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THE EFFECT OF NITROGEN CONTENT IN ORGANIC FERTILIZER ON NUTRIENT CONTENT OF SORGHUM HYDROPONIC FOODER

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ABSTRAK

The hydroponic method could be used as a solution to overcome the difficulty of the availability and continuity of fodder. One of the fodder that can be developed using hydroponic method is sorghum. The purpose of this study was to evaluate the quality of hydroponic sorghum fodder as a feed alternative for ruminants. The treatment used in this study was the use of organic fertilizer as a nitrogen source which was derived from cow and goat manures. The treatments used in this study were P0: 36 ml EM4 + molasses, P1: 36 ml EM4 + molasses + cattle manure, and P2: 36 ml EM4 + molasses + goat manure. Each treatment consisted of 40 g of sorghum seeds. The fodder was harvested at 7, 14 and 21 days of age. The variables observed of this study were nutrient content, in vitro digestibility value, and gas production. Based on the results of the study, it could be concluded that the use of EM4 + molasses + cattle manure as a fertilizer provides the most optimum nutrient content, in vitro digestibility, and gas production of hydroponic sorghum fodder.

Keywords: *Sorghum, hydroponic fooder, nutrient content*

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INTRODUCTION

Hydroponics is a planting system that uses media other than soil. In this system, nutrient requirements are given through irrigation, which is known as fertigation. With the use of fertigation, the amount and concentration of fertilizer could be supplied according to the plant's requirement during growth until harvesting.

The application of this method requires good lighting conditions (sunlight), temperature, and humidity, as well as requires a tank and pump to recycle water so that this method is generally carried out in a greenhouse (Naik et al., 2013). The hydroponic planting method is an excellent method to increase fodder production because it is very easy and can be done at any time regardless of the season.

This method is also environmentally friendly because it does not damage the soil by not using pesticides and does not require large areas for farming (Saputro et al., 2018). Moreover, the use of this method could accelerate the growth of fodder up to 50%, with better productivity and quality (Ebenezer et al., 2018).

The increase in harvest age is beneficial to improve dry matter and organic matter contents. This result is influenced by an increase in the nutrient conversion obtained from water and seed deposits during the hydroponic cultivation.

The nutrient utilization of hydroponic fodder in the rumen could be identified by in vitro method. The in vitro feed evaluation techniques is beneficial to measure and predict the digestibility of feed ingredients, the effect of feed ingredients on fermentability in the rumen, and the effect of feed ingredients on rumen microbial growth (Kurniawati, 2007).

The total gas production value is a representation of in vitro feed substrate digestibility. This is because the substrate fermentation will produce gas directly (mostly in the form of CO2 and CH4) or indirectly (in the form of buffering volatile fatty acid).

MATERIAL AND METHODS

The materials used in this study were 360 g of white sorghum seeds (Numbu variety). The treatment of the planting method was the addition of organic solution consisting of EM4 (effective microorganism), a source of dissolved carbohydrates in the form of molasses, and various sources of nitrogen from manure (cattle and goats). The treatments used were P0: 36 mL EM4 + molasses, P1: 36 mL EM4 + molasses + cattle manure, and P2: 36 mL EM4 + molasses + goat manure.

Each treatment unit consisted of 40 g of sorghum seeds. The seeds were firstly soaked in 1 L of water (containing 1 mL of 20% sodium hypochlorite solution) for 20 minutes. After that, the seeds were cleaned with water and then soaked in water for 24 hours. During the experimental period, the fodder was sprayed twice daily. The fodder was harvested at 7, 14, and 21 days of age.

RESULT AND DISCUSSIONS

The nutrient content of hydroponic sorghum fodder including dry matter (DM), organic matter (OM), crude protein (CP), crude fiber (CF), and ether extract (EE). Table 1 shows the effect of organic fertilizer on the nutrient content of hydroponic sorghum fodder.

As can be seen in Table 1, hydroponic sorghum fodder with P1 treatment at 14 days of harvest age had DM content of 22.56%, while the best CP content was achieved at 21 days of harvest age. This result was consistent with Chrisdiana (2018) who reported that the increase in harvest age could increase DM and OM contents, which was influenced by the improvement of nutrient conversion obtained from water and seed deposits during cultivation. Fodder growth was strongly influenced by the availability of nutrients in the seed. The CP content of hydroponic sorghum fodder was increased along with the harvest age. In accordance with this finding, Chrisdiana (2018) also stated that CP content will increase with a longer cultivation period. It

was further explained that the increase in CP content was due to the decrease in the percentage of carbohydrate fraction used as plant food reserves during growth so that it could increase the CP content. Akbag et al. (2014) stated that the increase in CP content was due to the use of carbohydrate reserves during the germination process and growth during the assimilation process. In this study, the increase in EE content had the same mechanism as the increase in CP content. The EE content was associated with chlorophyll production which accompanies plant growth (Fazaeli et al., 2012).

Table 1. Effect of organic fertilizer on the nutrient content of hydroponic sorghum fodder

Treatment	Harvest age	Nutrient content				
		DM (%)	OM (%)*	CP (%)*	CF (%)*	EE (%)*
P0	7 days	29.48±0.60j	97.42±0.39j	14.86±0.48ab	4.67±0.72a	4.14±1.23a
P1	7 days	27.24±0.21i	96.33±0.19i	14.35±0.24a	5.65±1.25ab	4.16±0.38a
P2	7 days	25.76±0.30h	95.25±0.03h	15.05±0.25ab	5.43±0.44a	4.82±0.20a
P0	14 days	22.56±0.24g	95.11±0.39h	17.98±0.28de	11.05±0.80c	6.31±0.13b
P1	14 days	20.73±0.88f	94.29±0.29g	17.41±0.26cd	11.37±1.71c	6.29±0.36b
P2	14 days	18.86±0.72e	92.89±0.28e	18.59±0.36e	12.16±1.62c	6.52±0.30bc
P0	21 days	15.60±0.90d	92.83±0.22e	25.74±0.30i	19.81±1.73d	6.38±0.09bc
P1	21 days	13.41±0.43c	91.99±0.23d	23.81±0.59h	21.39±1.18d	6.73±0.21bc
P2	21 days	11.55±0.61b	91.13±0.20bc	21.79±0.13g	23.95±0.30e	7.47±0.12cde

Notes: *Based on 100% DM
Different superscripts indicate a highly significant difference (P<0.01)

In vitro digestibility value Table 2 shows the effect of organic fertilizer on dry matter and organic matter digestibility (DMD and OMD) of hydroponic sorghum fodder. The results showed that the digestibility value was correlated with the harvest age. The optimal DMD and OMD value was achieved at 7 days of harvest age. Based on the treatment of organic fertilizers, it can be seen that P1 gave a highly significant difference. The nutrient utilization of hydroponic fodder in the rumen can be identified by in vitro method. The in vitro feed evaluation technique could be used to measure and predict the digestibility of feed ingredients, the effect of feed ingredients on fermentability in the rumen, and the effect of feed ingredients on rumen microbial growth (Kurniawati, 2007).

Table 2. Effect of organic fertilizer on digestibility value of hydroponic sorghum fodder

Treatment	Harvest age	DMD (%)	OMD (%)
P0	7 days	83.99 ± 1.77^{j}	81.68 ± 1.23^{j}
P1	7 days	84.81 ± 1.60^{j}	82.19 ± 0.93^{k}
P2	7 days	82.35 ± 1.74^{ij}	80.55 ± 1.17^{ij}
P0	14 days	77.71 ± 0.88^{fg}	75.57 ± 1.26^{fg}
P1	14 days	79.65 ± 1.92^{gh}	76.24 ± 1.67^{gh}
P2	14 days	76.45 ± 1.04^{f}	73.58 ± 0.56^{f}
P0	21 days	67.51 ± 1.51^{cd}	65.55 ± 1.94^{cd}
P1	21 days	68.45 ± 1.38^{d}	66.66 ± 2.05^{d}
P2	21 days	65.43 ± 1.67^{c}	63.37 ± 1.95^{c}

Notes: Different superscripts within the same column indicate a highly significant difference (P<0.01)

CONCLUSIONS

According to the results of this study, it could be concluded that the use of EM4 + molasses + cattle manure as a fertilizer provides the most optimum nutrient content and in vitro digestibility of hydroponic sorghum fodder

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