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The Effect of Solid Organic Fertilizer Application on the Growth of Bede Grass (*Brachiaria decumbens*)

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Abstract
Bede grass (Brachiaria decumbens) is a high-quality forage plant commonly used as green fodder due to its favorable growth characteristics, biomass production, and nutritional value. This study aimed to evaluate the effect of solid organic fertilizer application and different fertilizer doses on the growth and production of Bede grass. The experiment was conducted using a randomized block design with five treatments and three replications. The treatments consisted of P0 (without solid organic fertilizer), P1 (10 tons/ha), P2 (20 tons/ha), P3 (30 tons/ha), and P4 (40 tons/ha) of solid organic fertilizer. The results showed that the application of solid organic fertilizer had no significant effect (P>0.05) on most growth and production parameters of Brachiaria decumbens, except for fresh leaf yield, which was significantly affected (P<0.05). These findings indicate that the application of solid organic fertilizer at different doses did not significantly influence vegetative growth. However, the application rate of 30 tons/ha tended to produce better growth and yield compared to other treatments, although the differences were not statistically significant. Further research is recommended to consider environmental factors such as soil properties and light intensity to better understand the response of Brachiaria decumbens to solid organic fertilizer. The use of a 30 tons/ha fertilizer dose may be considered due to its tendency to provide optimal results.

Keyword: G*rowth; Solid Organic Fertilize; Bede Grass (Brachiaria decumbens)*

1. Introduction

Bede grass (*Brachiaria decumbens*) is a genus of tropical pasture grass with more than 100 species. Among these species, several have superior characteristics as livestock feed, such as high biomass production, abundant nutritional value, drought tolerance, and wide adaptation to tropical climates. The advantages of this grass are its high productivity and high nutritional quality. Most farmers in Indonesia face limited access to fresh feed as their main source of feed. Farmers are forced to provide the minimum amount of feed available in their area, resulting in suboptimal feed. Although this is a practical solution, it neglects the nutritional aspects of livestock feed that can affect livestock conditions. Ruminants such as cattle, buffalo, goats, and sheep rely on feed as their main source of nutrition. This food is not only filling but also rich in essential nutrients such as protein, energy, vitamins, and minerals. Nutritious feed plays an important role in providing economically beneficial feed for livestock and increasing productivity. Bede grass (*Brachiaria decumbens*) has great potential to be developed and managed as a source of forage for livestock, due to its complete nutritional content [1].

Bede grass (*Brachiaria decumbens*) has good nutritional composition, making it an excellent choice for providing quality livestock feed. Bede grass (*Brachiaria decumbens*) has a moisture content of 11.00%, ash 13.50%, crude protein 11.50%, crude fiber 46.00%, crude fat 2.80%, BETN 34.20%, and TDN 43.00% [2]. The high protein content in *Brachiaria decumbens* grass makes it a good feed source for livestock, especially when compared to other grasses such as Pennisetum purpureum, which has a protein content of 9.50% [3].

In their study, [4] stated that under optimal conditions, *Brachiaria decumbens* can produce around 95-135 tons of fresh material per hectare per year or around 20-27 tons of dry material. Rumpur Bede (*Brachiaria decumbens*) can also produce fresh weight of around 12 to 25 tons per hectare per year under optimal growing conditions and proper nitrogen fertilization. This study shows that consistent nitrogen application can increase biomass growth in *Brachiaria decumbens*, thereby providing higher fresh yields. Stable production of this grass is very important in meeting livestock feed requirements in tropical regions, especially since *Brachiaria decumbens* is well adapted to the tropical climate and has a high biomass production capacity [5].

Plant growth is influenced by various factors, one of which is environmental factors, such as light, humidity, temperature, and nutrient availability, which have a significant effect on plant growth. According to [6], plants need light for photosynthesis, while water and nutrient availability are very important to support optimal metabolism and growth. Understanding the plant growth process is very important in the context of agriculture. With in-depth knowledge of the factors that influence growth, farmers can implement more effective cultivation practices to increase the yield and quality of agricultural products. For example, proper fertilization techniques can increase nutrient availability, thereby supporting optimal plant growth [7]. Plant growth occurs through several mechanisms, including cell division in plants, which takes place in meristematic regions, such as root tips and buds, where the formation of new cells occurs actively. According to [8], this cell division is very important in the early stages of plant growth, as it determines the capacity and rate of growth that will be achieved during the plant's life cycle. After division, new cells undergo expansion. This process involves the absorption of water and nutrients, which causes the cells to enlarge and increase the volume of the tissue [9]. The enlarged cells will differentiate into various types of tissue, including leaf, stem, and root tissue. This differentiation is necessary for the formation of functional organs in plants [9].

Fertilization is one of the important factors that affect crop productivity, one of which is solid organic fertilizer. Solid organic fertilizer is an organic fertilizer formulation made by compacting organic materials, such as livestock manure (cattle, chicken, goat, and duck) and household waste. Research by [10] shows that organic fertilizer contains the macro nutrients N, P, and K, but also contains micro nutrients in amounts that are important for plant growth. Organic fertilizer can be applied to the soil in the same way as chemical fertilizer. The addition of organic fertilizer can reduce the negative impact of chemical fertilizers while improving the physical, biological, and chemical properties of the soil. This solid fertilizer is called Lemeksari, which is made from livestock manure (cattle, chickens, goats, and ducks), household waste, charcoal husks, molasses, and fermenters. The advantage of organic fertilizer is that it can improve soil quality by adding organic matter that decomposes slowly, so that soil fertility can be maintained over a long period of time [11]. Fertilizer application to the soil aims to increase and/or maintain the inorganic fertility of the soil. Soil fertility is assessed based on the availability of nutrients, both macro and micro. [12] stated that one way to increase soil fertility is through the use of biological waste that is recycled into organic fertilizer. This process involves decomposer microorganisms, such as bacteria and fungi, which play a role in breaking down organic matter into nutrients that can be absorbed by plants. [13] state that the process of breaking down organic matter into organic fertilizer can occur naturally or artificially, both of which contribute significantly to soil fertility and the sustainability of agricultural systems. The application of solid organic fertilizer has been proven to have a positive impact on the growth of *Brachiaria decumbens*. Research by [14] shows that nitrogen fertilization with an optimal dose of 130-170 kg N/ha/year can increase the biomass production of *Brachiaria decumbens* by up to 33%. In addition, the addition of solid organic fertilizers, such as compost or manure, helps improve soil fertility and provides essential nutrients needed for optimal growth of *Brachiaria decumbens* [15]. Besides enhancing growth, organic fertilization also affects the nutritional content of *Brachiaria decumbens*. Research by [16] found that this grass contains 7-11% crude protein, 32-36% crude fiber, and 53-58% total digestible nutrients (TDN), which can be increased through proper organic fertilization. With proper fertilization management, the productivity and nutritional quality of *Brachiaria decumbens* can be optimized, making it a highly valuable source of livestock feed [17].

The application of solid organic fertilizer has a positive effect on the growth of *Brachiaria decumbens* grass, with a significant increase in plant height and number of leaves produced [18] According to [19], the application of 30 tons/ha of solid organic fertilizer has been proven to have a positive effect on the growth of *Brachiaria decumbens* grass, as seen from the increase in biomass and resistance to drought.

Based on the above description, the objectives of this study are to determine the effect of solid organic fertilizer application on the growth of *Brachiaria decumbens* grass and to determine the effect of solid organic fertilizer application at different doses on the growth of *Brachiaria decumbens* grass.

2. Materials and Methods

Research Time and Place

This research was conducted over a period of two months, from October 9, 2024 to December 9, 2024, at Jln Sedap Malam, Banjar Kebon Kori Kelod, Gang Melati No.15, Kelurahan Denpasar Timur, Bali Province, on a 60 m² plot of land owned by a local resident.

Experimental Design

The design used was RAK with 5 treatments and 3 replicates. The treatments used were P0 = Grass without solid organic fertilizer, P1 = Grass with 10 tons/ha of solid organic fertilizer, P2 = Grass with 20 tons/ha of solid organic fertilizer, P3 = Grass with 30 tons/ha of solid organic fertilizer, P4 = Grass with 40 tons/ha of solid organic fertilizer. There were a total of 15 experimental units planted with 6 grass seedlings per unit, resulting in a total of 90 grass seedlings. The experimental design of this study can be described as follows:

Figure 1. Treatment Plot Plan

Research Materials and Tools

The seeds used were *Brachiaria decumbens* grass seeds sourced from the Denpasar Superior Livestock and Forage Seedling Center (BPTU-HPT), located in Pangyangan Village, Pekutatan District, Jembrana Regency, Bali. These seeds were obtained in the form of seedlings, which were already available at the center.

The fertilizer used in this study was solid organic fertilizer (lemeksari) from a fertilizer manufacturing company located in Klungkung. The solid organic fertilizer called lemeksari is made from cow manure, chicken or duck manure, burnt husks, decomposed leaf litter, molasses, and EM4, which can be produced from fruit waste around the fertilizer processing site using Eco-enzime. The use of solid organic fertilizer is beneficial for long-term soil fertility and produces safe products for health. The materials used in its production are easily obtainable. It is also sold at an affordable price of Rp 1,200.00/kg.

The land was first cleared of weeds using a sickle. Once cleared, the land was plowed to loosen the soil and make it easier to divide into plots. The plowed land was left for 1 week before being divided into 15 plots using a hoe, and each plot was planted with 6 grasses that had been provided. Each plot measures 1.2 m² x 1.8 m², with a distance of 50 cm between groups/plots and a distance

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of 60 cm between plants. The water used in this study came from two sources: first, from a borehole at the research site, and second, from natural sources (rainwater).

The tools used in this study were sickles, used to clear the land and cut grass; hoes, used to loosen the soil manually and to make plots for planting grass; buckets, used to carry water for watering and fertilizing the grass; and dippers and jugs, used to pour water onto the plants. A squat scale was used to weigh fertilizer, and a digital scale with a capacity of 15 kg and a sensitivity of 5 g was used to weigh grass production after cutting. A measuring tape was used to measure land area and plant height. Plastic is used to roll up the grass that has been cut in one plot so that it does not mix with other plots, raffia rope is used to tie the grass that has been rolled up with plastic, writing instruments are used to code the grass that has been tied and to record the weight of fresh and dry materials, and a camera is used to document activities during the research.

Research Implementation

Prepare plots measuring 1.2 m² x 1.8 m² with a distance of 50 cm between groups or plots. The fertilizer used in this study was solid organic fertilizer (lemeksari) with different amounts in each unit or experimental plot. To determine how much fertilizer will be used in this study, the calculation is as follows:

P0 = Grass without solid organic fertilizer (lemeksari)

P1 = Grass with 10 tons/ha of solid organic fertilizer, with a plot area of 1.2 m² x 1.8 m²
= 2.16 m², so the fertilizer for treatment P1
= (plot area : area of 1 hectare) x 10 tons
= (2.16 m² : 10,000 m²) x 10,000 kg
= 0.000216 x 10,000 kg
= 2.16 kg x 3 plots
= 6.48 kg

Therefore, for treatment P1, 6.48 kg of fertilizer is used.

P2= Grass with 20 tons/ha of solid organic fertilizer application
= (2.16 m² : 10,000 m²) x 20,000 kg
= 0.000216 x 20,000 kg
= 4.32 kg x 3 plots
= 12.96 kg

Therefore, for treatment P2, 12.96 kg of fertilizer was used.

P3 = Grass with 30 tons/ha of solid organic fertilizer application
= (2.16 m² : 10,000 m²) x 30,000 kg
= 0.000216 x 30,000 kg
= 6.48 kg x 3 plots
= 19.44 kg

So, for treatment P3, 19.44 kg of fertilizer was used.

P4 = Grass with 40 tons/ha of solid organic fertilizer
= (2.16 m² : 10,000 m²) x 40,000 kg
= 0.000216 x 40,000 kg
= 8.64 kg x 3 plots
= 25.92 kg

So, for the P3 treatment, 25.92 kg of fertilizer was used.

Therefore, the total amount of solid organic fertilizer (lemeksari) used in this study is as follows:

= P0 + P1 + P2 + P3 + P4
= 0 + 6.48 kg + 12.96 kg + 19.44 kg + 25.92 kg = 64.8 kg

Planting

The selected seeds are then planted in prepared plots at a depth of one finger in the soil. Six grasses of the same type are planted in each plot. There are 15 plots, so a total of 90 grasses must be planted at a distance of 60 cm x 60 cm and 30 cm from the edge of the plot.

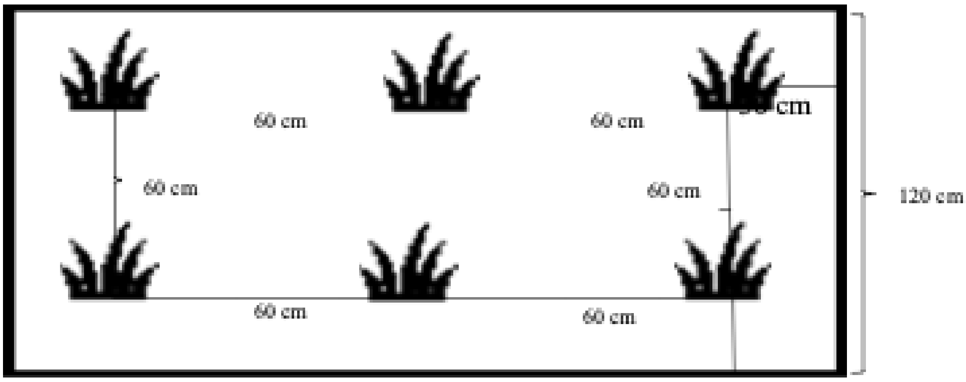

Figure 2. Planting Distance for Research Grass

Plant Maintenance

Proper maintenance and management are necessary to achieve high production capacity. Plant care is carried out from sowing grass seeds to cutting the grass. Plant maintenance includes watering twice a day, in the morning and afternoon, and weeding during the plant growth period. Weeding is done by pulling out weeds by hand and with a sickle, and is done carefully so as not to damage the grass plants.

Cutting

Before mowing, measurements are taken, such as plant height, number of shoots, and number of leaves. Mowing is done when the grass is 60 days old after planting, followed by weighing the mowed grass for each treatment to determine its wet weight. This is followed by a drying process using a 70°C dry oven, and after drying, the grass is weighed again to determine its dry weight.

Observed Variables

The variables observed in this study are as follows:

1. Plant Height (cm); Plant height observations were conducted to determine plant growth, using randomly selected grasses marked with yellow, green, and red ribbons. Measurements began when the grass was 2 weeks old after planting and were then taken once a week until the predetermined cutting age. Grass height was measured using a tape measure from the ground surface to the last leaf branch.
2. Number of Leaves (pieces); Observations were made by counting the number of green leaves that had fully opened on the grass marked with tape. Observations were made once a week until the predetermined cutting age, starting when the plants were 2 weeks old after planting.
3. Number of tillers (stems/clumps); The number of tillers (stems) was observed by counting the tillers on the parent plant. The tillers included in the calculation were those that had produced fully open leaves.
4. Fresh Weight Production (Fresh Weigh) tons/ha;
5. Total fresh weight production (Fresh Weigh) is obtained by weighing all grass plants per plot after cutting using digital scales. After that, the fresh weight is converted to tons per hectare (tons/ha) using the following formula :
    a. = x fresh weight/plot
6. Stem Dry Weight and Dry Weight of Leaves tons/ha;
   Dry matter production is obtained from the fresh matter production of elephant grass after weighing and taking a sample of ± 1 kg of grass, followed by separation of the stems and leaves. After that, the stems and leaves are chopped to speed up the drying

process. Drying is carried out in the sun and then in an oven until dry, then weighed for dry weight. To obtain dry weight production, it can be formulated as follows:

DM/DW =
Description:
c = Dish + sample oven 105º C
b = Weight of dish oven 105º C
a = Weight of sample
Then the dry weight of the sample is converted to dry weight per plot and per hectare using the following formula:

$$\text{Dry weight/plot} = \frac{Total\ weight/plot}{sample\ weight}\ x\ dry\ weight\ of\ sample$$

$$\text{Dry weight/ha} = \frac{Area/ha}{Area/plot}\ x\ dry\ weight\ of\ plot$$

Data Analysis

The data obtained from the research results were analyzed using analysis of variance. If there were significant differences ($P < 0.05$) between treatments, Duncan's multiple range test was performed [20].

3. Results and Discussion

Research Results

The results of statistical analysis of the effect of solid organic fertilizer application on the growth of Bede grass (*Brachiaria decumbens*), including plant height, number of leaves, number of tillers, and yield, are shown in Table 1 below.

Table 1. Effect of Solid Organic Fertilizer Application on the Growth and Yield of *Brachiaria Decumbens* Grass

Observation Variables	Treatment					SEM
	P0	P1	P2	P3	P4	
Plant Height (cm)	169.34 a	170.64 a	180.62 a	168.40 a	165.30 a	3.53
Number of Leaves (pieces)	112.50 a	112.78 a	103.50 a	123.22 a	95.44 a	4.89
Number of Shoots (stems)	22.50 a	22.55 a	20.45 a	24.42 a	18.83 a	1.04
Fresh Weight Production (tons/ha)	70.22 a	72.53 a	87.19 a	102.62 a	79.48 a	4.72
Fresh Leaf Weight Production (tons/ha)	20.71 b	22.70 b	28.27 b	37.83 a	24.28 b	1.54
Fresh Stem Weight Production (tons/ha)	49.51 a	49.83 a	58.92 a	64.80 a	55.20 a	3.53
Dry Weight Production (tons/ha)	11.05 a	10.72 a	12.42 a	13.53 a	10.46 a	0.90
Dry Leaf Weight Production (tons/ha)	3.20 a	2.90 a	3.46 a	4.13 a	3.03 a	0.21
Dry Stem Weight Production (tons/ha)	7.85 a	7.82 a	8.96 a	9.39 a	7.42 a	0.69

Description:
1. Average values followed by the same letter in the same row indicate no significant effect in the Duncan 5% test ($P>0.05$).
2. SEM (Standard Error of The Treatment Means).
3. P0 = Grass without solid organic fertilizer application
   P1 = Grass with 10 tons/ha of solid organic fertilizer application
   P2 = Grass with 20 tons/ha of solid organic fertilizer application
   P3 = Grass with 30 tons/ha of solid organic fertilizer application
   P4 = Grass with 40 tons/ha of solid organic fertilizer application

a. Plant Height (cm)

The results of the analysis in Table 4.1 above show that the application of solid organic fertilizer had no significant effect (P>0.05) on the height of *Brachiaria decumbens* grass. The highest plant height was found in treatment P2 with a plant height of 180.62 cm, followed by P1 with a plant height of 170.64 cm, P0 with a plant height of 169.34 cm, P3 with a plant height of 168.40 cm, and the lowest was P4 with a plant height of 165.30 cm.

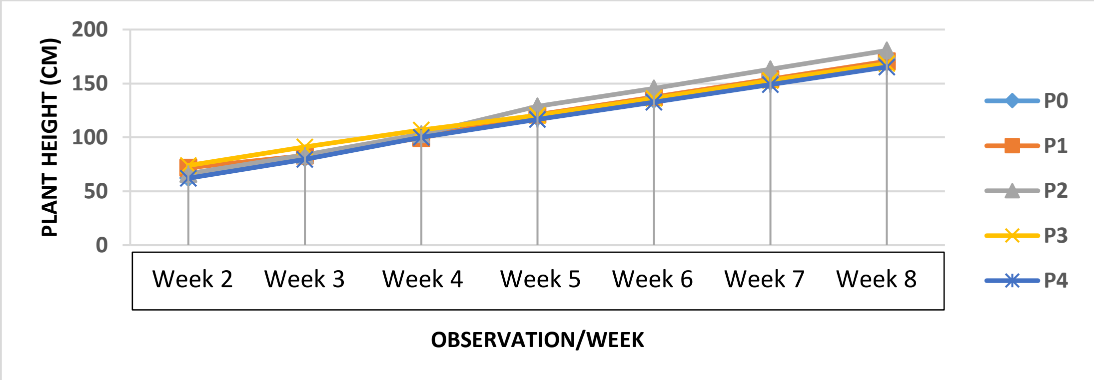

Figure 3. Effect of Solid Organic Fertilizer Application on the Height of *Brachiaria decumbens* Grass Plants

b. Number of Leaves (pieces)

The results of the analysis in Table 4.1 above show that the application of solid organic fertilizer had no significant effect (P>0.05) on the number of leaves of *Brachiaria decumbens* grass. The highest number of leaves was found in treatment P3 with 123.22 leaves, followed by treatment P1 with 112.78 leaves, P0 with 112.50 leaves, P2 with 103.50 leaves, and the lowest number of leaves was found in treatment P4 with 95.44 leaves.

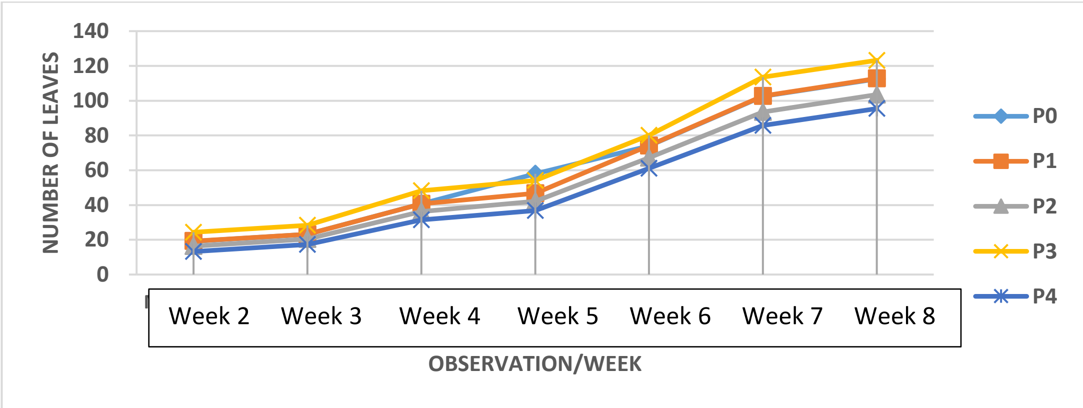

Figure 4. Effect of Solid Organic Fertilizer Application on the Number of Leaves of *Brachiaria decumbens* Grass

c. Number of Offshoots (stems)

The results of the analysis in Table 3.1 above show that the application of solid organic fertilizer had no significant effect (P>0.05) on the number of tillers of *Brachiaria decumbens* grass. The highest number of tillers was found in treatment P3 with 24.42 stems, followed by treatment P1 with 22.55 stems, P0 with 22.50 tillers, P2 with 20.45 tillers, and the lowest number of tillers was found in treatment P4 with 18.83 tillers.

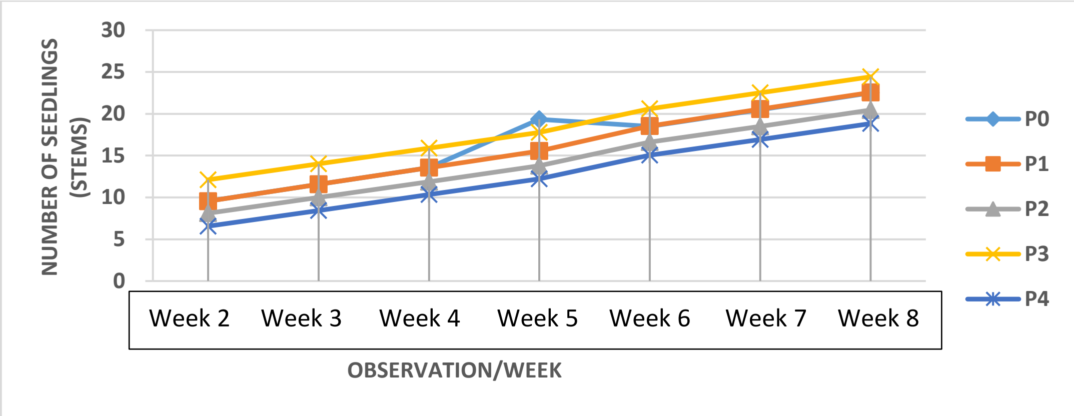

Figure 5. Effect of Solid Organic Fertilizer Application on the Number of *Brachiaria decumbens* Grass Seedlings

d. Fresh Weight Production (Fresh Weight) tons/ha

The results of the analysis in Table 3.1 above show that the application of solid organic fertilizer had no significant effect (P>0.05) on the fresh weight production of *Brachiaria decumbens* grass. The highest fresh weight production of *Brachiaria decumbens* grass was found in treatment P3 with a production amount of 102.62 tons/ha, followed by treatment P2 with a production amount of 87.19 tons/ha, P4 with a production amount of 79.84 tons/ha, P1 with a production amount of 72.53 tons/ha, and the lowest fresh weight production was found in treatment P0 with a production amount of 70.22 tons/ha.

e. Fresh Weight of Leaves (ton/ha)

The results of the analysis in Table 4.1 above show that the application of solid organic fertilizer had a significant effect (P<0.05) on the fresh weight of leaves of *Brachiaria decumbens* grass. The highest fresh weight of leaves of *Brachiaria decumbens* grass was found in treatment P3 with a production amount of 37.83 tons/ha, followed by treatment P2 with a production amount of 28.27 tons/ha, P4 with a production amount of 24.28 tons/ha, P1 with a production amount of 22.70 tons/ha, and the lowest fresh weight production of leaves was found in treatment P0 with a production amount of 20.71 tons/ha.

f. Fresh Stem Weight (Fresh Weight of Stem) tons/ha

The results of the analysis in Table 4.1 above show that the application of solid organic fertilizer had no significant effect (P>0.05) on the fresh stem weight of *Brachiaria decumbens* grass. The highest fresh stem weight production of *Brachiaria decumbens* grass was found in treatment P3 with a production amount of 64.80 tons/ha, followed by treatment P2 with a production amount of 58.92 tons/ha, P4 with a production amount of 55.20 tons/ha, P1 with a production amount of 49.83 tons/ha, and the lowest fresh leaf weight production was found in treatment P0 with a production amount of 49.51 tons/ha.

g. Dry Weight Production (Dry Weight) tons/ha

The results of the analysis in Table 4.1 above show that the application of solid organic fertilizer had no significant effect (P>0.05) on the dry weight production of *Brachiaria decumbens* grass. The highest dry weight production of *Brachiaria decumbens* grass was found in treatment P3 with a production amount of 13.53 tons/ha, followed by treatment P2 with a production amount of 12.42 tons/ha, P0 with a production amount of 11.05 tons/ha, P1 with a production amount of 10.72 tons/ha, and the lowest fresh weight production was found in treatment P4 with a production amount of 10.46 tons/ha.

h. Dry Weight of Leaves ton/ha

The results of the analysis in Table 4.1 above show that the application of solid organic fertilizer had no significant effect (P>0.05) on the dry weight production of *Brachiaria decumbens* grass leaves. The highest dry weight production of *Brachiaria decumbens* grass leaves was found in treatment P3 with a production amount of 4.13 tons/ha, followed by treatment P2 with a production amount of 3.46 tons/ha, P0 with a production amount of 3.20 tons/ha, P4 with a production amount of 3.03 tons/ha, and the lowest fresh leaf weight production was found in treatment P1 with a production amount of 2.90 tons/ha.

i. Dry Weight of Stem (ton/ha)

The results of the analysis in Table 4.1 above show that the application of solid organic fertilizer had no significant effect (P>0.05) on the dry weight of stems of *Brachiaria decumbens* grass. The highest dry weight of stems of *Brachiaria decumbens* grass was found in treatment P3, with a production amount of 9.39 tons/ha, followed by treatment P2 with a production amount of 8.96 tons/ha, P0 with a production amount of 7.85 tons/ha, P1 with a production amount of 7.82 tons/ha, and the lowest fresh leaf weight production was found in treatment P4 with a production amount of 7.42 tons/ha.

Discussion

Based on the analysis of the research results, it shows that the application of solid organic fertilizer has no significant effect (P>0.05) on the height of *Brachiaria decumbens* grass plants. The highest plant height was obtained in treatment P2 with a fertilizer dose (20 tons/ha) of 180.62 cm, followed by P1 (170.64 cm), P0 (169.34 cm), P3 (168.40 cm), and the lowest in P4 (165.30 cm). These results are still within the normal range as stated by [21] the height of *Brachiaria decumbens* grass can reach 80 cm to 2 m. Explained by [21], who stated that plant height is a parameter that is sensitive to environmental factors, especially light. In addition to light, there are several other factors that may have influenced the results of this study, including the availability of nutrients in the soil, which may have been sufficient so that additional fertilizer did not have a significant impact, nutrient absorption efficiency by plants is influenced by soil structure and microorganism activity, as well as the gradual release of nutrients from organic fertilizers, which may not have been optimal during the research period. In addition, environmental temperature and humidity also play a role in plant physiological processes, while genetic factors can limit plant height growth even when a certain amount of fertilizer is applied. The low plant height growth in some treatments may also be due to suboptimal photosynthetic capacity and nutrient uptake from the soil. Thus, the results of this study indicate that the plant height growth of *Brachiaria decumbens* is not only influenced by fertilization but also by various environmental, soil, and plant characteristics.

The results of the analysis show that the application of solid organic fertilizer had no significant effect (P>0.05) on the number of leaves of *Brachiaria decumbens* grass plants. The highest number of leaves was found in treatment P3 with a fertilizer dose of 30 tons/ha, producing 123.22 leaves, while the lowest was found in treatment P4 with a fertilizer dose of 40 tons/ha, producing 95.44 leaves. This result is higher than the findings of [22], who stated that *Brachiaria decumbens* plants fertilized with nitrogen can produce around 50-70 leaves per clump under ideal growing conditions. The higher number of leaves in P3 can be attributed to the opinion of [23], who stated that the number of leaves is influenced by cutting height and nutrient availability.

Although not significantly influential, variations in the number of leaves indicate the plant's response to different types of organic fertilizers. One factor that may play a role is the availability of nutrients in the soil, which is already sufficient, so that additional fertilizer does not provide a significant increase. In addition, the gradual release of nutrients from organic fertilizers may also affect their short-term effectiveness. Environmental factors such as light intensity and soil conditions may also contribute to differences in the number of leaves, although not dominantly. Thus, the results of this study indicate that the number of leaves of *Brachiaria decumbens* is not only influenced by organic fertilization, but also by other factors that play a role in plant growth. Based on the results of the study, it was found that the application of solid organic fertilizer had no significant effect (P>0.05) on the number of tillers of *Brachiaria decumbens* grass. The highest number of tillers was obtained in treatment P3 with a fertilizer dose of 30 tons/ha, producing 24.42 tillers, while the lowest number was found in treatment P4 with a fertilizer dose of 40 tons/ha, producing 18.83 tillers. These results are slightly lower than those reported by [24], who stated that the ideal number of tillers for *Brachiaria decumbens* ranges from 25 to 35 tillers per clump under optimal growth conditions.

These differences may be due to variations in environmental conditions and cultivation techniques. Nevertheless, the number of tillers produced is still sufficient to support efficient land cover and biomass productivity. According to [25], *Brachiaria decumbens* grass has the potential to be developed as a source of forage for livestock due to its resistance to various conditions. This adaptability may influence tiller formation, whereby plants can continue to produce sufficient numbers of tillers even without intensive fertilization. Several other factors may also influence the results of this study, including the availability of nutrients in the soil, which may already be sufficient, so that the addition of organic fertilizer does not have a significant impact on the number of tillers.

In addition, the gradual release of nutrients from organic fertilizers may not meet the needs of plants during the vegetative growth period. Environmental factors such as light intensity, temperature, and humidity can also affect tillering, especially since this plant is known to have a high adaptability to various environmental conditions. [26] also mention that this genus is widely distributed in various tropical and subtropical regions, demonstrating its high adaptability. This adaptability may enable the plant to maintain relatively stable tiller production even with different fertilization inputs. Thus, the results of this study indicate that the number *of Brachiaria decumbens* tillers is not only influenced by organic fertilization, but also by plant adaptation factors and environmental conditions that play a role in supporting its vegetative growth.

The results of the analysis show that the application of solid organic fertilizer had no significant effect (P>0.05) on the fresh weight production of *Brachiaria decumbens* grass. The highest fresh weight production was found in treatment P3 with a fertilizer dose of 30 tons/ha, producing 102.62 tons/ha of fresh weight, followed by P2 (87.19 tons/ha) , P4 (79.48 tons/ha), P1 (72.53 tons/ha), and the lowest in P0 (70.22 tons/ha). The higher fresh weight production in P3 indicates that a solid organic fertilizer dose of 30 tons/ha can support maximum vegetative growth of plants. This study is in line with the statement by [27], which states that the application of 30 tons/ha of solid organic fertilizer has a positive effect on the growth of *Brachiaria decumbens* grass, as seen from the increase in biomass and resistance to drought. This is supported by [28], who stated that under optimal conditions, *Brachiaria decumbens* can produce around 95-135 tons of fresh material per hectare per year or around 20-27 tons of dry material.

The application of solid organic fertilizer showed a significant effect (P<0.05) on the fresh weight production of *Brachiaria decumbens* grass leaves and had no significant effect (P>0.05) on the fresh weight production of *Brachiaria decumbens* grass stems. The highest fresh weight of leaves was also found in P3 (37.83 tons/ha), while the highest fresh weight of stems was found in P3 (64.80 tons/ha). The results of this study were greater than those reported by [29], who reported that the time of harvest had a significant effect on the fresh weight production of plants, with the highest yield for leaves (1.8 tons/ha) obtained at 45 days of harvest, while the optimal fresh weight of stems (2.5 tons/ha) was achieved at 60 days of harvest. Several factors that may influence the results of this study are the quality of organic fertilizer and the activity of soil microorganisms that play a role in increasing the availability of nutrients for plants. The balance of macro and micro nutrients, good soil structure, and the frequency and technique of cutting can also affect the fresh weight production of plants. In addition, rainfall and water availability play a role in supporting photosynthesis and nutrient transport. Plant genetic factors also contribute to their capacity to respond to fertilization and environmental conditions. Thus, although organic fertilization does not show a significant effect, these factors still contribute to the fresh weight production of Brachiaria decumbens.

Based on the analysis of the research results, it shows that the application of solid organic fertilizer has no significant effect (P>0.05) on the dry weight production of *Brachiaria decumbens* grass. The highest dry weight production was obtained in treatment P3 with a fertilizer dose of 30 tons/ha, producing a dry weight of 13.53 tons/ha, followed by P2 (12.42 tons/ha), P0 (11.05 tons/ha), P1 (10.72 tons/ha), and the lowest in P4 (10.46 tons/ha). These results are in line with the findings of [30], who stated that *Brachiaria decumbens* is capable of producing dry matter of up to 12-15 tons per hectare per year under intensive management conditions with optimal nitrogen fertilization (300-400 kg N/ha/year). The dry weight production in P3, which reached 13.53 tons/ha, indicates that the plants were able to reach their production potential even when using organic fertilizer.

The application of solid organic fertilizer had no significant effect (P>0.05) on the dry weight production of leaves and stems of *Brachiaria decumbens* grass. For dry weight production of leaves, the highest yield was obtained in treatment P3 (4.13 tons/ha) and the lowest in P1 (2.90 tons/ha). Meanwhile, for stem dry weight production, the highest yield was found in P3 (9.39 tons/ha) and the lowest in P4 (7.42 tons/ha). These results are higher than the findings of [29], who stated that dry leaf weight reached 3.5 to 4.5 tons per hectare per year under optimal growth conditions and dry stem weight was in the range of 4 to 5 tons per hectare per year. Several factors can affect the dry weight production of *Brachiaria decumbens*, even though the application of solid organic fertilizer did not show a significant effect (P>0.05), including the quality of organic fertilizer that releases nutrients gradually, soil conditions that are already rich in nutrients, and suboptimal cutting frequency and techniques. Additionally, inconsistent rainfall and water availability can inhibit photosynthesis, while plant genetic factors also influence dry matter production capacity.

4. Conclusion

The application of solid organic fertilizer had no significant effect (P>0.05) on all growth and production parameters of Bede grass (*Brachiaria decumbens*), except for fresh leaf weight production, which showed a significant difference (P<0.05). This indicates that the application of solid organic fertilizer at various doses has not had a significant effect on the vegetative growth of the plant. The application of solid organic fertilizer at different doses had no significant effect (P>0.05) on the growth of Bede grass (*Brachiaria decumbens*). However, the application of 30 tons/ha of solid organic fertilizer had the potential to produce the best growth and production results compared to other doses.

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