overall plant development.

## 4. CONCLUSION

The formulation of the planting medium, consisting of a 1:1:2 ratio of soil, sand, and pig manure, combined with applying golden snail egg POC at a rate of 200 ml per plant, yielded the most favorable outcomes for the growth of Arabica coffee seedlings. This specific medium resulted in plants measuring 18.06 cm in height, with a stem diameter of 1.92 cm, a leaf area of 22.44 cm², a dry weight of 0.81 grams, a root volume of 4.65 ml, and a root length of 7.42 cm. Furthermore, the application of golden snail egg POC at the exact dosage of 200 ml per plant facilitated optimal growth, achieving a height of 18.46 cm, an average of 4.57 leaves, a stem diameter of 1.75 cm, a leaf area of 21.91 cm², a dry weight of 0.70 grams, a root volume of 4.42 ml, and a root length of 6.69 cm. The most practical combination of planting medium and POC dosage (M3K2) resulted in a plant height of 24.67 cm, an average of 5.33 leaves, a stem diameter of 2.53 cm, a leaf area of 27.26 cm², a dry weight of 1.12 grams, a root volume of 6.25 ml, and a root length of 10.33 cm.

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