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Feasibility of use of total mixed ration feed containing fermented trembesi leaves

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Abstract

This study aims to determine the level of fermented trembesi leaves in the Total Mixed Ratio (TMR) ration that can be given to ruminants. This research will be carried out at the Animal Feed Science Laboratory, Department of Animal Feed Nutrition, Faculty of Animal Husbandry, Gadjah Mada University for 5 months, from June 2022 to November 2022. This study determines the digestibility of forage using in vitro gas production measurements using the Menke and Steingass method with PEG administration. There are 8 treatment levels of adding tamarind leaves in TMR, namely To = TMR without fermented tamarind leaves, T1 = TMR containing fermented tamarind leaves (5%) of the total forage given, T2 = TMR containing fermented tamarind leaves (10%) of the total forage provided. given, T3 = TMR containing fermented tamarind leaves (15%) of the total fermented forage, T4 = TMR containing fermented tamarind leaves (20%) of the total given forage, T5 = TMR containing fermented tamarind leaves (25%) of the total forage given, T6 = TMR containing fermented tamarind leaves (30%) of the total given forage, and T7 = TMR containing fermented tamarind leaves (5%) of the total given forage. Each treatment was repeated 3 times. The data for the determination of the chemical composition were analyzed for variance using a completely randomized design (CRD) in a unidirectional pattern. If there is a significant difference as the effect of the treatment, it is continued with Duncan's new multiple range test (DMRT). The research concluded that the addition of fermented tamarind leaves up to 35% of the total mix ration (TMR) can be given to ruminants. and the best treatment on TMR containing trembesi leaves of 35% with a digestibility of BK of 26.31.

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Keywords

Trembesi leaves, Fermentation, Total mix ration

Introduction

In Indonesia, the population of trembesi trees (*Sammanea saman*) is quite large and evenly distributed. Trembesi trees are widely chosen for planting because they have a wide canopy making them ideal for reforestation. The trembesi tree was once one of

the commodities that the Government of Indonesia required to plant, because this tree has a strong ability to absorb groundwater, can absorb 28.5 tons/year of carbon dioxide and has roots that can symbiosis with rhizobium bacteria to fix nitrogen from the air.

Indonesian people have also used trembesi trees for a long time. The fruit is consumed by humans, the wood is used for furniture and the leaves are used as animal feed. The use of trembesi leaves as animal feed is notrecommended because they contain anti-nutritional saponins.

The research results showed that trembesi leaves contained 10.83% protein and 1.47% saponins [6]. The saponin content of trembesi leaves can be reduced by fermentation using microbes. Lactobacillus plantarumMut 7 which was added to the trembesi leaf fermentation process was able to reduce the saponin content to 0.22% [7] and increase its digestibility to 53.33% [8].

The presence of Lactobacillus plantarum has been isolated and identified from spoiled pasteurized cow'smilk waste [8] which is then used to ferment trembesi leaves and can reduce saponins up to 0.12% and has a digestibility of 56.78% [7]. The obstacle faced was that pasteurized cow's milk waste was not easy to obtain and required costs to buy it.

The digestive process of ruminants passes through 4 stomach compartments namely rumen, reticulum, omasum and abomasum. The first and main process of ruminant digestion is in the rumen. In the rumen, the feedwill undergo a fermentation process. The fermentation process cannot be separated from the role of microbes which we often call rumen microorganisms (MOR).

The types of bacteria contained in the contents of the rumen are acid-forming, lipolytic, amylolytic,proteolytic, and cellulolytic bacteria [9][2] stated that the total LAB in rumen content was influenced by the feed given (the ratio of forages and concentrates), bacterial composition and fermentation conditions in the rumen. The results of a study by [10] showed that the total viable LAB in the rumen contents of fistula-drenated.

Ongole crossbreed cattle after spray drying was 9.1 log CFU/ml (fresh rumen content) and 8.9 log CFU/ml. Research conducted by Winurdana [9], the addition of fresh rumen contents and carbohydrate sources additives (bran and cassava flour) resulted in a very rapid decrease in pH and resulted in high production of lactic acid.

From the description above, it is necessary to study the presence of bacteria in rumen waste that can be used as a fermenting agent for trembesi leaves (*Sammanea saman*) and its application to increase the productivity of ruminants. This study aims to determine the level of fermented trembesi leaves in the Total Mixed Ratio (TMR) ration that can be given to ruminants. This research is expected to provide complete information about the feasibility of using TMR with fermented trembesi leaves.

Method

This research was conducted at the Animal Feed Science Laboratory, Department of Animal Feed Nutrition, Faculty of Animal Husbandry, Gadjah Mada University for 5 months, from June 2022 to November 2022. This study determined the digestibility of forage using in vitro gas production measurements, [4] with PEG administration.

Material

The material in the form of forage TMR rations is presented in Table 1. The material was tested for digestibility using an in vitro gas test, with the addition of PEG, according to the weight of the sample. The composition of the nutrient content of the TMR used is presented in Table 2.

Samples (Table 1) were taken, 3 repetitions and each repetition weighed 300 g fresh condition then put into newspapers whose weight was previously known. The samples were then put into the oven at 55 °C for 4 days, and milled. Samples that were already in the form of mash were put into a syringe as much as 200 mg (BK) and added to the sample weight of polyethylene glycol (PEG). The addition of PEG as a binder of tannins contained in the forage can reduce the digestibility value of the forage. In vitro analysis of test gas according to [4] used rumen fluid taken from fistula cattle fed king grass (*Pennisetum hybrid*) and wheat pollard.

Table 1. Rations to be evaluated for feasibility

No	TMR code	Information
1	T1	TMR (TMR= Total Mixed Ration), without fermented trembesi leaves
2	T2	TMR contains fermented trembesi leaves (5%) of the total forage given
3	T3	TMR contains fermented trembesi leaves (10%) of the total forage given
4	T4	TMR contains fermented trembesi leaves (15%) of the total forage given
5	T5	TMR contains fermented trembesi leaves (20%) of the total forage given
6	T6	TMR contains fermented trembesi leaves (25%) of the total forage given
7	T7	TMR contains fermented trembesi leaves (30%) of the total forage given
8	T8	TMR contains fermented trembesi leaves (35%) of the total forage given TMR

Table 2. Composition of treatment ration

	Composition (gr) BB					BK	Protein	LK	SK	BETN	TDN	
Perl	RG	DT	DP	AT	TG	(%)	(%)	(%)	(%)	(%)	(%)	(gr)
T1	1000	0	100	300	100	24.51	10.17	2.09	21.05	55.40	69.41	874.52
T2	1000	50	100	300	100	24.67	10.97	2.04	22.36	53.45	69.05	893.93
T3	1000	100	100	300	100	25.32	14.18	1.81	27.62	46.43	68.29	991.22
T4	1000	150	100	300	100	24.95	12.39	1.94	24.69	50.44	68.79	932.87
T5	1000	200	100	300	100	25.08	13.03	1.89	25.73	49.01	68.62	952.32
T6	1000	250	100	300	100	25.21	13.62	1.85	26.71	49.68	68.45	971.77
T7	1000	300	100	300	100	25.32	14.18	1.81	27.62	46.43	68.29	991.22
T8	1000	350	100	300	100	25.43	14.70	1.78	28.48	45.27	68.15	1010.67

Observed variable

The variables measured in this study were the chemical composition of the TMR, the digestibility of organic matter, and the digestibility of TMR dry matter and metabolizable energy (ME).

Data analysis

The data for the determination of chemical composition were analyzed for variance using one-way completely randomized design (CRD) analysis. If there is a significant difference as an effect of the treatment, it is continued with Duncan's new multiple range test (DMRT) [1].

Results and discussion

From the research conducted, the following results were obtained. The purpose of this study was to determine the level of fermented trembesi leaves in the Total Mixed Ratio (TMR) ration that could be given to ruminants. From Table 3 it is known that the chemical composition of TMR made has a fairly good nutritional content with crude protein content between 15-23%, a fairly high BK above 89%, high crude fiber between 30-35% which is quite good given to ruminants.

According to [5], feeding will be more efficient if it is given in the form of TMR, which is a mixture offeed that contains all the nutrients needed by livestock and is given as the only feed without additional feed. Thetotal mix ratio has the advantage that it can be stored for a long time.

Digestibility of feed is part of the nutrients that are absorbed by the animal's body from nutrients that arenot excreted in the form of feces. The results of the digestibility of feed nutrients in the study can be seen in Table 4.

Table 3. Chemical composition of TMR containing fermented trembesi leaves

Perl	KA	BK	BO	PK	LK	SK	Abu	BETN
T1	8.56a	91.44b	94.79a	15.90a	2.25a	32.42b	5.27b	44.14c
T2	9.35a	90.65b	95.42a	16.96a	2.09a	35.27c	4.57a	41.09b
T3	9.16a	90.84b	94.57a	18.71b	3.12b	34.34c	5.42c	38.40a
T4	9.24a	90.76b	95.56a	19.22b	1.85a	33.53b	5.34c	40.04b
T5	9.34a	90.66b	94.78a	20.36b	3.04b	30.07a	5.21b	41.31b
T6	10.21b	89.97a	95.13a	22.76c	2.91b	32.36b	4.86a	37.09a
T7	10.08b	89.92a	94.98a	23.96c	2.79b	31.58a	5.01b	36.64a
T8	9.91b	90.09a	95.22a	21.64c	2.82b	31.09a	4.78a	39.65b

Table 4. Digestibility of BK and BO digestibility and metabolized energy TMR

Treatment	KcBO	KcBK	ME
T1	32.15c	27.05c	2414.35b
T2	30.88c	26.14c	169763a
T3	27.16b	20.71a	2379.12b
T4	24.30a	19.23a	2354.82b
T5	22.92a	18.53a	2534.64b
T6	28.08b	20.53a	2459.91b
T7	28.27b	21.58b	2476.81b
T8	33.06c	26.31c	2503.57b

Table 4 shows that the highest BK digestibility was found at T8, namely 33.06 and the BO digestibility was at T1, namely 27.05, but the BO digestibility at T1 and T8 was not significantly different. This shows that the use of TMR feed containing fermented trembesi leaves is appropriate for ruminants with sufficient digestibility.

According to [5] that the factors that affect digestibility in terms of feed, digestibility is influenced by the treatment of feed (processing, storage and method of administration) type, amount and composition of feed given to livestock. This was also reinforced by [9] that the factor affecting the digestibility value of dry matter rations is the level of proportion of feed ingredients in the ration.

In the TMR used, the use of forage is quite high, namely 60%, forage which is a source of easily digestible carbohydrates will more quickly increase rumen microbial synthesis so that it will increase the digestibility of dry matter and organic matter. The higher the microbial development, the higher the microbial activity in digesting feed. According to [3] that the increase in digestibility is caused by an increase in the bacterial population in the rumen. The more feed ingredients that can be digested, the faster the feed flow rate from the rumen to the next digestive tract so that the space in the rumen for additional feed consumption tends to increase.

Conclusion

The addition of fermented tamarind leaves up to 35% of the Total mix ration (TMR) can be given to ruminants. The best treatment for TMR containing Trembesi leaves was 35% with a BK digestibility of 26.31.

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