Comparison of mineral content of cuscus manure fertilizer and its trial results on the growth of *Setaria sphacelata*

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Abstract. This study aims to determine the mineral content of cuscus' manure and its utilization on the growth of *Setaria spachelata* grass. The study was designed with a completely randomized design (CRD) with 3 treatments (control / P0; cuscus manure from banana fruit feed / P1; and cuscus manure from avocado / P2) and 5 replications. The dose of organic fecal fertilizer for cuscus, 40 grams / polybag. The setaria seedlings used were adult poles measuring 20 cm, which were planted in polybags measuring 30 x 15 cm and weighing 5 kg of soil. The results showed that there were differences content in manure mineral among the types of fruit eaten as feed. Furthermore, its use on setaria grass was able to increase its growth, namely plant height, number of leaves and number of tillers, the control treatment was significantly different from treatment P1 and P2 (P <0.05), but between P1 and P2 did not show any differences. Plant height ranges from 35.10 - 39.10 cm, the number of leaves is 71 - 101, while the number of tillers is 13 - 21 tillers per polybag. The cuscus manure has the potential as organic fertilizer.

Keywords: cuscus manure, mineral, growth, *setaria spachelata*

1. Introduction

Good forage productivity needs to pay attention to the quality, quantity and continuity of its availability throughout the year, which of course is correlated with livestock productivity. Especially for the Papua region, the type of setaria grass has not been widely developed or cultivated by breeders and some have developed it but in very limited quantities only for the needs of their livestock. Setaria grass has good quality as forage for livestock, this can be seen from its growth, production, and nutritional value and is palatable to livestock. The nutritional value of *Setaria sphacelata* consists of crude protein 6-7%, crude fiber 42.0%, Nitrogen-Free Extract (BETN) 36.1% and fat 2.8%, in addition to being cut grass for feed, it is also used as grass for pasture, because it is trampled-proof [7].

Papua is an area that has high biodiversity in both flora and fauna. Cuscus is one of them and some of them are endemic species. In Manokwari, cuscus is bred for conservation and education purposes. Previously, there have been many studies documenting the types of cuscus feed that exist in several areas in Papua and these animals consume fruits from trees in the forest, in addition to young shoots or leaves [10].

Animal manure has been widely used as organic fertilizer for crops and livestock feed. Animal manure that are well known are bat droppings called guano, which have high potassium and phosphorus content. Cuscus is an animal that is protected according to the regulations. However, another thing that
can be used in captivity is to use the feces as organic fertilizer for the setaria grass feed plant. Thus, this study aims to determine the mineral content of cuscus fertilizer and the trial based on the feed consumed, namely bananas and avocados on the growth of setaria grass.

2. Materials and methods

The research was conducted on Flamboyan street, Amban Manokwari, West Papua for 3 months. This study used an experimental method with observation techniques for laboratory analysis in the form of complete mineral analysis using AAS for cuscus dung fertilizer. Meanwhile, the application of cuscus dung as organic fertilizer was carried out with a completely randomized design (CRD) with 3 treatments and 5 replications. The treatments were: P0 = control or no fertilization; P1 = Organic fertilizer of cuscus dung from banana consumption; and P2 = Organic fertilizer of cuscus from avocado consumption. The type of cuscus that is kept is adult *Spilocuscus maculatus*. The types of feed given were bananas and ripe avocados. Feed was given with a frequency of 2 times a day, namely in the morning and evening on an ad-libitum basis, with the distribution of the first 2 weeks for bananas and the next for avocados, every day the feces were collected and dried in the sun to dry and used as samples. Observations for organic fertilizer trials were carried out every week on the growth of setaria grass (*Setaria spachelata*). Observational data obtained were analyzed statistically with analysis of variance (Anova) and if there was a significant difference in the treatment, it was continued with Duncan's Test (DMRT).

3. Results and discussions

3.1. Mineral content of cuscus animal manure

Just as organic fertilizer from livestock has been widely used as fertilizer for plants in general, animal feces can also be used as organic fertilizer. Organic fertilizers contain minerals or nutrients needed by plants.

| Mineral Composition | Banana Feed Based Cuscus Feces | Avocado Feed-Based Cuscus Feces |
|---------------------|--------------------------------|---------------------------------|
| Calcium (Ca)        | 0.61                           | 0.22                            |
| Phosphorus (P)      | 0.47                           | 0.12                            |
| Magnesium (Mg)      | 0.80                           | 0.80                            |
| Potassium (K)       | 3.20                           | 2.56                            |
| Sodium (Na)         | 0.07                           | 0.09                            |
| Nitrogen (N)        | 0.85                           | 0.76                            |

Source: Analysis results of Testing Laboratory, BPT Ciawi Bogor, 2019

These results indicate that the quality of the fertilizer is quite good and can be used as organic fertilizer. The quality of the manure is influenced by the type of livestock, the quality of the feed and the way the manure is stored. Manure has a good influence on the physical and chemical properties of the soil and encourages the development of micro-organisms [8]. Animal feces is a fairly good manure because it contains nutrients N, P and K. This is according to Yusuf (2009) statement, livestock feces have 3 important nutrients, namely Nitrogen (N), Phosphorus (P), and Potassium (K). In addition to these three nutrients, manure also contains very complete micronutrients although in small amounts, the three types of N, P and K elements have different amounts in each animal. [3] also added the function of Nitrogen, Phosphorus, and Potassium. Nitrogen is a nitrogen nutrient that can improve plant vegetative growth. Plants that grow on sufficient N soil have greener leaves and N also functions as protein formation. Phosphorus has a function as root development and can strengthen the stem so it doesn't collapse easily. Potassium has a function as a stomata opener (regulates respiration and evaporation), enhances resistance to drought and leaf diseases and as root development. Macro and
micro nutrients contained in cow, goat and buffalo feces are needed by all plants as well as Setaria grass, these nutrients can affect the development and production of plants.

### 3.2. Test results on setaria grass growth

**Table 2.** Results of recapitulation of setaria grass growth given organic cuscus feces fertilizer at the first defoliation.

| Variable                  | Treatment | P0          | P1          | P2          |
|---------------------------|-----------|-------------|-------------|-------------|
| Plant height (cm)         |           | 35.10 ±2.28 | 38.97 ±3.06 | 39.10 ±2.42 |
| Number of leaves (strands)|           | 71 ±16.44   | 101 ±16.39  | 101 ±13.62  |
| Tiller                    |           | 13 ±3.08    | 21 ±5.98    | 21 ±4.98    |
| Relative growth rate (RGR)|           | 0.46 ±0.20  | 1.90 ±0.87  | 1.79 ±0.57  |
| C/N Ratio                 |           | 12          | 13          | 13          |

Means in the same row without a common letter are different at P<0.05.

3.2.1. **Plant height.** The taller plant indicates that its growth is getting better, as well as its production. The results of statistical analysis (Anova) showed that the P1 and P2 treatments had a significant effect (P<0.05) on plant height. Duncan's further test results showed that the treatment P0 (0.46) was significantly different from P1 (1.89) and P2 (1.79) while P1 and P2 were not significantly different. The results of this study are lower when compared to the research of [8], namely (0.70) with the treatment of 20 tons/ha of Panicum maximum. This is because of the utilization of nutrients by setaria plants so that they play a role in supporting the growth process, besides that several other factors such as the intensity of sunlight, water supply and temperature can also affect the growth of setaria grass. This is in accordance with what was stated by [5] that light intensity is one of the most important factors for plant growth. This statement agrees with [9], that sunlight is a very important climatic factor in photosynthesis because it acts as a source of energy in the plant growth process.

3.2.2. **Number of leaves.** The results of statistical analysis (Anova) showed that the addition of cuscus dung fertilizer had a significant effect (P<0.05) on the number of leaves. The results of this study are higher when compared with the research of [11], namely 92 leaves (strands) of Setaria splendidia grass with a dose of 40 grams/pot of horse feces organic fertilizer. This is because the treatment with the given dose of cuscus manure can be absorbed by the setaria grass, and the presence of these nutrients is able to support the photosynthesis process, resulting in an increase in the number of leaves. The results of the DMRT follow-up test showed that the P0 treatment was significantly different from the P1 and P2 treatments, but the P1 and P2 treatments were not significantly different or the same. The use of organic cuscus feces fertilizer in P1 and P2 treatments was able to help increase and enhance the absorption of nutrients in the soil in polybags so as to provide a different response to the number of leaves from the control. In addition, it can be said that the process of photosynthesis can run well, which is ideally what happens in a plant. In line with [4] the number of nutrients absorbed by plants will enhance the photosynthesis process so that more carbohydrates are produced by plants which will help the formation of plant stems and leaves.

3.2.3. **Number of tillers.** The number of tillers is one of the part that shows the growth and development of plants. The number of tillers also determines the high and low of the forage produced and has a role in terms of its function as forage. Based on the results of statistical analysis (Anova) showed that the organic fertilizer treatment of cuscus feces had a significant effect (P<0.05) on the number of tillers of setaria grass (Table 2).

This is because the dose of organic cuscus feces fertilizer given to the planting media has been utilized by plants to meet nutrient needs so as to increase the number of tillers. Fertilizers derived from manure contain a number of nutrients and organic matter that can improve the physical, chemical and
biological properties of the soil and provide nutrients N, P and K needed by plants. The statement agrees with Muhakha et al. (2013) if enough space for plant growth and nutrients is available in the soil according to plant needs, more and more new individuals will be formed.

3.2.4. Relative growth rate (RGR). The relative growth rate shows an increase in dry weight in a time interval and its relationship with initial weight [2]. RGR is also very important in determining the efficient use of energy in plants to grow at a certain time unit.

The results of statistical analysis (Anova) showed that the treatment had a significant effect (P<0.05) on the growth rate. The results of this study are lower when compared to the research of [8], which is 0.70 with a treatment of 20 tons/ha of Panicum maximum. It is suspected that the utilization of nutrient content by plants has not been maximized in supporting the growth process of setaria grass. Other several factors such as the intensity of sunlight, water supply and temperature can also affect the growth of setaria grass. This is in accordance with what was stated by [5] that light intensity is one of the most important factors for plant growth. This statement agrees with [9], that sunlight is a very important climatic factor in photosynthesis because it acts as a source of energy in the plant growth process.

Further Duncan's test results showed that the treatment P0 (0.46) was significantly different from P1 (1.89) and P2 (1.79) while P1 and P2 were not different. This is because the content of macro and micro nutrients contained in the organic fertilizer of cuscus feces is almost the same and the dosage is also the same so that it does not give a significant difference to the growth rate.

3.2.5. C/N Ratio. Based on table 2, the treatment of manure cuscus has significant than without fertilizer, namely for plant height, number of leaves, tiller, relative growth rate and C/N Ratio for the growing of Setaria spachelata in the first defoliation.

4. Conclusion
There were differences content in manure mineral among the types of fruit eaten as feed. Furthermore, its use on Setaria grass was able to increase its growth, namely plant height, number of leaves and number of tillers, the control treatment was significantly different from treatment P1 and P2 (P <0.05), but between P1 and P2 did not show significant. Plant height ranges from 35.10-39.10 cm, the number of leaves is 71-101, while the number of tillers is 13-21 tillers per polybag. The cuscus manure has the potential as organic fertilizer.

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