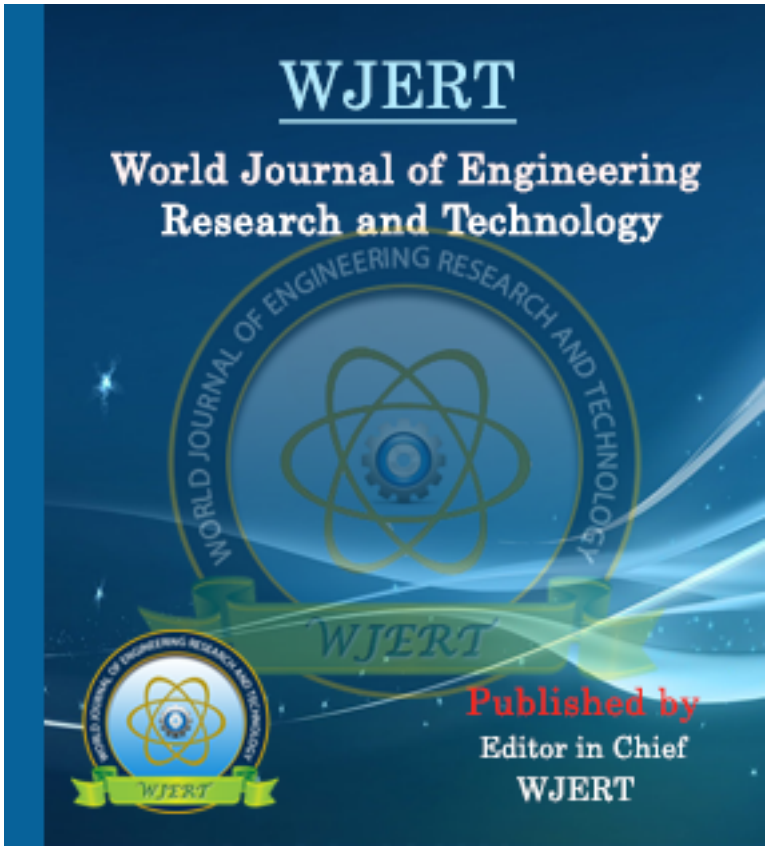
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GROWTH AND YIELD PENNISETUM PURPUREUM CV Mott IN VARIOUS LEVEL OF DOSAGE AND FREQUENCY OF ORGANIC LIQUID FERTILIZER (OLF) APPLICATIONS IN TIMOR LESTE

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ABSTRACT

A study has been carried out with the aim to evaluate the growth and yield of *Pennisetum purpureum* CV Mott given OLF. The experiment used a completely randomized design with 2 factors and 4 replications: factor A (OLF dose): P2 (1 liter of OLF: 2 liters of water), P4 (1 liter of OLF: 4 liters of water), P6 (1 liter of OLF: 6 liters of water) and P8 (1 liter of OLF: 8 liters of water), and factor B which is the frequency application of OLF consisting of W2 (OLF given 2 days), W4 (OLF given 4 days) and W6 (OLF given 6 days once). The results showed that height increase and highest number of tillers of 10.22 cm week^{-1} and 10.54 week^{-1} tiller were obtained at the dose of P2, with frequency of W2 gave. The best frequency application of OLF was obtained at twice daily (W2) OLF of 956.25 and 139.81 g pot^{-1} respectively for fresh weight and dry weight of forage results. The highest protein content and forage fiber were 9.18% and 24.87%, respectively, obtained by gave a dose of P2, while the frequency of OLF giving every two days gave the highest crude fiber content of 24, 05%. It can be concluded that: growth, forage yield, and forage nutrient content of *Pennisetum purpureum* CV Mott is influenced by the dosage and frequency application of OLF, and the best OLF dose for *Pennisetum* plants CV Mott purpureum is P2 with the frequency of giving W2.

KEYWORDS: cattle faeces OLF, dosage, frequency application, *Pennisetum purpureum* CV Mott.

INTRODUCTION

Timor Leste in its development, refers to the National Strategic Development Plan 2011 - 2030 (Plano Estratégico Desenvolvimento Nasional 2011 - 2030), which one the source of foreign exchange is highly dependent on increasing industrial development sourced from the agriculture, tourism and oil / gas sectors. Increasing the number of population and the number of tourists in Timor Leste can also have an impact on the increasing consumption of meat and other agricultural products. Livestock products from ruminants are very dependent on the availability of forage. The availability of forage can be increased through the introduction of a variety of major feed crop cultivation technologies. One of the technologies that can be developed in Timor Leste to increase the production of forage and conservation of agricultural land is by providing nutrients into the soil in the form of organic or inorganic fertilizers. By providing these inputs, it will directly provide benefits in the process of growth and crop production which will ultimately be used by livestock for growth and production needs.

Kate elephant grass, also known as the Odot elephant grass or Pennisetum purpureun cv Mott is very well known in areas that introduce it as superior forage fodder plants for example in Indonesia because it has advantages compared to other species of elephant grass that have been known for a long time in Indonesia and in Timor Leste. The advantages of kate elephant grass among others only 1 meter high so that it is easy to manage, has a leaf weight that is higher than the trunk and has a high palatability for ruminants. This plant gave a positive response to the addition of organic fertilizer with fresh forage production of this plant is 46.35 - 99.28 tons with the production of forage dry matter 13.04 - 26.11 tons ha^{-1}, with crude protein content of 8.08 - 9,12% and crude fiber worth 32.02 - 32.70% (Sada et al., 2018). Productivity of kate elephant grass as feed depends on the quality of the growing media. The physical, chemical and biological quality of the soil will have an impact on the amount of nutrients available and utilized by the Kate elephant grass to grow and produce.

One effort that can be done to improve soil quality is to add liquid organic fertilizer made from cattle faeces. One cattle each day produces faeces ranging from 8-10 kg per day or 2.6 - 3.6 tons per year (Huda and Wikanta, 2017). In Timor Leste, the number of cattle is 383,243 individuals (Ministry of Finance, 2016). Potential cattle faeces in Timor Leste is 996,432 -

1,379,675 tons per year. Cattle faeces is one of the potential ingredients for making organic fertilizer, including liquid organic fertilizer. Liquid Organic Fertilizer (LOF) is a liquid fertilizer that is processed from basic ingredients both urine, faeces, mixed with a starter (EM4), with other ingredients and clean water used for fertilizing, fertilizing plants, increasing plant productivity because as a source of nutrients N, F, and P are very important for plant growth and development. Toe et al. (2016) reported that the OLF dose affected the growth and production of cetaria grass while Febriana et al., (2018) reported that the frequency application of OLF at the time of its application to plants affected the growth and production plants. The amount of OLF that is applied to the kate elephant grass plants expressed in doses and frequency aplication will affect the growth and forage production of kate elephant grass.

Based on the above background, the study was conducted with the aim of evaluating the growth and yield of gajah kate grass (*Pennisetum purpureum* CV Mott) who were given OLF on different doses made from cattle faeces and frequency of watering and determine the best dose and frequency of OLF application.

MATERIALS AND METHODS

This experimental research has been carried out in Hera Village, Metinaro Subdistrict, Dili District, East Timor, for 4 months (May - September 2018). The materials used are gajah kate grass pols (*Pennisetum pupureum* cv Mott), Liquid Organic Fertilizer (LOF) based on cattle faeces, vertisol type soil as a planting medium, basic fertilizer SP 36 (36% P_2O_5), Urea (45% N) and Pottasium Chloride (60% K_2O), the sized of polybag is 20 x 50 cm with a diameter of 22 cm, and "Dursban" brand insecticide.

The equipment used is a plastic house measuring 12 x 8 m (96 m2), a set of agricultural tools, 0.5 cm diameter sieve, Camry spring scales with a capacity of 10 kg with a sensitivity of 1 g to weigh the soil, digital scales with Sartorius brand with a capacity of 200 g with a scale of the smallest 0.0001 g for weighing fertilizer, Sartorius brand digital scales with a capacity of 2600 g with the smallest scale of 0.1 g to weigh forage, meter to measure plant height, scissors, liters to measure the amount of water spraying water and liquid organic fertilizer (OLF).

Research procedure

Plastic house is made as a place to put pots (polybags), which have been filled with soil as much as 15 kg pot^{-1}, bring in the tillers grass, preparation of tools and materials, making OLF according to Toe *et al*. (2016), i.e. by means of cattle faeces dried and then mixed evenly with fresh chopped leaves of gamal with a ratio of 2: 1.(20 kg of faeces and leaves of gamal 10 kg). Then put in a plastic drum and then added water with a ratio of 2 liters of water to 1 kg of material weight (60 liters); EM4 (600 ml liters), granulated sugar (600 g), and 600 grams of rice flour). After that the drum is closed tightly and left for 21 days. Polybags are placed in a plastic house with a distance of 0.5 x 0.5 meters. Planting 2 tillers pot^{-1} continued with watering, replanting and maintenance. The basic fertilizer is SP 36 (36% P2O5) with a dose of 50 kg ha^{-1} at planting, Urea fertilizer (45% N) is given at a dose of 50 kg ha^{-1} when the plant is 14 days old and Pottasium Chloride (60% K2O)) with a dose of 50 kg ha^{-1} given twice, namely 25 kg ha^{-1} given at planting to stimulate initial growth and the remaining 25 kg ha^{-1} given to a 14-day-old plant. All fertilizers application by immersion with a distance of ± 5 cm from the planting hole. OLF application when the plant is 14 days old by watering 200 ml $point^{-1}$ planting is carried out in accordance with the treatment. once a week until harvesting. Weed handling is done when there are weeds. Harvesting when the plant is 60 days old by cutting the plant 15 cm from the ground surface. The forage is then separated from the stem and leaves, then weighed and prepared for the sample and analyzed.

Experimental design

The experiment used a completely randomized design (CRD) factorial pattern with 2 factors: Factor A (OLF dose): P2 (1 liter of OLF: 2 liters of water), P4 (1 liter of OLF: 4 liters of water), P6 (1 liter of OLF: 6 liters of water) and P8 (1 liter of OLF: 8 liters of water), and factor B which is the frequency application of OLF consisting of W2 (OLF given 2 days), W4 (OLF given 4 days) and W6 (OLF given 6 days once). Experiments using replications four times so that there are 48 units of the experiment. Variables measured include: increase in plant height, increase in number of tillers, forage production, and forage nutrients (crude protein and crude fiber). Experimental data were analyzed using analysis of variance (Anova) and continued with Duncan Test, using SPPS version 21.

RESULTS AND DISCUSSION

General State of Research

The experiment was carried out on vertisol soil, with a pH of 7.65 with an organic C content of 0.02%, 0.05% N total, 12.95 ppm P_2O_5, 2.45 g K_2O, 12.40 g CEC, with a texture of 31.93 % sand, 52.36% dust, and 15.71% clay. OLF contains 42.46% organic C, 0.05% N total, 0.10% P_2O_5, 1.51% K_2O with a pH of 7.7. The temperature during this study ranged from 29.46 to 32.02 ^oC with humidity ranging from 48.91 - 51.25%. During the study, plants grew well, but it was clearly seen that plants that received OLF showed better and more fertile plants.

Table 1: Effect of treatment on grass growth of *Pennisetum purpureum* CV Mott.

Treatment/variable	P2	P4	P6	P8	Average
Plant height (cm week^{-1})					
W2	10,22 a	3,63 c	3,87 c	4,24 b	5,49
	A	A	B	A	A
W4	5,91 a	3,75 b	4,06 a	4,22 a	4,49
	B	A	A	A	B
W6	4,63 a	3,58 b	4,19 a	3,91 b	4,08
	B	A	A	B	C
Average	6,92 a	3,65 c	4,04 b	4,12 b	
Number of tillers (tiller week^{-1})					
W2	10,54 a	8,11 b	8,04 b	6,82 c	8,37
	A	B	B	A	A
W4	8,55 a	7,75 a	7,89 a	6,36 b	7,63
	B	B	B	A	B
W6	6,22 a	6,87 a	6,93 a	6,50 a	6,65
	C	C	C	A	C
Average	8,43 a	7,61 b	7,62 b	6,56 c	

Note: Different lowercase letters in the same row and different capital letters in the same column show significant differences (P <0.05). P2 = 1 liter of OLF: 2 liters of water, P4 = 1 liter of OLF: 4 liters of water, P6 = 1 liter of OLF: 6 liters of water, P8 = 1 liter of OLF: 8 liters of water, W2 = 2 days, W4 = 4 days once, and W6 = once every 6 days.

Table 2: Effect of treatment on forage production of *Pennisetum purpureum* CV Mott.

Treatment/variable	P2	P4	P6	P8	Average
Fresh forage results (g pot^{-1})					
W2	1125,00	725,00	875,00	1100,00	956,25
					A
W4	575,00	350,00	450,00	525,00	472
					B
W6	400,00	750,00	575,00	450,00	543,75

					B
Average	700,00 a	608,33 a	633,33 a	691,67 a	
Dry weight of forage (g pot^{-1})					
W2	140,25	121,50	136,75	160,75	139,81
					A
W4	93,50	63,25	87,50	85,25	82,38
					B
W6	72,50	101,75	88,75	76,00	84,75
					B
Average	102,08 a	95,50 a	104,33 a	107,33 a	

Note: Different lowercase letters in the same row and different capital letters in the same column show significant differences (P <0.05). P2 = 1 liter of OLF: 2 liters of water, P4 = 1 liter of OLF: 4 liters of water, P6 = 1 liter of OLF: 6 liters of water, P8 = 1 liter of OLF: 8 liters of water, W2 = 2 days, W4 = 4 days once, and W6 = once every 6 days.

Table 3: Effect of treatment on protein content and crude fiber forage of *Pennisetum purpureum* CV Mott.

Treatment/variable	P2	P4	P6	P8	Average
Crude Protein (% DM)					
W2	9,29	8,45	8,55	8,48	8,69
					A
W4	9,24	8,73	8,34	8,35	8,66
					A
W6	9,01	8,8	8,57	8,31	8,67
					A
Average	9,18 a	8,66 b	8,49 bc	8,38 c	
Crude Fiber (% DM)					
W2	24,88	24,69	23,29	22,37	24,05
					A
W4	24,89	22,09	21,28	23,18	22,86
					B
W6	24,84	21,09	22,46	22,31	22,67
					B
Average	24,87 a	22,62 b	22,34 b	22,95 b	

Note: Different lowercase letters in the same row and different capital letters in the same column show significant differences (P <0.05). P2 = 1 liter of POC: 2 liters of water, P4 = 1 liter of POC: 4 liters of water, P6 = 1 liter of POC: 6 liters of water, P8 = 1 liter of POC: 8 liters of water, W2 = 2 days, W4 = 4 days once, and W6 = once every 6 days.

The growth of the *Pennisetum purpureum* plant CV Mott.

Data on the effect of treatment on the growth of the *Pennisetum purpureum* CV Mott plant are listed in Table 1. Analysis of variance showed that the treatment had a very significant effect (P <0.01) on plant growth, and there were interactions between the two factors.

Duncan's test shows that in a single factor the dose of OLF and the frequency application of OLF, the best treatment is shown by P2 and W2 which are different from other treatments. The interaction effect was seen in P2 which was significantly different from other OLF doses while the twice daily application time was the best compared to other treatments. This can occur because in P2 treatment the number of OLF is more than other treatments. This high amount of OLF contains nutrients, especially N, F and P which are needed by plants for plant growth. Application of OLF can improve the physical properties of the soil by improving soil structure that was initially dense into loose and providing space in the soil for water and air that will stimulate the growth of anaerobic bacteria in the roots and available water will be absorbed by plants so as to support plant growth. In addition OLF can improve soil chemical properties, especially related to nutrients contained in the soil, namely nitrogen (N), Fhosphorus (F) and Potassium (P), so that it will help plants absorb nutrients from the soil. OLF will also improve soil biological properties which will stimulate the growth of microorganisms in the soil, which is useful for plants to help bind nutrients, both from the soil and air and loosen the soil so that plants will flourish. Giving OLF will also improve soil acidity. Giving of OLF will also improve soil acidity. The addition of organic fertilizer has the role of improving soil structure, increasing the soil's absorption of water, increasing the living conditions of micro-organisms in the soil, and as a source of nutrients for plants (Huda and Wikanta, 2017).

The results of the forage *Pennisetum purpureum* CV Mott

Table 2 shows data on the effect of treatment on forage production of *Pennisetum purpureum* CV Mott. Analysis of variance showed that a single factor of OLF dose had no significant effect (P> 0.05) on forage production, whereas the frequency factor of OLF application had a significant effect (P <0.05). Between the dose factor and the frequency of OLF application, there was no interaction. Duncan's test shows that on a single factor the frequency of OLF giving, W2 shows the highest forage production which is different from W4 and W6. The difference in the OLF dose did not affect the results of the forage nor did the interaction between the dose and the frequency of OLF application show a significant difference.

High forage production in these treatments is the impact of high growth in plants that receive such treatment. In treatments with higher OLF doses with more frequent applicable, the availability of nutrients becomes higher. The high availability of nutrients causes nutrient uptake, especially nitrogen to be higher which results in high photosynthetic activity which

results are stored in plant parts. Febrianna *et al.*, (2018) explained that increasing the dose and frequency of OLF fertilization increased plant growth and production, but the frequency of giving too long (more than 5 days) actually did not affect the growth and production of *Pennisetum purpureum* CV Mott (Sada *et al*., 2018).

The content of protein and crude fiber forage *Pennisetum purpureum* CV Mott

Data on the effect of treatments on *Pennisetum purpureum* forage nutrient CV Mott is shown in Table 3. Analysis of variance showed that a single factor of OLF dose had a significant effect (P <0.05) in crude protein and forage crude fiber, while the frequency factor for OLF application had only a significant effect (P <0.05) on forage crude fiber levels. Between the dose factor and the frequency of OLF application, there was no interaction. Between the dose factor and the frequency of OLF application, there was no interaction. Duncan's test showed that on a single factor the OLF dose and the frequency of OLF application, P2 and W2 showed the highest levels crude protein and forage crude fiber. Even though the combination of treatments had no significant effect, the highest levels of crude protein and crude fiber were shown by the P2W2 treatment.

High crude protein content in the treatment is the impact of high N uptake in the treatment. The element N is the basic ingredient of the formation of forage proteins. While high levels of crude fiber in the treatment is the impact of high forage production in the treatment. The high weight of biomass, causing plants to produce crude fibers that bind to lignin to be able to support these plants. This will increase the level of forage crude fiber.

CONCLUSION

Based on the results and discussion of experimental data, it can be concluded that: growth, forage production, and forage nutrient content of *Pennisetum purpureum* CV Mott is influenced by the dose and frequency application of OLF based of cattle faeces. Interaction between the dose and frequency application of OLF only occurs in plant growth only, and the best dose of OLF for *Pennisetum purpureum* CV Mott plants is 1 liter of OLF in 2 liters of water with a frequency of giving 2 days.

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