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Use of Compost Fertilizer from Sheep Manure and Chicken Manure on Bengal Grass Growth (*Panicum maximum*) after First Harvest

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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Original Research Article

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ABSTRACT

This study at to determine the effect of manure on the growth and production of fresh forage tall elephant grass. The design used was completely randomized design (CRD) with 4 treatments and 5 replications. The treatments were as follows: Po = control (without fertilizer), P1 = cow manure; P2 = sheep manure and chicken manure P3. The results showed that the use of some types of manure to the planting of elephant grass was highly significant ($p < 0.01$) in the plant height, leaf length, number of tillers and fresh forage production.

Keywords: Bengal grass; sheep manure; chicken manure.

1. INTRODUCTION

Bengal Grassis a type of grass that is widely used as animal feed that has a good nutritional composition. The origin of the Bengal grass is from Africa, precisely in Zimbabwe which was later given the Latin name *Panicum maximum*.This type of grass can serve as ground cover, grazing, or processed in the form of hay and silage [1]. The characteristics of this plant are that it grows upright to form clumps, can reach 1-1.8 m high, leaves are smoother than elephant grass, hairy leaflets and tongues, form many tillers, flowers are arranged in panicles and

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are green or yellowish in color, and roots deep fiber, drought resistance, high production potential, high quality feed [2].

Bengal grass has a nutritional content of PK 18.37%, SK 27.40%, LK 3.81, Ash 3.81. This grass can grow on rocky soil with a thin layer of soil, even on poorly drained soil and is tolerant of mild dry conditions and shade soil, long-lived plant, adaptable to all types of soil. At light intensity of 30-50% still producing normally. Cultivation in the context of developing and utilizing Bengal grass as forage for livestock has introduced several superior cultivars [3,4].

Many types of superior grasses have been cultivated in our country, the most popular are of course elephant grass and king grass [5-7]. Actually, there is another grass race that also has high potential to be used as forage for livestock which is actually also easy to cultivate, namely Bengal grass (*Pannicum maximum*). Bengal grass is a grass originating from tropical and sub-tropical Africa. Entered Indonesia in 1865 and cultivated because of its high nutritional value as animal feed [8-10].

The problem with artificial fertilizers used so far is that it causes damage to the soil structure due to the continuous use of artificial fertilizers so that the development of plant roots is not perfect. This will also have an impact on the production of crops cultivated by farmers who are usually given artificial fertilizers. Likewise, the effect of modern production facilities on the environment has been felt by many farming communities, the continuous use of artificial fertilizers causes dependence and their land becomes more difficult to cultivate [11,12].

Manure is organic fertilizer derived from livestock manure, either in the form of solid manure (feces) mixed with leftover feed, or urine (urine). Feed has a very important influence in determining nutrient levels, if the feed given contains a lot of N, P and K nutrients, the feces will also be rich in these substances [13]. [14] includes the element N which functions in protein synthesis to form plant organs. Element P functions for root growth and on the top of plants such as stems and leaves, other functions are to stimulate flower growth and increase resistance to pests and diseases. Elemental K is useful for increasing the synthesis and translocation of carbohydrates, thereby accelerating cell wall thickness and stalk strength [15,16].

Provision of manure on grass greatly affects the productivity of cultivated grass plants.Manure contains different nutrients depending on the type of animal. Manure can increase the availability of nutrients for plants and can stimulate plant vegetative growth. The application of manure can increase the production of fresh weight forage and dry weight of Bengal grass [17].

The purpose of the study was to determine the effect of the use of fertilizerscage from sheep manure and chicken manure on the growth of bengal grass (*Pannicum maximum*) after the first defoliation.

2. MATERIALS AND METHODS

2.1 Place and Time of Research

This research was conducted in Klambir Lima Kebun Village, Hamparan Perak District, Deli Serdang Regency, North Sumatra Province. This research was conducted for 3 months and started from April 2017 to July 2017.

2.2 Research Materials and Tools

The materials used in this study were bengal grass seed (*Pannicum maximum*), manure from chicken and sheep manure.

The tools used in this study were hoes, sickles, ropes and scales, wheelbarrows, meters, spades, calculators, stationery.

2.3 Research Methods

The method used in this study was a completely randomized design (CRD) with 6 treatments and 4 replications. The treatment given is as follows:

T0= Bengal grass without manure
T1= fertilizercompost 50% chicken manure + 50% sheep manure
T2= fertilizercompost 25% chicken manure + 75% sheep manure
T3= fertilizercompost 75% chicken manure + 25% sheep manure
T4= fertilizercompost 100% chicken manure
T5= fertilizer100% sheep manure compost

2.4 Data Analysis

The linear model used in this study is a non-factorial Completely Randomized Design (CRD) with a linear model as follows:

$$Yij = + i + ij$$

Information :

- Yij :The results of the observation of the i-th treatment and j . repetition
- µ :General mean
- i :Effect of treatment to – i
- ij :Experimental error due to treatment - i and repetition - j

If there is a real difference, it will be tested further with further tests in accordance with the coefficient of diversity of the research data [18].

2.5 Land Preparation

Land preparation begins with clearing the land of weeds andgarbage using a hoe and scratching. Sand the making of 24 plots of land with the size of each plot of 3 mx 3 m and the distance between the plots of 1 m. Furthermore, manure was spread at a dose of 20 tons/ha according to the treatment evenly on each plot and allowed to stand for 2 weeks before planting.

2.6 Planting

Bengal Grass Planting (*Panicum maximum*) is donein the form of cuttings planted as deep as 2 cm according to the cuttings used as research material. Bengal Grass Seeds (*Panicum maximum*) were planted perpendicularly with a spacing of 60 mx 60 m.

2.7 Plant Maintenance

Plant maintenance is carried out since the seeds of the Bengal Grass (*Panicum maximum*) are planted in the field until the grass is harvested. The maintenance of the Bengal Grass plant (*Panicum maximum*) includes the following:

2.8 Weeding

During the growth of the Bengal Grass (*Panicum maximum*) weeds were carried out on each plot of weeds. Weeding is done by pulling the weeds by hand carefully so as not to damage the roots of the Bengal grass (*Panicum maximum*) plant itself. While weeding, carefully loosen the soil.

2.9 Sprinkling

At the beginning of growth,Bengal Grass (*Panicum maximum*)need to get enough water. Therefore, watering is done once a day, or depending on the weather and soil conditions. When watering, the soil should not be too wet (muddy), because it can cause plant roots to rot. Watering activities are carried out in the morning.

2.10 Data Treatment and Collection

The treatment of manure from sheep and chicken manure was given two weeks before planting. Manure was sprinkled on each plot as much as 20 tons/ha (18 kg/9 m²). Bengal grass growth data was taken two weeks after the first defoliation. Data on plant height, number of leaves and number of tillers were carried out once a week. Fresh forage production data was carried out when the Bengal grass was 50 days old by cutting all the grass in each plot by leaving 10 cm above the soil surface. Furthermore, the grass from each plot was weighed to determine the production of fresh forage.

2.11 Observed Parameters

1. Plant Height After First Cutting (cm)

Plant height measurements were carried out from the limit after the first cutting to the tip of the highest leaf.

2. Number of Leaves After First Defoliation (strands)

Measured from the base of the leaf to the tip of the longest leaf.

3. Number of tillers after first defoliation(stalk)

Measured together with plant height.

4. Fresh Forage Production After First Defoliation (kg)

Measurement of forage production was carried out by cutting and weighing all the grass contained in the plot.

3. RESULTS AND DISCUSSION

3.1 Plant Height (cm)

The data on the average growth of grass height during the study are presented in Table 1 and the height development of the Bengal grass during the study is explained in Fig. 1.

Table 1. Average plant height using chicken and sheep manure compost on Bengal grass

Treatment	Test				Total	Average
	I	II	III	IV		
T0	172.40	170,40	173.50	172.30	688,60	172.15 A
T1	201.30	206,80	205,30	203.60	817.00	204.25 C
T2	193.40	193.60	195.00	194.30	776.30	194.08 B
T3	224,20	225,20	226.30	225,70	901.40	225.35 D
T4	230.61	228.50	236.70	225,80	921.61	230.40 D
T5	192.70	190.60	189.50	192.30	765.10	191.28 B

Description: Different superscripts in the same column show very significant differences (p > 0.01)

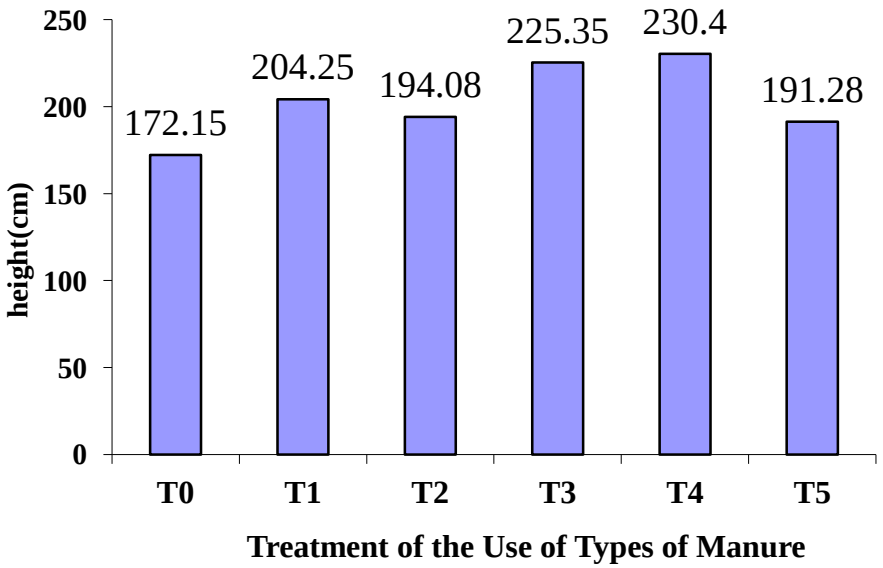

Fig. 1. Height growth of bengal grass from the effect of manure use

The results showed that the T4 treatment (chicken manure) and T3 treatment (75% chicken coop manure and 25% sheep) were better than the use of fertilizers in T1 treatment (50% chicken coop manure and 50% sheep), T2 treatment (chicken manure) 25% and sheep 75%), and treatment T5 (sheep manure),This is because the application of manure can increase nutrient elements, especially N and K in the soil. Although the combination of sheep manure and chicken manure still cannot compensate for the application of 100% chicken manure which has higher N, P, and K content and the decomposition power of sheep manure is slower due to the hardness of sheep manure. This is what makes fertilizer application with T4 treatment (100% chicken manure) the best in the study.

The element N is needed by plants for the formation of chlorophyll, and chlorophyll itself is an acceptor in the absorption of sunlight which is needed by plants in the photosynthesis process in order to produce photosynthesis which is needed by plants for growth and development [19].

The availability of nutrients in the soil through proper fertilization during plant growth and development results in the activity of plant roots causing the addition of nutrients, making more nutrients can be absorbed from the soil. According to Santoso [20] states that nitrogen in plants functions as a constituent of protoplasm, chlorophyll molecules, nucleic acids and amino acids which are constituents of proteins, if nitrogen deficiency occurs it can cause disturbed vegetative and generative growth of plants.The average developmental height of the Bengal grass from the measurement results during the study is presented in Fig. 1.

3.2 Leaf Length (cm)

The average leaf length of Bengal grass from the effect of chicken and sheep manure application is presented in Table 2 and clarified in Fig. 2.

Table 2. Average leaf length of bengal grass from the effect of giving chicken and sheep manure compost during the study

Treatment	Test				Total	Average
	I	II	III	IV		
T0	83.80	82.40	83.80	83.90	333.90	83.48 A
T1	95.50	94.80	96.20	97.10	383.60	95.90 D
T2	93.40	91.10	92.80	92.30	369,60	92.40 C
T3	103.90	102.40	104.70	104.50	415,50	103.88 E
T4	105,90	107.40	108.70	109.50	431.50	107.88 F
T5	85,20	87.50	86.60	88,10	347,40	86.85 B

Description: Different superscripts in the same column show very significant differences (p > 0.01)

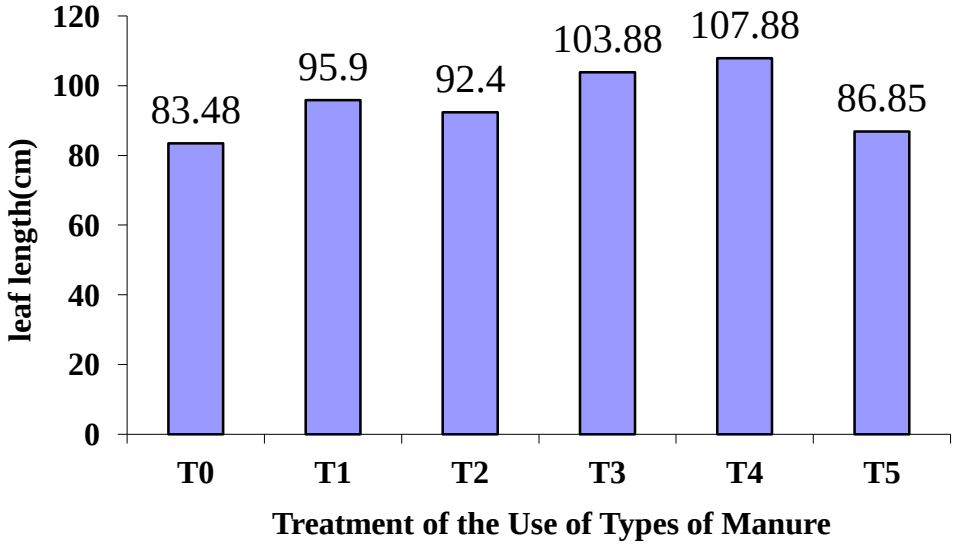

Fig. 2. Development of leaf length from the effect of giving some manure

The results showed that the treatment using manure from chicken and sheep manure had a very significant effect on leaf length. In general, the treatment with manure gave better results on leaf length when compared to without the use of manure (P0). This is because manure contains high levels of nutrients needed by plants.The growth of bengal grass leaf length during the study can be presented in Fig. 2.

The use of fertilizer in the T5 treatment (sheep manure) had shorter leaves due to the slower solubility of sheep manure in the soil so it was absorbed. Fertilization using chicken manure (T4) has a better leaf length when compared to the treatment of sheep cages or a combination of the two manures. This is because the solubility of nutrients in chicken coop is higher than sheep manure, thus accelerating the absorption of nutrients in the soil. and some can be washed into the soil and not absorbed by plant roots, besides that the use of fertilizers quickly results in nutrients in the soil for plants remaining available to plants. Lingga and Marsono [21] stated that it is necessary to apply fertilizers containing more nutrients, which are assessed based on the nutrient content of the fertilizer, concentration and organic fertilizer. This is due to the higher amount of nutrients in organic matter resulting in better leaf length.

3.3 Number of Tillers (Children)

The average number of saplings of Bengal grass from the effect of applying several types of fertilizers during the study is presented in Table 3 and clarified in Fig. 3.

Table 3. Average number of Bengal grass tillers from the effect of manure application for chickens and sheep during the study

Treatment	Test				Total	Average
	I	II	III	IV		
T0	3.60	3.80	4.20	4.30	15.90	3.98 A
T1	4.95	4.57	4.80	5.20	19.52	4.88 BC
T2	4.43	4.50	4.60	4.45	17.98	4.50 ABC
T3	4.40	4.90	5.30	5.50	20,10	5.03 C
T4	4.80	5.20	4.90	5.30	20,20	5.05 C
T5	4.20	3.90	4.30	4.40	16.80	4.20 AB

Description: Different superscripts in the same column show very significant differences (p > 0.01)

The number of tillers is an important factor in increasing bengal grass production. Tests in the use of several types of manure have a very significant effect on the number of tillers. HThis shows that fertilizer from sheep and chicken manure can stimulate the increase in the number of tillers. The number of tillers cannot be separated from the effect of nutrient dissolution in manure as well asabsorption of nutrients by plant roots, so that nutrients and absorbed by bengal grass plant roots can be utilized by plants for plant propagation. From the results of the study, it was found that the use of chicken manure in T4 treatment was the best number of tillers with the highest number of tillers, followed by T3 treatment with a combination of 75% chicken manure + 25% sheep and the lowest with the use of sheep manure.

The two types of manure used are organic fertilizers which have different solubility and are slower than inorganic fertilizers.Organic fertilizers that dissolve and melt in the soil are able to add nutrients to the soil and are sufficient for the development of Bengal grass plants. One of the more dominant factors is that the type of fertilizer will accelerate its response to the increase in the number of plant tillers [20]. The growth of the number of Bengal grass tillers during the study can be presented in Fig. 2.

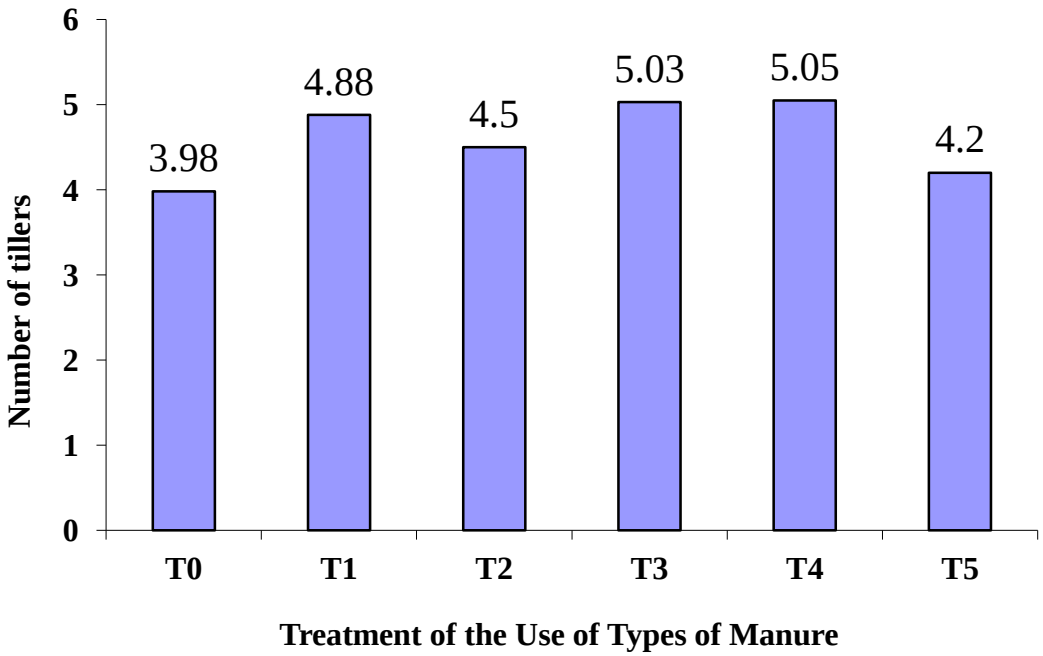

Fig. 3. The development of the number of tillers from the effect of giving several types of manure

4. CONCLUSIONS

The use of chicken and sheep manure and their combination on Bengal grass showed that the use of fertilizer in T4 treatment (100% chicken manure) was still the best and for the combination, T3 treatment (75% chicken manure and 25% sheep) was a type of fertilizer. cages are the best in increasing the growth and production of bengal grass.

5. SUGGESTION

Further research is needed on the use of various types of manure and their combinations on different grasses to determine the most efficient and best fertilizer for the growth of the grass.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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