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APPLICATION OF DRY-MIX-MANURE LAYER ON PRODUCTION OF *BRACHIARIA MUTICA* CULTIVATED IN UNRESTRICTED SUNLIGHT AREA

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Abstract

A development of ruminant farms needs to be accompanied by various efforts including the development of livestock feed forage production that adapts well around the farm. One of such effort is to develop B. mutica forage in open land by utilizing livestock waste. Ruminant animals such as cows and goats have a good palatability in consuming this forage. This preliminary experiment is a part of our research that aimed to examine the effect of an application of Dry-Mix-Manure (DMM) as planting media layer on production of B. mutica which is cultivated in an unrestricted of sunlight area. In this study B. mutica cultivation was carried out on a planting bed coated with a DMM 500 dose applied to m^2 surface as planting layer with 10 cm thick and the distance one hole to another was 50 cm along 10 meters. Four rows as a replication of planting. The parameters were: fresh production and dry weight of the forage. Harvesting was done at the age of 8 weeks after planting. A descriptive analysis was realized to the data obtained. The results showed that the mean of fresh production in this unrestricted sunlight areas was 12,527 kg / ha. The conclusion was that fertilize of Dry-Mix-Manure with a dosage 500 in the andosol soils was adaptable to get a good production of B. mutica cultivation under a full day sunlight during 12 hours about 6AM to 6PM.

***Key words**: forage, cultivation, Brachiaria mutica, organic fertilizer, bio-waste*

INTRODUCTION

The development of ruminant farms is determined by various factors, one of which is related to the forage of animal feed.

The wet tropical climate is a characteristic of Indonesia climate along the year. The diverse vegetation included the forages consumed by the cattle. Normally the intensity of solar radiation in the mid-year period between July and September in this area is higher than in the period of October to May.

B. mutica is one of the forages suitable to be developed in these climatic conditions because this grass species can adapt to various climatic and soil conditions (Rumokoy and Toar, 2014). This condition is favourable for forage plants in carrying out photosynthesis and the process of forming roots, stems and leaves. In this condition, nearly 50% of the land has not been utilized properly. In reality in various locations have relatively a lot of potential agricultural lands but not yet utilized optimally, or some are even left unused.

Naturally humid climate conditions are an important factor in cultivating and producing forage production in order to maintain or increase ruminant livestock production.

As an alternative solution is to revitalize the land which is based on the activities of researching and developing the use of dry organic mix-manures as a top layer of raised planting media on open land, by cultivating the *B. mutica* forage.

For this reason, we have conducted a research aimed at answering the challenges and opportunities mentioned above by conducting a study of *B. mutica* forage production using DMM 500 fertilizer.

MATERIALS AND METHODS

This research was conducted at the Lotta Agricultural Center (SAL), in the agricultural area at coordinates 1°25'05.8 "N 124°50'33.2" E, altitude around 150 meters.

Figure 1. Image of Research Location map (Google Map, accessed: 10 November 2019)

B. mutica forage was obtained and selected from SAL coconut plantations. This selection aims to obtain uniformity from *B. mutica* which will be planted in this study. Furthermore, *B. mutica* will grow optimally on various influences such as light intensity, and environmental conditions that related to a reported of Abraham et al (2014)

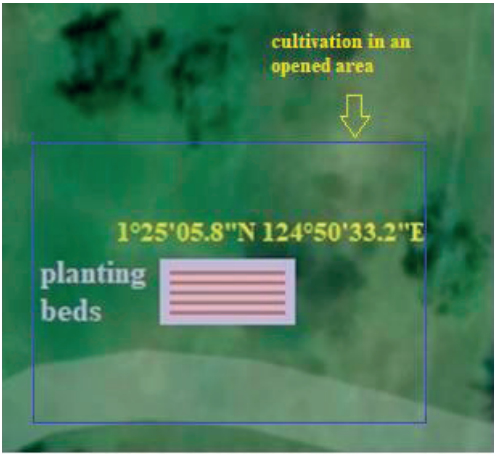

Figure 2. Location of open research land for *Brachiaria mutica* experiment cultivation Figure adapted to the real map (Google Map, accessed: 10 November 2019)

Before planting, the land used is cleaned and then loosened with a tractor, and then cleaned from unused materials such as rocks, gravel and so on, after that bed was made for a planting preparation.

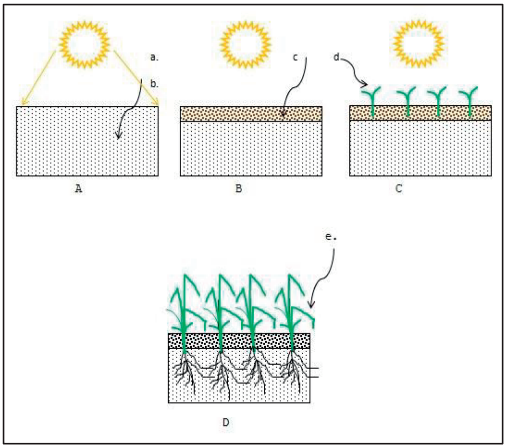

Figure 3. Scheme of a planting system in opened area by using fertilizer of DMM without mechanic restriction of sunlight transmission along the experiment

Notes: A. Field with full day sunlight transmission (a. Sunlight, b. plantation bed); B. DMM layer (c) on the top of the plantation bed of *B. mutica*; C. Plantation of *B. mutica* selected; D. Growth of the experiment forage on the soil fertilized with DMM.

Dry-Mix-Manure layer material was composed of a combination of dry manure material of pigs and cattle farms which was used as a top layer of beds with a dose of DMM 500 grams for dimensions of length and width of 100 cm2 with a thickness of 10 cm.

The planting media beds were incubated for 1 month, after that *B. mutica* was planted with a distance of 50 cm from one hole to the next 10 meters along with 4 rows of planting replications.

To get optimal plant growth, weeding is done to eradicate weeds. Manual weeding is done every 5 days during the planting period. Every day the plants were watering in the morning around 8 and the afternoon at 3. After the plants are 8 weeks old harvesting is done. Samples were collected from each subplot by cutting the plant 10 cm from the soil surface.

Figure 4. A manual sampling of *B. mutica* through a defoliation by a collector

The fresh plant samples were weighed and then put into plastic bags and then dried under the sunlight without shade.

RESULTS AND DISCUSSIONS

Climatic conditions that occur during the observation were sunny without rainfall. The sun's rays started to appear from 6 am to 6 pm, without any cloud obstructions. The type of soil at the site of experiment was andosol (Dien et al, 2018), and could be related to the influence of volcanic dust from Mount Lokon which is about 7 km away. Lokon eruption recorded in the last 20 years happened many times. The dust had affected the agricultural land around Minahasa including in Lotta Pineleng (Kurniawan, 2014). The fresh production results presented in the table 1 could be influenced by the environmental conditions which were favourable for growth of the experiment grass. Environmental factors that influence a growth of *Brachiaria* include: climate (Brouder and Volenec, 2008) water condition (Cameron and Lemcke, 2008), altitude (Asmare et al., 2017), type and fertility of the soil (Luce et al., 2016) as a growth medium, the intensity of sunlight (Lopes et al., 2017) which is very important for photosynthesis in plant's chlorophyll (Young and Smith, 1980; Gomez et al.,), as well as the temperature, humidity of the environment. A good maintenance could be an important factor of grass quality production improvement (Lima et al., 2018), included the factor of genetic (Volenec et al., 1996) and the manner of harvesting (Adnew et al., 2019; Tamele et al., 2017).

Table 1 shows a fresh production of *B. mutica* planted using DMM layer fertilizer was 12.5t / Ha, the minimum yield reached 9,880 kg / Ha while the maximum fresh production was 15,002 kg / Ha. This production rate could be linked to the availability of nutrient elements of the growing media enriched with DMM organic fertilizer. The utilization of manure connected to the quality of soils has been reported by Soelaeman and Haryati (2011).

Table 1. Fresh Production (kg) per ha in opened area

Replication	T01	T02	T03	T04
1	13,600	8,720	13,880	9,880
2	13,080	10,560	14,800	15,000
3	10,360	13,680	12,840	11,640
4	12,480	12,880	11,480	13,560
∑	49,520	45,840	53,000	50,080
$\bar{X}$	12,380	11,460	13,250	12,520

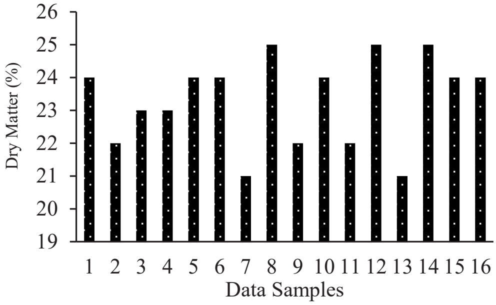

Figure 5. Production of Dry Material of *B. mutica*

Figure 6. Weighing of samples of fresh production of *B. mutica* harvest

The use of the DMM dose was able to reach the average production value which was still higher than the forage production as the previous observations (Rumokoy and Toar, 2014). This showed that a role of DMM fertilizer provided a positive response in producing fresh forages from the above grass species, especially for those grown on andosol soils with full light transmission conditions without obstructions.

Figure 4 showed an average dry matter production of *B. mutica* in the test field (around 21% to 25%).

The role of nutrient release from manure will help produce high quality forage (Suarna and Budiasa, 2016). The utilization of surrounding resources could be applied to the development of forage production and also toward the development of animal husbandry with an integrated system pattern as described by Carvalho et al, (2019) and Rumokoy et al, (2018).

The sunlight radiation has an important role to the process of biomass synthesis in forages planted in opened sunlight areas (Lopes et al., 2017) compared to the location with shade.

Experiment realized by Rumokoy et al, (2014), in a different place and type of soils, showed a variation of fresh production of this grass according to the level of sunlight restriction areas under several ages of coconut as presented in Figure 7. Similarity, Anis et al., 2015 confirmed that sunlight restriction influenced the production of grass production. This situation affected also the nutrition value of the grass plants (Abraham et al., 2014).

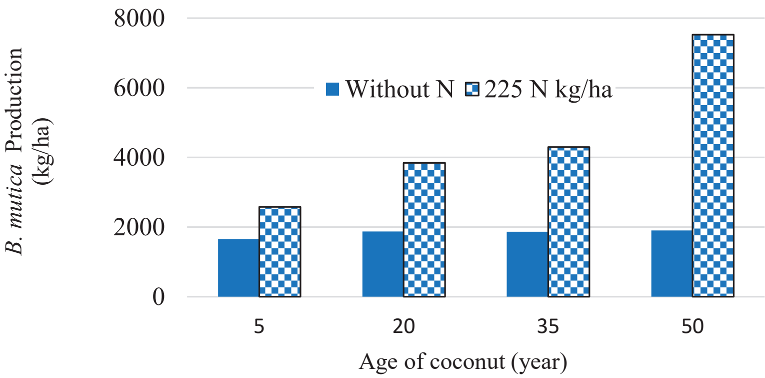

Figure 7. Production of *B. mutica* grass under canopy of coconut trees
Sources*: Rumokoy et al, 2014 (data were processed)*

CONCLUSIONS

B. mutica grass adapts to locations that receive continuous sunlight from 6 am until 6 pm at noon. These results of grass production signals that wetlands in the tropics that have not been utilized optimally can be revitalized by developing *B. mutica* crop production.

The conclusion of this research is that the DMM layer as an organic fertilizer is suitable for application in the production of forage B. mutica in andosol fields without sunlight restrictions. Thus, the availability of forage problem for ruminant animals can be overcome by developing *B. mutica* production even though in a season with high sunlight intensity.

This research can be continued to find out the role of DMM fertilization on B. mutica production after defoliation.

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