e-ISSN 2579-9479
p-ISSN 2828-4348
Accredited by a Directorate General of Higher Education, Research and Technology No. 79/E/KPT/2023

Jurnal Ilmu Peternakan Terapan
March 2026, 9 (2): 71-80
DOI: https://doi.org/10.25047/jipt.v9i2.6855
Available online at https://publikasi.polije.ac.id/index.php/jipt

Utilization of oil palm frond compost and its effect on the growth and productivity of Pakchong grass (*Pennisetum purpureum cv. Thailand*)

Pemanfaatan kompos pelepah kelapa sawit dan pengaruhnya terhadap pertumbuhan dan produktivitas rumput Pakchong (Pennisetum purpureum cv. Thailand)

Rani Oktavianti Rahma Putri, Neli Definiati*, Rita Zurina Muchlis, Wismalinda Rita, and Edwar Suharnas

Department of Animal Husbandry, Faculty of Agriculture and Animal Husbandry, Muhammadiyah University of Bengkulu, Jl. Bali, Bajak Village, Teluk Segara, Bengkulu, Indonesia, 38119.

*Corresponding author: nelidefiniati@umb.ac.id

ARTICLE INFO

Received:
18 January 2026
Accepted:
13 February 2026
Published:
30 March 2026

Keywords:
Animal feed
Oil palm frond compost
Pakchong grass
Productivity.

A B S T R A C T

This study evaluated the effect of oil palm frond compost on the productivity of Pakchong grass (*Pennisetum purpureum cv. Thailand*) as livestock feed. The research was conducted at the UPTD-PPT IB Livestock and Animal Health Service of Bengkulu Province from July 2024 to April 2025 using a Randomized block design (RBD) with four treatments and three replications. The treatments included T0 (control), T1 (10 tons/ha), T2 (20 tons/ha), and T3 (30 tons/ha). The observed parameters included plant height, leaf width, stem diameter, and number of tillers. The results showed that compost application did not significantly affect plant growth at the first harvest. However, significant improvements were observed during the second harvest, indicating the increased effectiveness of the compost following optimal decomposition. The highest productivity was achieved with the P3 treatment (30 tons/ha), yielding a plant height of 620.7 cm, a stem diameter of 57.42 mm, a leaf width of 10.77 cm, and an average of five tillers per clump. The findings indicate that, although no statistically significant effect was observed, the application of oil palm compost tended to improve the vegetative growth of Pakchong grass at the second harvest..

A B S T R A K

Penelitian ini mengevaluasi pengaruh kompos pelepah kelapa sawit terhadap produktivitas rumput Pakchong (Pennisetum purpureum cv. Thailand) sebagai pakan ternak. Penelitian dilakukan di UPTD-PPT IB Layanan Kesehatan Ternak dan Hewan Provinsi Bengkulu dari Juli 2024 hingga April 2025 menggunakan Rancangan acak kelompok (RAK) dengan empat perlakuan dan tiga ulangan. Perlakuan yang digunakan meliputi P0 (kontrol), P1 (10 ton/ha), P2 (20 ton/ha), dan P3 (30 ton/ha). Parameter yang diamati meliputi tinggi tanaman, lebar daun, diameter batang, dan jumlah anakan. Hasil menunjukkan bahwa aplikasi kompos tidak secara signifikan mempengaruhi pertumbuhan tanaman pada panen pertama. Namun, perbaikan yang signifikan diamati pada panen kedua, menunjukkan peningkatan efektivitas kompos setelah dekomposisi optimal. Produktivitas tertinggi dicapai dengan perlakuan P3 (30 ton/ha), menghasilkan tinggi tanaman 620,7 cm, diameter batang 57,42 mm, lebar daun 10,77 cm, dan rata-rata lima anakan per rumpun. Kesimpulan dari penelitian ini bahwa walaupun tidak berbeda nyata, pada panen kedua, pemberian kompos pelepah sawit cenderung meningkatkan pertumbuhan vegetatif Pakchong grass.

Kata kunci:
Pakan ternak
Kompos pelepah sawit
Rumput Pakchong
Produktivitas.

INTRODUCTION

Forage is the main source of feed for ruminants and is very important for supporting the life, growth, production, and reproduction of livestock, as it provides the nutrients they need. The availability of adequate forage is crucial for livestock survival, so forage must contain essential nutrients such as water, crude fiber, fat, minerals, and vitamins. Several factors must be considered in the sustainable provision of feed, including the preparation of alternative feed raw materials to mitigate factors such as seasonal feed shortages, climate variability, limited land availability, competition with food crops, and post harvest handling losses that can reduce feed quality and quantity (Siswoyo et al., 2023). Therefore, the provision and processing of forage must be carried out correctly to support the expected growth of livestock. To achieve optimal productivity in ruminant livestock, increasing the availability of forage with adequate quality and quantity is essential, as forage is the primary feed for ruminant livestock and is crucial for successful livestock production, particularly meat and milk (Definiati et al., 2023).

Pennisetum purpureum cv. Thailand is a variety developed over six years by Dr. Krailas Kiyothong, a nutritionist and plant breeder, from a cross between elephant grass (*Pennisetum purpureum Schumach*) and pearl millet (*Pennisetum glaucum*). Pearl millet (*Pennisetum glaucum*) is an annual cereal crop that grows in dry and semi-dry areas, with more than 85% genetic similarity (Suherman, 2021). Therefore, this grass belongs to the Poaceae family, Pennisetum genus, and *Pennisetum purpureum cv. Thailand* species.

Pakchong grass (*Pennisetum purpureum cv. Thailand*) is one of the leading grass varieties, widely cultivated as a livestock feed in various regions of Indonesia. This grass is known for its high biomass production potential, wide adaptability to various environmental conditions, and adequate nutritional content to meet the needs of ruminant livestock. Its production is excellent, even exceeding that of elephant grass. Based on research by Wangchuk et al. (2015) Pakchong grass can grow to over 3 meters in less than 60 days with a crude protein content of 16-18%. This grass can even be harvested at 45 days of age. According to Septian et al. (2022) Pakchong grass biomass production can reach 500 tons per hectare per year, almost double that of common elephant grass (*Pennisetum purpureum*), which produces around 250-275 tons per hectare per year.

The nutritional content of Pakchong grass consists of 22% dry matter, 7% crude fat, 72.21% NDF, 45.72% ADF, and 7.98% crude protein (Suherman, 2021). This grass can grow in rocky soil with a thin layer of topsoil, including in areas with poor drainage, and is tolerant of moderately dry conditions and shady soil. As a perennial plant, Pakchong grass can adapt to a wide range of soil types. In fact, at light intensities between 30% and 50%, this grass can still produce a normal yield. Cultivation efforts to develop and utilize Pakchong grass as animal feed have been carried out by introducing several superior varieties (Hasan et al., 2024).

The potential of Pakchong grass (*Pennisetum purpureum × Pennisetum americanum*) as a superior livestock feed is gaining attention, especially in areas with limited fertile land such as Bengkulu Province. Based on research by Liman et al. (2022) Pakchong grass has a high crude protein content of around 16% at 40 days of harvest and can produce large amounts of biomass, reaching around 60 tons per hectare at 70 days of age, making it very suitable for use as high-quality animal feed. On the other hand, fertile land in Bengkulu continues to shrink due to land conversion and intensification of food crop cultivation. However, there is great potential in utilizing agricultural waste, especially palm oil leaf waste, which is often discarded or burned, causing environmental problems such as air pollution and soil degradation. Based on research by Ramon et al. (2022) shows that gain and production in ruminant livestock. In addition, of palm oil waste as feed for ruminant livestock can significantly reduce environmental pollution while supporting sustainable livestock production.

Indonesia is an agrarian country rich in agricultural products, including the palm oil plantation sector. Palm oil (*Elaeis guineensis Jacq*) is one of the strategic plantation commodities in Indonesia's plantation sector development, as it creates jobs and serves as a source of foreign exchange for the country. According to data from the Ministry of Agriculture of, the total area of oil palm plantations in Indonesia has reached 11 million hectares, double the area in 2000. This area is estimated to increase to 13 million hectares by 2020. This growth is reflected in increased palm oil production and exports, as well as the expansion of plantation areas. Bengkulu Province is one of the regions with a very large area of oil palm plantations, which continues to increase every year. According to data from the Bengkulu Province Food, Horticulture, and Plantation Service in 2024, the hectares. The province's oil palm plantations covered 328,251 hectares, with a total production of 1,000,962 tons (BPS Bengkulu, 2024).

The use of oil palm frond waste as compost raw material is an effective, innovative solution to overcome waste while improving soil fertility. Compost from this waste contains complete nutrients, such as nitrogen, phosphorus, and potassium, which are important for the growth of feed crops, including Pakchong grass. In addition to adding nutrients, compost loosens the soil, improves porosity and aeration, enhances water retention, and facilitates root growth. Oil palm fronds contain cellulose (43%), hemicellulose (18.5%), lignin (14.2%), crude protein (2.2%), crude fat (3%), crude fiber (47%), and ash (4%), making it a potential biomass for industry and agriculture (Wati et al., 2024). Its use reduces solid waste from plantations and increases soil productivity. This compost increases soil microbial activity, accelerates the decomposition of organic matter, and reduces soil acidity, thereby creating a favorable environment for root growth. The application of 25 tons of compost per hectare has been proven to yield the best results in increasing plant height.

In an effort to develop sustainable livestock farming, integrating the utilization of agricultural waste and forage production is important. This study introduces a novel application of oil palm frond compost as an organic fertilizer, specifically in Pakchong grass cultivation, building on previous research demonstrating significant effects of oil palm frond compost on forage quality parameters, such as crude protein and fiber, in other grass species (Ningsih et al., 2022). By optimizing both agricultural waste recycling and forage productivity, this approach aims to reduce farmers. In addition, this approach supports environmental conservation by promoting environmentally friendly agricultural waste management and improving natural soil fertility (Silalahi et al., 2023).

Based on the above description, research was conducted to determine the effect of compost use on "Utilization of oil palm frond compost and its effect on the growth and productivity of Pakchong grass (*Pennisetum purpureum cv. Thailand*)."

MATERIALS AND METHODS

Time and Location

This research was conducted at the Technical Implementation Unit for Livestock Breeding and Feed, Bengkulu Province Livestock and Animal Health Service, from July 2024 to April 2025.

Material

The main materials used in this study included Pakchong grass (*Pennisetum purpureum cv. Thailand*) as the plant cultivated and observed. Oil palm fronds were used as the primary raw material for compost production and were sourced from oil palm plantations in Bengkulu Province. Rice bran and cow manure were added as composting materials to enhance compost. Local microorganisms (MOL) were utilized as bioactivators to accelerate the decomposition process of organic materials during compost production. Water was used as a solvent in preparing the MOL solution and in the compost fermentation process.

Methods

The equipment used in this study included soil cultivation tools such as hoes, machetes, and sickles, as well as tractors. Plant measurement tools, including measuring tapes and calipers, were used to measure plant height, stem diameter, and leaf width. A chopper to fermentation. Sprayers were utilized to apply the MOL solution to the compost piles. Sacks and tarpaulins were used to store and cover the compost during fermentation. Both sitting and hanging scales were employed to weigh materials and harvest yields. An oven was used for the drying process when required for further analysis. Additionally, writing instruments and cameras were used documenting all research activities.

Experimental Design

This study used a Randomized block design (RBD) due to the heterogeneous nature of the experimental land. This design involved four treatments with three replicates, resulting in a total of 12 experimental units. The treatments given were as follows:

T0 = without using compost
T1 = using 10 tons/ha of compost fertilizer
T2 = using 20 tons/ha of compost fertilizer
T3 = using 30 tons/ha of compost fertilizer

The mathematical model used in the Randomized block design (RBD) is:

$$Yij = \mu + \tau i + \beta j + \mathcal{E}ij$$

Description:
I = 1,2,…,p
J = 1,2,…,k
Yij = observation on treatment-i repetition-j
μ = average response variable
Ti = effect of treatment-i
Bj = influence of group-j
Ɛij = error from treatment-i and group-j

Data analysis was conducted using Analysis of variance (ANOVA) to evaluate the effect of treatments on the observed parameters. The analysis was performed using IBM SPSS Statistics version 26. Before ANOVA, the data were tested for normality and homogeneity of variance to ensure were met. When the ANOVA results indicated significant differences among treatments ($P<0.05$), mean separation was further carried out using Duncan's multiple range test (DMRT) to identify differences between treatments.

Research Steps

The research stages consisted of compost production, land preparation, compost application, planting, plant maintenance, and harvesting.

Compost Fertilizer Production

Compost fertilizer out through several stages. First, all equipment was prepared and cleaned to ensure the production process ran properly. Then, palm fronds were chopped into small pieces using a chopper decomposition. After that, the materials were weighed according to the predetermined composition: 332 kg of palm fronds, 17 kg of rice bran, and 7 kg of feces.

A 10% (v/v) local microorganism (MOL) solution was prepared by diluting 6 L of MOL stock solution and 1 L of molasses as a carbon source in 54 L of water, resulting in a total volume of 61 L. This preparation method is based on a dilution approach commonly applied in microbial bioactivator formulations, where the microbial inoculum, combined with a carbohydrate substrate, constitutes approximately 10% of the final solution volume to stimulate microbial activity before field application (Avila et al., 2021). The solid materials, including palm fronds, rice bran, and feces, were mixed evenly with the MOL solution until the mixture became sufficiently moist. Subsequently, the mixture was covered with a tarp to maintain moisture and prevent contamination from external factors.

The fermentation process lasted 7 weeks until the compost reached maturity, characterized by a darker color, a neutral odor, and a loose texture.

Land Preparation

The land used was selected from an area that had never been cultivated. The preparation stages included weeding, soil loosening, and dividing the land into 36 plots measuring 3×3 m (9 m^2) with a distance of 50 cm between plots and 100 cm between rows.

Compost fertilizer was spread according to the treatment (9 kg, 18 kg, and 27 kg per plot), then left for 1 week before planting. This treatment was intended to allow the fertilizer to decompose and blend optimally.

Block 1	L2D3	L2D0	L2D1	L2D2	L1D0	L1D3	L1D1	L1D2	L3D2	L3D3	L3D1	L3D0
Block 2	L1D1	L1D2	L1D3	L1D0	L3D3	L3D1	L3D0	L3D2	L2D2	L2D1	L2D3	L2D0
Block 3	L3D1	L3D3	L3D0	L3D2	L2D3	L2D2	L2D1	L2D0	L1D0	L1D1	L1D3	L1D2

Figure 1. Map of the Pakchong grass research experimental field used in this study.

Description:

The experimental land had a total area of 4,700 cm × 1,100 cm, which was equivalent to 5,170,000 cm^2 or 517 m^2. Each plot was designed with a width a plot area of 900 cm^2. The distance between plants was set at 100 cm, while the spacing between the plants and the plot edges was maintained at 50 cm to ensure uniform growth conditions.

Furthermore, the distance between plots was arranged at 100 cm, and the plant spacing between adjacent plots was set at 200 cm to allow sufficient space for plant maintenance and observation activities. This layout was intended to optimize land use while facilitating crop management and data collection.

Compost Fertilizer Application

Compost fertilizer is applied once, before planting. The application method involves spreading the fertilizer on the soil surface and then mixing it evenly into the topsoil.

Preparation for Planting

The Pakchong grass seedlings used were healthy cuttings measuring 25 cm in length and having at least two nodes. The seedlings were planted on fertilized land at a 45° angle, with a planting distance of 50 × 50 cm. One node of the stem was inserted into the soil to promote better root growth.

Plant Maintenance was Conducted

Maintenance was carried out regularly, including watering during periods without rainfall, weeding, and tilling to improve soil structure. This maintenance aimed to maintain the availability of nutrients, water, and light for the plants, thereby allowing optimal growth to occur.

Harvesting was Conducted

The first harvest was conducted 50 days after planting to allow optimal initial vegetative growth. In comparison, the subsequent harvest was conducted 60 days after planting, allowing sufficient time for regrowth and biomass recovery after the first cutting. Harvesting was conducted by cutting the plants 15 cm above the ground to allow regrowth in the next period.

Observation Parameters were Observed

The parameters observed in this study included variables related to the vegetative growth of Pakchong grass, namely:

1. Plant height (cm)

Plant height was measured from the soil surface to the tip of the longest leaf on four representative plants per plot. Observations were conducted weekly from 21 days after planting through harvest. This measurement procedure follows standard manual plant phenotyping methods commonly used as reference measurements in agronomic and crop growth studies (Ma et al., 2023).

2. Number of offspring

The number of offspring was counted on the same four plant samples per plot. Observations were carried out weekly from 21 days after planting to assess vegetative branching development, following conventional agronomic growth assessment practices (Paturkar et al., 2022).

3. Leaf width (cm)

Leaf width was measured weekly on the widest part of a fully expanded leaf from four plant samples per plot, starting from 21 days after planting until harvest. This approach is consistent with standard leaf trait measurement protocols used as ground truth data in plant phenotyping research. (Ma et al., 2023).

4. Stem diameter (mm)

Stem diameter was measured on the largest stem of four plant samples per plot using a digital caliper. Measurements were taken weekly from 21 days after planting until harvest to monitor stem thickening, in accordance with commonly adopted manual measurement methods in crop growth and stem morphology studies. (Wang et al., 2023).

These parameters were used as indicators of Pakchong grass productivity as animal feed.

RESULTS AND DISCUSSION

Pakchong Grass Productivity with Different Compost Doses in the First Harvest

Organic compost derived from oil palm residues has been widely applied in forage production systems due to its potential to improve soil fertility and support vegetative growth through gradual nutrient release. In

Table 1. Average productivity of Pakchong grass with different compost doses on the first harvest productivity

Compost dosage (tons/ha)	Plant height (cm)	Leaf width (cm)	Stem diameter (mm)	Number of off-spring
T0 (Control)	326.89^{ns}	9.4^{ns}	48.18^{ns}	3^{ns}
T1	315.33^{ns}	10.1^{ns}	53.05^{ns}	3^{ns}
T2	312.33^{ns}	9.9^{ns}	54.13^{ns}	2^{ns}
T3	321.42^{ns}	10.2^{ns}	56.16^{ns}	2^{ns}

Note: Figures followed by the same letter indicate a non-significant difference based on the DMRT test at the 5% level (P>0.05). T0: without using compost; T1: using 10 tons/ha of compost fertilizer; T2: using 20 tons/ha of compost fertilizer; T3: using 30 tons/ha of compost fertilizer.

this study, the effects of oil palm leaf compost on the early growth performance of Pakchong grass at the first harvest are summarized in Table 1, which includes plant height, leaf width, stem diameter, and number of offspring as key vegetative indicators commonly used in agronomic evaluation (Santosa et al., 2025).

In the first harvest, the application of oil palm leaf compost did not significantly affect plant height or the number of offspring compared to the control treatment, indicating that nutrient mineralization from the compost remains limited during the early growth stage. Similar observations were reported by Santosa et al. (2025), who noted that organic fertilization often shows delayed effects on plant height due to slow nutrient release. Conversely, higher compost doses tended to increase leaf width and stem diameter, indicating improvements in nutrient availability and soil physical conditions, particularly related to potassium and phosphorus, which play crucial roles in cell expansion and stem structural development. A similar trend was reported by Farouk et al. (2024), who found that organic fertilization increased stem thickness and leaf development even though the effects on plant height were not immediately apparent.

The first harvest results showed that particularly plant height. The highest plant height was observed in the control treatment (T0), reaching 326.89 cm. At the same time, compost applications at 10, 20, and 30 tons/ha resulted in slightly lower plant heights of 315.33 cm, 312.33 cm, and 321.42 cm, respectively. These findings indicate that at the early harvest stage, compost application did not provide a clear growth advantage over the control treatment. This condition is likely related to the slow decomposition rate of palm leaf compost, which limits the direct availability of nutrients during early vegetative growth.

In contrast to plant height, leaf width at the first harvest increased gradually with increasing compost dosage. The widest leaves were recorded in the T3 treatment (10.2 cm), followed by T1 (10.1 cm), T2 (9.9 cm), and control (T0) at 9.4 cm. The observed pattern suggests that although the compost was not fully decomposed, the added organic matter began to release small amounts of nitrogen, increased photosynthetic capacity. This is consistent with findings by Zhang et al. (2023), who reported that the addition of organic fertilizer enhanced net photosynthetic rate and leaf area index by improving nutrient availability during early growth stages.

A clearer response to compost application was observed in the stem diameter. At the first harvest, stem diameter increased consistently with higher compost doses, with the largest diameter recorded in T3 (56.16 mm), followed by T2 (54.13 mm), T1 (53.05 mm), and T0 (48.18 mm). These results show that even in the early stages of growth, oil palm leaf compost improves stem structure development by providing essential nutrients, such as phosphorus (P) and potassium (K), that are more readily available to plants than without compost application, thereby increasing growth and nutrient uptake. Compost also improves soil structure and stimulates microbial activity, enabling K to contribute to various physiological functions, including cell division and expansion processes related to plant stem thickness and strength (Sulistijowati et al., 2024).

Despite improvements in several vegetative parameters, the number of offspring at the first harvest remained relatively low in all treatments. The control (T0) and T1 treatments each produced three offspring, whereas T2 and T3 produced only two offspring each. This limited shoot response indicates that the nutrients derived from oil palm leaf compost have not been fully mineralized and therefore cannot optimally support lateral shoot formation at this early stage. Overall, these results suggest that in the first harvest, oil palm leaf compost primarily affects structural growth rather than actively stimulating shoot development, with its full benefits expected to emerge in subsequent harvests.

Pakchong Grass Productivity with Different Compost Doses in the Second Harvest

The application of organic compost has been shown to generally improve soil properties and support the vegetative growth of forage crops by gradually releasing nutrients during decomposition. In this study, the growth response of Pakchong grass to oil palm leaf compost in the second harvest is summarized in Table 2, using plant height, leaf width, stem diameter, and number of offspring as indicators of plant adaptation to organic nutrient inputs (Zaghloul et al., 2024).

In the second harvest, higher compost application tended to increase leaf width and stem diameter, suggesting greater nutrient availability and improved structural development as the compost mineralization process progressed. Although plant height and number of offspring showed limited variation between treatments, this pattern suggests that organic compost primarily promotes stem thickening and leaf expansion rather than rapid vertical growth in later growth stages. A similar response was reported by Zaghloul et al. (2024), who observed an increase in vegetative traits after the application of organic matter, and by Junaidi et al. (2025), who found that compost significantly improved forage grass growth parameters after sufficient decomposition time.

In the second harvest, a significant increase in plant height was observed in all treatments, with the highest value recorded in T3 (620.7 cm), followed by T2 (604.27 cm), T1 (567.08 cm), and T0 (540.15 cm). This increase indicates that nutrient accumulation from the decomposition of palm oil leaf compost is becoming more optimal. According to Ariyanti et al. (2019) Palm oil leaf compost contains 34.8% C-organic, 0.98% N, 0.53% P_2O_5, and 0.28% K_2O, which play an important role in the formation of vegetative tissue. Nitrogen supports chlorophyll synthesis and stem elongation, while phosphorus promotes root development and cell division (Hidayat et al., 2022). These findings are consistent with Kolway et al. (2023), who reported an increase in optimal plant height at a compost dose of 25-30 tons/ha due to stable nutrient availability and better soil conditions.

Leaf width in the second harvest increased further, with the highest value observed in T2 (11.22 cm), followed by T3 (10.77 cm), T1 (10.83 cm), and T0 (9.22 cm). The increase in leaf width is closely greater nutrient availability, especially nitrogen, which stimulates mesophyll cell formation and expands the photosynthetic surface area (Siregar et al., 2024). Wider leaves increase light absorption and photosynthetic efficiency, increases biomass accumulation. These results are consistent with the findings of Muwakhid et al. (2021; Wangchuk et al., 2015), who reported that the Pakchong variety and other Napier hybrids showed increased leaf

Table 2. Average productivity of Pakchong grass with different compost doses at the second harvest

Compost dosage (tons/ha)	Plant height (cm)	Leaf width (cm)	Stem diameter (mm)	Number of off-spring
T0 (Control)	540.15^{ns}	9.22^{ns}	47.77^{ns}	4^{ns}
T1	567.08^{ns}	10.83^{ns}	52.96^{ns}	5^{ns}
T2	604.27^{ns}	11.22^{ns}	55.93^{ns}	5^{ns}
T3	620.70^{ns}	10.77^{ns}	57.42^{ns}	5^{ns}

Note: Figures followed by the same letter indicate a non-significant difference based on the DMRT test at the 5% level (P>0.05). T0: without using compost; T1: using 10 tons/ha of compost fertilizer; T2: using 20 tons/ha of compost fertilizer; T3: using 30 tons/ha of compost fertilizer width and productivity under conditions of high organic matter content.

During the second harvest, stem diameter values increased further, reaching 57.42 mm in T3, 55.93 mm in T2, 52.96 mm in T1, and 47.77 mm in T0. The increase in stem diameter reflects better lignin and cellulose formation, supported by the availability of potassium and phosphorus from coconut leaf compost. Potassium strengthens cell walls and regulates osmotic balance, while phosphorus supports the development of xylem and phloem tissues. (Harahap et al., 2020). These findings are consistent with Rizki Afandi et al. (2024), who reported similar increases in stem diameter with the application of organic fertilizer.

In contrast, the second harvest showed a clear increase in the number of offspring. All plots treated with compost (T1, T2, and T3) produced five tillers, while the control produced only four. This increase indicates that compost decomposition has become more complete, increasing the availability of nutrients, especially nitrogen and potassium, which play an important role in stimulating tiller formation (Gea et al., 2025). These results are in line with the research by Ferdiansyah et al. (2025), which reported an increase in Pakchong grass tiller formation at organic fertilizer rates up to 30 tons/ha, due to increased microbial activity and nutrient mineralization.

CONCLUSION

Although no statistically significant effect was observed, the application of oil palm compost tended to improve the vegetative growth of Pakchong grass at the second harvest.

ACKNOWLEDGMENTS

The author gratefully acknowledges the Animal Husbandry Study Program and all parties who supported this research. Special thanks are extended to the supervisor, Mrs. Neli Definiati, S.P., M.P., for her guidance and motivation. Appreciation is also given to the UPTD Livestock Breeding and Feed Unit of the Bengkulu Province Livestock and Animal Health Service for the facilities and assistance provided. It is hoped that this research will contribute to the development of sustainable agriculture and animal husbandry.

REFERENCES

Afandi, R., Syukri, & Iswahyudi. (2024). The effect of 16-16-16 NPK pearl fertilizer and chicken cage fertilizer dosage on the growth and production of mini elephant grass (*Pennisetum purpureum cv. Mott*). *Agrotechnology Journal*, 12(2), 14–20. https://doi.org/10.32734/ja.v12i2.15822

Ariyanti, M., Dewi, I. R., & Natali, G. (2019). Utilization of organic fertilizer made out of oil palm midrib in oil palm nursery. *International journal on advanced science, engineering and information technology*, 9(4), 1324-1329. https://doi.org/10.18517/ijaseit.9.4.8103

Bengkulu, B. P. S. P. (2024). Bengkulu province in figures 2024. Bengkulu: BPS Bengkulu Province. ISBN/ISSN: 0215-2002.

De Avila, G. M., Gabardo, G., Clock, D. C., & de Lima Junior, O. S. (2021). Use of efficient microorganisms in agriculture. *Research, Society and Development*, 10(8), 1-13. https://doi.org/10.33448/rsd-v10i8.17515

Definiati, N., Sahputra, A., & Setyowati, N. (2023). Weed availability as a ruminant forage source on coffee farmers' land in kandang village, Indonesia. *International journal of life science and agriculture research*, 02(07), 166-173. https://doi.org/10.55677/ijlsar/v02i07y2023-03

Farouk, A. S., Abdelghany, A. M., Shehab, A. A., Alwakel, S. E., Makled, K. M., Naif, E., Ren, H., & Lamlom, S. F. (2024). Optimizing wheat productivity through integrated management of irrigation, nutrition, and organic amendments. *BMC Plant Biology,* 24(1), 1-15. https://doi.org/10.1186/s12870-024-05213-2

Ferdiansyah, S., & Meriksa Sembiring. (2025). Response of organic fertilizer from several animal manures to the growth and production of Pakchong grass (*Pennisetum purpureum cv. Thailand*) as animal feed. *Journal of innovation research and knowledge*, 5(2), 1405-1416. https://doi.org/10.53625/jirk.v5i2.10610

Gea, I., Saragih, E. W., Lekitoo, M. N., & Djunaedi, M. (2025). The effect of fertilizer type on elephant grass (*Pennisetum purpureum*) productivity: A comparative study between goat manure compost, urea, and NPK on inceptisol soil. Agrisaintifika: *Journal of Agricultural Sciences,* 9(2), 430-438. https://doi.org/10.32585/ags.v9i2.6691

Harahap, F. S., Walida, H., Rahmaniah, R., Rauf, A., Hasibuan, R., & Nasution, A. P. (2020). The effect of empty oil palm fruit bunch and rice husk charcoal application on several chemical properties of soil in tomatoes. *Agrotechnology Research Journal,* 4(1), 1-5. https://doi.org/10.20961/agrotechresj.v4i1.41121

Hidayat, M. S., Hasibuan, A., Harahap, B., & Nasution, S. P. (2022). Utilization of empty oil palm fruit bunches as fertilizer material at pt karya hevea Indonesia. *Factory journal of industry, Management and Industrial Systems Engineering*, 1(2), 52–58. https://doi.org/10.56211/factory.v1i2.172

Junaidi, J., & Sembiring, M. (2025). Effect of compost dosage on the growth and yield of odot grass (*Pennisetum purpureum cv. Mott*). Agrivet: *Journal of Agricultural and Animal Sciences*, 13(1), 1-10. https://doi.org/10.31949/agrivet.v13i1.13784

Kolway, Y., Joris, L., & Eoh, M. (2023). Application of two types of manure on the initial growth of king grass (*penisetum purpuphoides*). *Journal of Biology Education and Application*, 10(1), 131-140. https://doi.org/10.30598/biopendixvol10issue1page131-140

Liman., Wijaya, A. K., Erwanto., Muhtarudin., Septianingsih, C., Asidiq, T., Nur, T., & Adhianto, K. (2022). Productivity and quality of pakchong-1 hybrid grass (*Pennisetum purpureum × Pennisetum americanum*) at different harvesting ages and fertilizer levels. *Pakistan Journal of Biological Sciences*, 25(5), 426–432. https://doi.org/10.3923/pjbs.2022.426.432

Ma, Y., Zhang, Y., Jin, X., Li, X., Wang, H., & Qi, C. (2023). A visual method of hydroponic lettuces height and leaves expansion size measurement for intelligent harvesting. *Agronomy*, 13(8), 1-12. https://doi.org/10.3390/agronomy13081996

Ministry of Agriculture of the Republic of Indonesia. (2022). Statistics on national leading plantations 2020-2022. Directorate General of Plantations, Ministry of Agriculture of the Republic of Indonesia. Retrieved from https://ditjenbun.pertanian.go.id/template/uploads/2022/08/STATISTIK_UNGGULAN-2020-2022.pdf

Muwakhid, B., & Ali, U. (2021). The effect of using “organic” leaf fertilizer on the productivity and quality of elephant grass (*Pennisetum purpureum CV. Hawai*) as forage. *Livestock and Animal Research*, 19(1), 21–31. https://doi.org/10.20961/lar. v19i1.41092

Ningsih, W. U., Syafria, H., & Akmal, A. (2022). Effectiveness of palm frond compost fertilizer on crude protein, crude fiber, and ash content of Kumpai grass (*Hymenachne amplexicaulis*). *Indonesian Journal of Animal Science*, 24(2), 137–142. https://doi.org/10.25077/jpi.24.2.137-142.2022

Paturkar, P., Ghosh, S., Bandyopadhyay, S., & Chaudhuri, S. (2022). Ground-truth based evaluation of plant phenotyping traits using manual measurements. *Plant Methods,* 18(1), 1-15. https://doi.org/10.1186/s13007-022-00889-9

Prihantoro, I., Karti, P. D. M. H., & Siregar, F. M. (2024). Strategies to improve land fertility through optimization of organic fertilizer to enhance the productivity of *Indigofera zollingeriana* at field scale. *Journal of Nutrition Science and Feed Technology*, 22(3), 151–158. https://doi.org/10.29244/jintp.22.3.151-158

Ramon, E., Efendi, Z., Kusnadi, H., Yuliasari, S., Ishak, A., & Wulandari, W. A. (2022). Utilization of oil palm waste as animal feed for Bali cattle in Margomulyo village, central Bengkulu. IOP Conference Series: *Earth and Environmental Science*, 1041(1), 1–6. https://doi.org/10.1088/1755-1315/1041/1/012057

Santosa, B., Amri, M., Metri, Y., & Sari, D. R. (2025). Effect of several types of compost on the growth and yield of rice. *Agrotechnology Research Journal*, 9(1), 37–41. https://doi.org/10.20961/agrotechresj.v9i1.102113

Septian, M. H., & Abdillah, M. (2022).

Contemporary potential forage crops for ruminants (contemporary forage for ruminants). *Journal of Livestock Science and Production*, 6(2), 462–473. https://doi.org/10.31002/jalspro.v6i2.6756

Silalahi, A. M., Syah, R. F., & Hastuti, P. B. (2023). Optimization of composting time from palm fronds and empty fruit bunches of palm oil (*Elaeis guineensis Jacq*) with various bioactivators. *Jurnal Agronomi Tanaman Tropika* (JUATIKA), 5(1), 218–231. https://doi.org/10.36378/juatika.v5i1.2665

Siswoyo, P., Kurniawan, M. A., & Luthfi, M. F. (2023). Analysis of the productivity of purple fountain grass (*Pennisetum purpureum cv. Mott*) as goat feed. *Livestock Stock*, 5(1), 44-50. https://doi.org/10.36355/sptr.v5i1.995

Suherman, D., & Herdiawan, I. (2021). Characteristics, productivity, and utilization of hybrid elephant grass (*Pennisetum purpureum cv. Thailand*) as livestock feed. Maduranch: *Journal of Animal Science*, 6(1), 37-44. https://doi.org/10.53712/maduranch.v6i1.1071

Sulistijowati, R., Habie, D. A., Nento, W. R., & Peleh, E. I. (2024). Increase in nitrogen, phosphorus, and potassium of liquid fertilizer from fish canning waste and kepok banana peel (*Musa paradisiaca L.*). DEPIK: *Jurnal Ilmu-Ilmu Perairan, Pesisir dan Perikanan*, 13(3), 447-454. https://doi.org/10.13170/depik.13.3.39583

Wang, Y., Liu, H., Zhang, X., Li, Z., & Chen, D. (2023). Automatic stem diameter measurement validated using manual caliper-based methods. *Plant Methods*, 19(1), 68, 1-16. https://doi.org/10.1186/s13007-023-01045-7

Wangchuk, K., Rai, K., Nirola, H., Thukten, Dendup, C., & Mongar, D. (2015). Forage growth, yield and quality responses of napier hybrid grass cultivars to three cutting intervals in the himalayan foothills. *Tropical Grasslands-Forrajes Tropicales,* 3(3), 142–150. https://doi.org/10.17138/TGFT(3)142-150

Wati, D. S., Nursilawati, & Purwita, R. (2024). Literature review: Developing the potential of palm oil waste as a renewable energy source through hydrolysis to welcome to golden Indonesia 2045. CHEDS: *Journal of Chemistry, Education, and Science*, 8(2), 197–202. https://doi.org/10.30743/cheds.v8i2.10053

Zaghloul, E. A. M., Awad, E. S. A., Mohamed, I. R., El-Hameed, A. M. A., Feng, D., Desoky, E. S. M., Algopishi, U. B., Al Masoudi, L. M., Elrys, A. S., Mathew, B. T., AbuQamar, S. F., & El-Tarabily, K. A. (2024). Co-application of organic amendments and natural biostimulants on plants enhances wheat production and defense system under salt-alkali stress. *Scientific Reports,* 14(1), 1-15. https://doi.org/10.1038/s41598-024-77651-9

Zhang, G., Liu, X., Wang, Y., Li, C., & Chen, H. (2023). Effect of reducing nitrogen fertilization and adding organic fertilizer on net photosynthetic rate, root nodules, and yield in peanut. *Plants*, 12(16), 1-15. https://doi.org/10.3390/plants12162902