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Abstract

Purpose: *Syzygium jambos (L.)* is a species well adapted to warm, humid tropical climates with well-drained, loamy soils. This study aimed to evaluate the early growth performance of S. jambos seedlings under different organic soil amendments during a three-month observation period following transplanting.

Methodology: The experiment was conducted under semi-controlled nursery conditions using 8×10-inch polyethylene polybags. Four treatments were tested: pure garden soil, 50% vermicast:50% garden soil, 50% cow manure:50% garden soil, and 10% chicken manure mixed with garden soil. Data on seedling survival, height, stem diameter, and number of branches were collected. The results were statistically analyzed using Analysis of Variance (ANOVA) and Tukey's Honest Significant Difference (HSD) test to determine significant differences among treatments.

Findings: The highest survival rate (100%) was recorded in seedlings grown in garden soil alone. Significant differences were observed in percent survival, seedling height and stem diameter among treatments. The 50% vermicast–50% garden soil mixture produced the tallest seedlings (27.64 cm) and the thickest stems (6.80 mm), followed by garden soil and cow manure–soil treatments. The poorest growth was observed in the chicken manure–soil treatment, with seedlings averaging only 14.33 cm in height and 3.93 mm in stem diameter. Branching did not significantly differ among treatments.

Unique Contribution to Theory, Practice and Policy: Overall, vermicast combined with garden soil consistently promoted both high survival and vigorous early growth of *Syzygium jambos* seedlings, while chicken manure at the tested concentration was detrimental**.** Vermicast combined with garden soil is recommended as an effective potting medium for enhancing the early growth and vigor of *Syzygium jambos* seedlings. Moreover, further studies should test lower or composted forms of chicken manure, extend the growth period to capture branching and biomass, and conduct field trials to evaluate long-term survival and establishment.

Keywords: *Syzygium jambos, Survival, Organic Amendments, Growth Performance*

INTRODUCTION

Syzygium jambos, commonly known as rose apple, is a tropical fruit tree valued for both its ecological and economic roles. It is widely cultivated in Southeast Asia for its edible fruits and is often used in agroforestry systems due to its ability to provide shade, reduce erosion, and enhance soil fertility. Successful cultivation of this species, especially in the nursery phase, depends heavily on optimal growing conditions—including soil fertility, which directly influences seedling vigor and survival (Pérez-Harguindeguy et al., 2013).

Several studies reported that Syzygium spp. such as S. jambos known to contain phytochemicals such as flavonoid, saponin, tannins, quinones, and steroids which have been reported to have anticancer properties (Columna., 2019). In some cases, various traditional medicine applications have been widely recognized such as the S. jambo fruits improve brain and liver health, and flowers are simulated to relieve fever and cough (Ochieng., et. Al. 2022).

Growth of plants is a crucial stage of plant development. This improves seed germination, root establishment, increases the height and diameter, as well as quality and yield of the seedlings (Arslanoğlu., 2022). These are influenced by different factors particularly water intake, light, temperature and nutrient which is important during the early stage of plant development (Grossnickle., & MacDonald., 2018).

Organic fertilizers, such as vermicast, cow manure, and chicken manure, are increasingly being used as alternatives to synthetic inputs due to their positive effects on soil health and plant growth. These materials strengthen soil structure, augment microbial activity, and supply critical nutrients in a gradual-release format (Atiyeh et al., 2002). In nursery operations, especially for native or less commercially explored species like *S. jambos*, organic amendments offer a sustainable way to support early seedling development.

The application of vermicast has been widely used for growth medium in plants and show a better response to plants growth and development. It's been shown that best alternative growing media aside from animal manure (Politud., 2016). Organic fertilizers provide the vital nutrient (macronutrients and micronutrients) for plant development. Manure fertilizers including but not limited to cow manure, poultry manure, are widely recognized in improving soil fertility and providing nutrients support for plant growth. However, Observations reveals that long term applications of animal manure may cause soil degradation due to high levels of sodium accumulation in soil causing toxicity to plants, leading up to low growth, yield and productivity (Zhang., 2019). Moreover, a study of Dikinya., & Mufwanzala (2010) reported that above 40% of chicken manure shows ineffectiveness in enhancing soil productivity. It also stated some negative effect of chicken manure on soil electrical conductivity which is influenced by the salinity, nutrient, and water content, recorded to cause pollution, spread of diseases and the emission to greenhouse gas which contribute to climate change (Shaheen., et. Al. 2018).

Despite the known benefits of organic fertilizers, limited research exists on their specific effects on the early growth of *S. jambos* seedlings. Most existing studies focus on more economically dominant or fast-growing tree crops, leaving a gap in species-specific knowledge. Furthermore, nursery operators often rely on trial-and-error approaches when choosing growing media. This lack of standardized data hinders the optimization of seedling production for *S. jambos*, particularly in resource-limited and small-scale setups. Hence, this research aimed to assess the effects of selected organic amendments on the early growth performance of *S. jambos* seedlings.

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MATERIALS AND METHODS

Study Site

The study was conducted at Vallesteros Boarding House, Purok 3, Vista Alegre, Bayombong, Nueva Vizcaya. The area experiences a tropical environment, characterized by average temperature fluctuations between 22°C and 32°C and distinct wet and dry seasons. The experimental site was shaded by a translucent net to prevent direct sunlight damage and heavy rainfall impact, allowing the seedlings to grow under stable and moderately controlled light and moisture conditions.

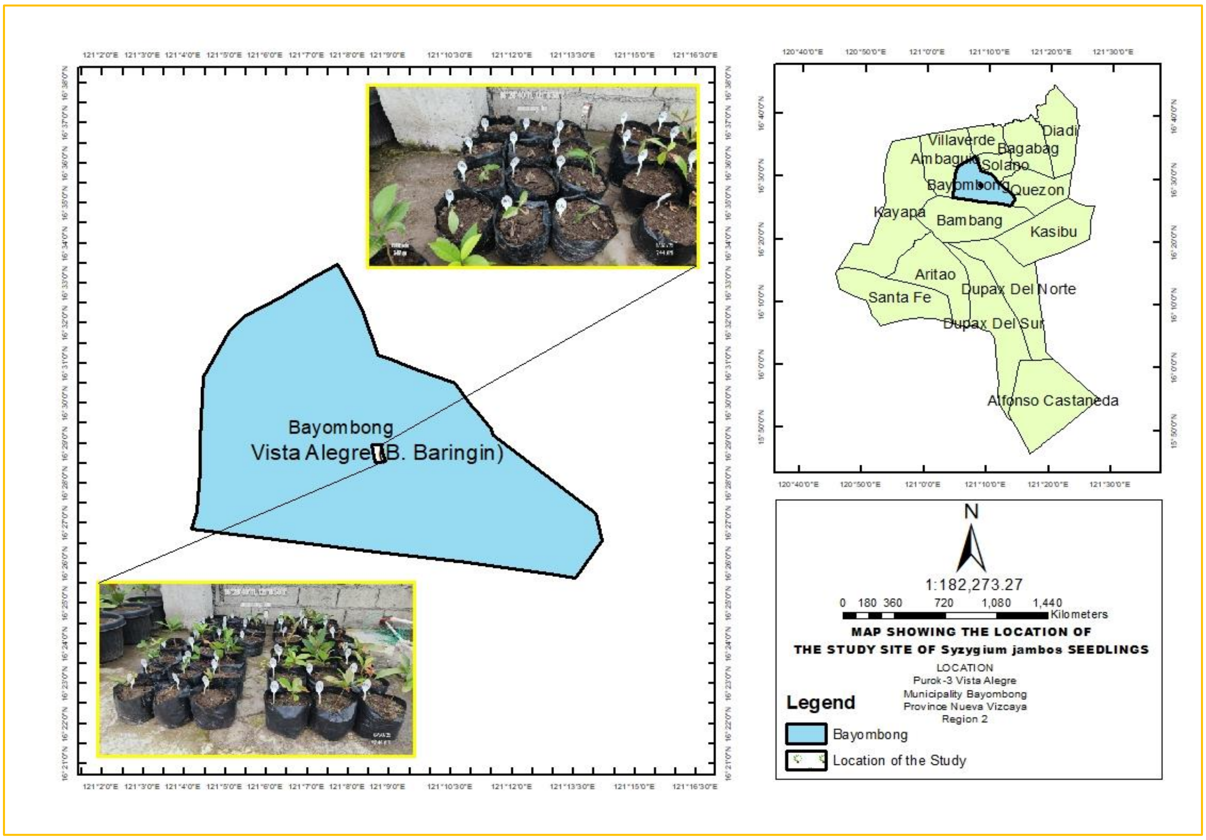

Figure 1: Location of the Study Area

Experimental Design and Treatments

A Completely Randomized Design (CRD) was used in the study to assess the effects of organic amendments on the early growth performance of *S. jambos* seedlings. This design was selected to minimize experimental bias and ensure that each seedling had an equal chance of receiving any of the treatments.

Out of 60 total seedlings raised under uniform nursery conditions, 48 were randomly selected for the experiment using simple random sampling. The selected seedlings were assigned to four treatments and replicated three times, with four seedlings per replicate, to ensure adequate representation and statistical reliability.

Four media treatments were utilized to evaluate their effects on the initial growth of *S. jambos* seedlings:

Table 1: Treatment combination

Treatment	Combination
T1	Garden soil (Control)
T2	50% vermicast, 50% garden soil
T3	50% cow manure, 50% garden soil
T4	10% chicken manure, 90% garden soil

The proportion of chicken manure in Treatment T4 was intentionally limited to 10% mixed with 90% garden soil. Poultry manure, particularly when fresh or poorly stabilized, often contains high levels of readily mineralizable nitrogen, ammonium-N, and soluble salts, which can lead to phytotoxicity, osmotic stress and impaired seedling emergence and early growth (Delgado et al., 2008; Ravindran et al., 2018). Consequently, to mitigate these risks and to reflect a safe practical application rate in nursery media, a conservative 10% incorporation rate of chicken manure was chosen. In contrast, vermicast and cow manure in this study were more stabilized organic amendments (lower immediate risk of phytotoxicity) and are commonly applied at higher mixing ratios; therefore, they were each applied at 50% with garden soil.

Planting Material

The planting materials *S. jambos* seedlings raised from wildings collected from mature, healthy mother trees within Barangay Ponon, Atimonan, Quezon Province. Wildlings were planted in 6x10 polyethylene bags filled with garden soil. Seedlings of uniform height (approximately 5–7 cm and average of 4 mm diameter) and age (around 3 weeks old) were selected for transplantation to ensure consistency across treatments.

Collection and Preparation of the Treatments

The garden soil was prepared first to serve as the control treatment of the study. Vermicast was obtained from the Center for Sustainable Development and Environmental Resources Management (CERMSD), Nueva Vizcaya State University (NVSU), and mixed with garden soil at a 50% ratio. Cow manure was purchased from an online shop and combined with garden soil in equal proportions (50:50) to maintain balance. Chicken manure, were collected at Tadji, Kasibu, Nueva Vizcaya, and used at a lower concentration, with a mixture of 10% chicken manure and 90% garden soil. This adjustment was made since chicken manure is naturally rich in nitrogen (N), phosphorus (P), and potassium (K); thus, a conservative proportion was used to prevent potential harm to the wildlings while still enriching the soil with nutrients and improving its structure over time. To ensure uniformity in preparation, two equal-sized buckets were used as measuring containers for both soil and treatment components. After obtaining the exact measurements, each mixture was thoroughly mixed and subsequently placed into 8 × 10 polyethylene bags, which served as the growing containers for the seedlings.

Data Collection

Stem diameter was measured with a digital tree caliper at a fixed point 2 cm above the soil surface, which was marked beforehand to maintain consistency across all measurements. Seedling height was determined using a meter stick, measuring from the soil surface to the tip of the apical bud or the highest fully extended shoot. In addition, the number of fully expanded branches per seedling was manually counted, considering only branches with fully developed leaves at the time of observation. All measurements were recorded systematically and checked for accuracy to minimize errors and ensure reliable data for subsequent analysis.

Figure 2: Measuring the Diameter using Digital Tree Caliper

Data Analysis

Data were tabulated and analyzed statistically with Analysis of Variance (ANOVA) to appraise for notable variations between treatments. Tukey's Honest Significant Difference (HSD) assessment was used as a pos hoc analysis when significant difference was discovered. Analysis to determine any particular treatment pairs vary significantly. The degree that was significant was set at $\alpha = 0.05$.

RESULTS AND DISCUSSION

The effects of organic amendments on the early growth performance of Syzygium jambos seedlings were evaluated in terms of percent survival, height, stem diameter, and number of branches over a three-month period. The results of ANOVA (Table 2) and their graphical representations (Fig. 3) are discussed below.

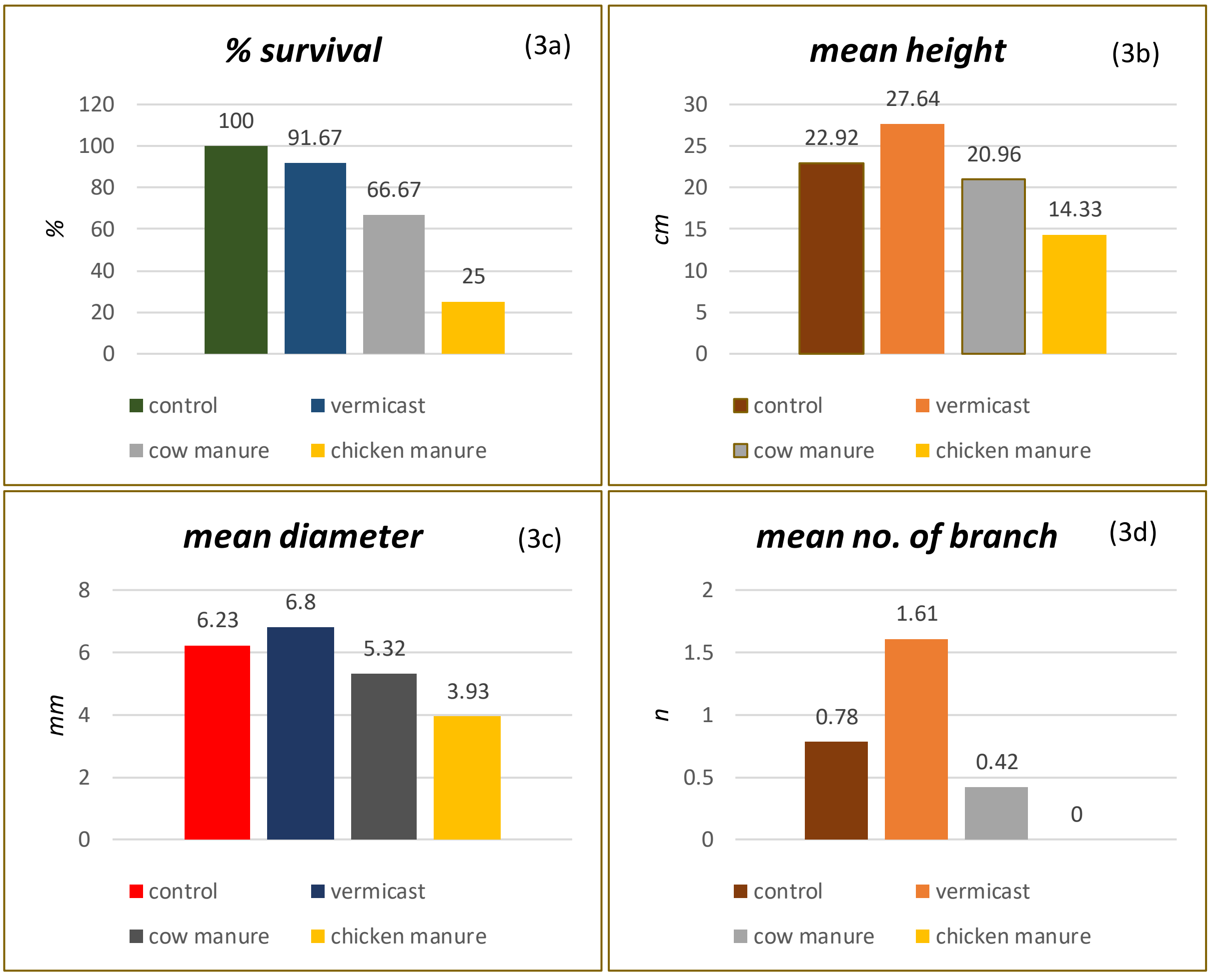

Figure 3: Provides a Visual Representation of the Growth Responses of S. Jambos Seedlings under Different Soil Amendments

Table 2: Means and Analysis of Variance Results

Parameter	Garden soil	Vermicast + garden soil	Cow manure + garden soil	Chicken manure + garden soil	Pr (> F)
% survival	100.00^{a}	91.67^{a}	66.67^{a}	25.00^{b}	0.0081
Height	22.92^{a}	27.64^{a}	20.96^{ab}	14.33^{b}	0.0286
Diameter	6.23^{ab}	6.80^{a}	5.32^{b}	3.93^{c}	0.0034
No. of Branch	0.78	1.61	0.42	0.00	0.1041

* There is no major difference between means that have the same letter.

Percent Survival

Survival of seedlings is significantly different among treatments (p = 0.0081; Table 2, Fig.3a). Garden soil (100%) and vermicast + soil (91.67%) showed the highest survival rates, statistically different to each other. Cow manure + soil had a moderate survival rate (66.67%),

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while chicken manure + soil exhibited the lowest survival (25%), significantly different from all other treatments. The high survival rates for garden soil and vermicast amendment can be attributed to nutrients and improved soil structure provided by garden soil and vermicast substrates. According to Lim et al. (2014) and Sharma & Garg (2019), vermicast improves soil aeration and moisture retention, creating a favorable rhizosphere for root development and early establishment of seedlings. The enhanced microbial activity also facilitates slow and steady nutrient mineralization, supplying nitrogen, phosphorus, and potassium (Singh et al., 2015). Similar studies of Ibanez et al. (2020) reported that *Psidium guajava* grown in vermicast has shown positive results for height and diameter due to improved nutrient-use efficiency and rhizospheric activity. The poor survival in chicken manure-amended soil may be due to its high nitrogen content and rapid nutrient release, which can result in ammonia toxicity and salt accumulation in the rhizosphere (Thepsilvisut et al., 2022). In contrast, the gradual nutrient release from cow dung and vermicast supported higher survival. Similar observations were made by Thaisuchat, Panikanan, and Meesumlee (2024), who reported enhanced seedling survival using vermicompost and cow dung as nursery substrates. Likewise, Mensah et al. (2017) found that excessive chicken manure reduced survival in plantain propagation despite promoting vegetative growth.

Seedling Height

Seedling height was also significantly influenced by the treatments ($p = 0.0286$; Table 2, Fig.3b). The tallest seedlings were produced in vermicast + soil exhibited (27.64 cm), followed by garden soil which obtained (22.92 cm) and cow manure + soil (20.96 cm), which were statistically comparable. Chicken manure + soil had the shortest seedlings (14.33 cm) and was significantly lower than all other treatments. The study reveals that treatment using the vermicast and soil mixture provides the most effective nutrient to enhance height growth of *S. jambo* seedlings. This is followed by garden soil and cow manure which is comparably obtained closely. However, chicken manure shows a detrimental effect in relation to height growth of the *S. jambo* seedlings. This suggests that chicken manure has an inhibitory effect in height growth of the seedlings due to its high salinity content (Zhang., 2019).

Figure 4: The Difference among the Treatments

Stem Diameter

Stem diameter significantly differed across treatments ($p = 0.0034$; Table 2, Fig. 3c). The thickest stems were recorded in vermicast + soil (6.80 mm), followed by garden soil (6.23 mm) and cow manure + soil (5.32 mm). The thinnest stems were found in chicken manure + soil

(3.93 mm), which was significantly smaller than all other treatments. This indicates that chicken manure shows the least significant effect on the diameter on *Syzygium jambos* seedling.

Number of Branches

Branch numbers did not significantly differ among treatments (p = 0.1041; Table 2, Fig. 3d). Nonetheless, vermicast + soil showed the highest mean value (1.61 branches), followed by garden soil (0.78) and cow manure + soil (0.42). Chicken manure produced no branching. The vermicast + soil treatment produced the most branching, which suggested that the combination of vermicast and soil are favorable in relation to branch growth.The cow manure + soil treatment resulted in a mean of 0.42 branches. This low mean suggests that while it supported some branching, it was less effective than the vermicast mixture or even the garden soil alone. Where in, chicken manure produced no branching, this indicates that the properties of the chicken manure, either due to its nutrient composition, concentration, or other factors, were inhibitory or ineffective in stimulating the development of lateral branches.

CONCLUSION AND RECOMMENDATION

This study aimed to evaluate the early growth performance of *Syzygium jambos* seedlings under different organic soil amendments. The objective was achieved, showing that vermicast combined with garden soil significantly improved survival, height, and stem diameter of seedlings compared to other treatments. Cow manure also enhanced growth, while chicken manure at 10% concentration was detrimental.

It is concluded that a 50% vermicast–50% garden soil mixture is the most effective potting medium for *S. jambos* seedlings. Future studies are recommended to test lower or composted forms of chicken manure, extend the growth period to assess biomass and branching, and conduct field trials to determine long-term performance.

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