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Utilization of Nutrition and Performance of Local Male Goats Given Concentrate Containing Fermented Cow Rumen Content Waste

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ABSTRACT: The aim of the research was to determine the effect of feeding concentrates containing fermented cow rumen waste on the consumption and digestibility of dry matter, organic matter, nitrogen, NDF and ADF of local male goats. This research was conducted for 5 months using 20 local male goats aged 8-10 months with an average body weight of 11.71 kg and CV 12%. This experimental research used a completely randomized design with 4 treatments and 5 replications. The treatment is as follows P0: Kume grass 70% + concentrate 30% (without fermented cow rumen contents); P10: kume grass 70% + concentrate 30% (concentrate contains fermented cow rumen contents); P20: kume grass 70% + concentrate 30% (concentrate contains 20% contents of fermented cow rumen); P30: kume grass 70% + concentrate 30% (concentrate contains 30% contents of fermented cow rumen). The results of the variance analysis showed that the treatment had no significant effect of $p>0.05$ on the consumption and digestibility of dry matter, organic matter, nitrogen, NDF and ADF in local male goats. The conclusion of this research is that concentrate supplementation containing fermented cow rumen waste up to a level of 30% gives relatively the same effect between each treatment on the consumption and digestibility of dry matter, organic matter, nitrogen, NDF and ADF of local male goats.

KEYWORDS: cow rumen waste, concentrate, consumption, digestibility, local male goats

INTRODUCTION

Feeding concentrates will stimulate the growth of the rumen epithelium, which means the dimensions of the rumen papillae and reticulorumen are larger, resulting in a larger rumen surface for the absorption of nutrients consumed by livestock. This impact is largely caused by increased production of butyrate and propionate when fermentable starch is consumed in rumen increases [1]. However, high concentrate consumption also has many negative impacts on rumen structure and function, including negative impacts on the barrier function of the rumen epithelium and decreased fiber digestion efficiency [2] negative impacts of high concentrate consumption on rumen structure and function is generally caused by a decrease in rumen pH [3], while the possible contribution of changes in the proportion of fatty acids produced above is generally not considered an important factor [4].

Concentrate supplementation in a ruminant farming business is a necessity, especially in the growth phase for local goat livestock on Timor Island, East Nusa Tenggara Province (ENT) with a traditional extensive rearing system, compounded by the availability of feed which fluctuates following seasonal changes, thus affecting productivity. goat farming. The use of concentrates can have an impact on increasing production costs, in this case the cost of rations, and this will have an impact on the level of income of farmers and breeders so that concentrate technology will be ignored and will not be adopted by farmer breeders, even though it will have an impact on achieving long livestock rearing times. long. to achieve slaughter weight and selling weight.

Seeing this problem, a solution is needed to produce concentrate feed that is low cost but has the nutritional value needed by livestock to increase their productivity. One type of waste that can be utilized is slaughterhouse waste (RPH) in the form of cow rumen contents. This waste has not been utilized optimally as a feed ingredient so it is left to dry around the slaughterhouse and pollutes the surrounding environment. The nutritional content of the rumen contents is 9.737% crude protein, 5.829% fat, 23.983% crude fiber, 13.915% ash and 9.086% air. Considering the weaknesses of the rumen contents, namely its distinctive odor and high fiber content, it is necessary to process it by fermentation in order to meet the criteria as a constituent of concentrate feed, so that a crude protein content of 14.647%, fat 10.524%, crude fiber 19.284% is obtained. %, ash 10.893% and air 3.924% (Results of FPKP Feed Chemistry Laboratory analysis 2023). The number of microbes in the rumen contents of cattle varies, including: proteolytic microbes 2.5×10^9 cells/g rumen contents, cellulolytic microbes 8.1×10^4 cells/gram rumen contents, amylolytic 4.9×10^9 cells/g contents, acid-forming

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microbes 5.6 x 10^9 cells/g content, lipolytic microbes 2.1 x 10^{10} cells/g content and lipolytic fungi 1.7 x 10^3 cells/g content. These microorganisms can digest starch, sugar, fat, protein and non-protein nitrogen to form microbes and B vitamins.

So far, the use of cow rumen contents as feed has been applied to cattle as reported by [5], the use of fermented cow rumen contents as a concentrate feed mixture at the 20% level provides energy digestibility of around 71.14 ± 1 .20-72.33 ± 3.58% and [6] using the same level produces daily weight gain in fattening Bali cattle of 0.44 ± 0.04 kg/e/h with ration conversion of 9.71 ± 0.67 and efficiency of 10.34 ± 0.74%. Seeing these results, in this study, we hypothesized that not only cattle can utilize rumen content waste as feed, but goat livestock can also utilize rumen content waste, considering that both types of livestock are both ruminants, even though livestock Goats have high food selection characteristics. Therefore, this study aims to determine the effect of giving concentrate feed containing fermented cow rumen waste on the consumption and digestibility of dry matter, organic matter, nitrogen, NDF and ADF of local male goats.

RESEARCH MATERIALS AND METHODS

This research was carried out in the goat livestock pen of the Field Laboratory of the Faculty of Animal Husbandry, Maritime Affairs and Fisheries, Nusa Cendana University for 2 months. The livestock used were 20 local male goats, aged 8-10 months, with an average body weight of 11,713 kg and a CV of 12%. The feed used consists of forage kume grass and concentrate with the addition of rumen content at the level as shown in the treatment. This research was carried out experimentally using a Completely Randomized Design (CRD) consisting of 4 treatments and 4 replications. The treatment is as follows:

P0 : Kume Grass 70%+Concentrate 30% (without from contents of cow rumen fermentation)
P10 : Kume Grass 70%+Concentrate 30% (concentrate contains 10% contents of cow rumen fermentation)
P20 : Kume Grass 70%+ Concentrate 30% (concentrate contains 20% contents of cow rumen fermentation)
P30 : Kume Grass 70%+ Concentrate 30% (concentrate contains 30% contents of cow rumen fermentation)

Meanwhile, feeding is based on a dry matter requirement of 4% of body weight with a ratio of 70% grass and 30% concentrate containing fermented rumen contents. The percentage of ingredients making up the concentrate and the nutritional content of the research ration are presented in tables 1 and 2.

Table 1. Percentage of Concentrate Composing Materials (%)

Feed Ingredients	Treatment			
	P0	P10	P20	P30
Rice Bran	40	35	30	25
Pollard	30	27,5	25	22,5
Fine corn	25	22,5	20	17,5
Fish Meal	5	5	5	5
contents of cow rumen, fermentation	0	10	20	30
Amount	100	100	100	100

Table 2. Nutrient Content of Research Rations

Feed Ingredients	Nutritional Composition						
	DM (%)	OM (%DM)	CP (%DM)	CF (%DM)	TDN (%DM)	NDF	ADF
Shorghum plumosum Var. Timorense (kume grass)	61,791	91,280	9,400	28,100	62,031		
concentrate	88,253	87,830	14,187	10,360	70,312		
contents of cow rumen, fermentation	96,076	89,107	14,647	19,284	61,470		
P0	69,730	90,245	10,836	22,778	64,515	55,059	25,127
P10	69,964	90,283	10,850	23,046	64,250	57,461	25,339

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P20	70,199	90,322	10,864	23,314	63,985	58,582	26,327
P30	70,434	90,360	10,878	23,581	63,720	59,254	26,557

Note: Analysis of Feed Chemistry Laboratory Results, Faculty of Animal Husbandry, Marine and Fisheries, Nusa Cendana University (2023), DM; dry matter, OM; Organic Matter, CP; Crude Protein, CF; Crude Protein, TDN; Total Digestible Nutrient, NDF; Neutral Detergen Fiber, ADF; Acid Detergen Fiber.

Data analysis

Data analysis was carried out according to the Analysis of Variance (ANOVA) Completely Randomized Design procedure to determine the effect of treatment on variables. If there is a real effect then proceed with Duncan's multiple range test to test the differences between treatments using the SPSS Statistics Version 26 application.

RESULTS AND DISCUSSION

Results

The results of the analysis of variance showed that the use of fermented rumen contents in concentrate feed did not have a significant effect of p.>0.05 on the consumption of dry matter, organic matter, nitrogen, NDF, ADF of Local Male Goat. Data on the mean nutritional consumption of research goats is presented in Table 3.

Table 3. Mean Nutrient Consumption of Local Male Goats

Parameter (g/ekor/hari)	Treatment				P-Value
	P0	P10	P20	P30	
Dry Matter	335,887±57,355	318,373±30,613	285,488±51,625	284,065±44,726	0,260 ^{ns}
Organic Matter	314,918±70,810	296,531±33,183	264,194±48,172	256,030±53,266	0,290 ^{ns}
Nitrogen	5,910±1,226	5,619±0,628	5,163±0,907	5,094±1,003	0,510 ^{ns}
NDF	208,168±51,425	228,838±25,709	201,726±37,679	194,950±41,663	0,570 ^{ns}
ADF	114,314±27,163	108,033±12,155	95,225±17,901	93,079±16,695	0,280 ^{ns}

Note: ^{ns} no significant effect p>0.05

P0 : Kume Grass 70%+Concentrate 30% (without from contents of cow rumen fermentation)
P10 : Kume Grass 70%+Concentrate 30% (concentrate contains 10% contents of cow rumen fermentation)
P20 : Kume Grass 70%+ Concentrate 30% (concentrate contains 20% contents of cow rumen fermentation)
P30 : Kume Grass 70%+ Concentrate 30% (concentrate contains 30% contents of cow rumen fermentation)

Meanwhile, the nutrient digestibility variable, based on the results of variance analysis, did not have a significant effect of p>0.05 on the digestibility of dry matter, organic matter, nitrogen, NDF, ADF of Local Male Goat. Data on the mean nutritional digestibility of research goats is presented in Table 4.

Table 4. Mean Nutrient Digestibility of Local Male Goats

Parameter (%)	Treatment				P-Value
	P0	P10	P20	P30	
Dry Matter	57,792±1,995	58,831±2,368	58,999±8,856	56,733±6,864	0,92 ^{ns}
Organic Matter	60,909±2,024	61,970±2,485	62,301±8,576	60,252±6,667	0,94 ^{ns}
Nitrogen	65,285±3,049	69,012±4,520	66,296±7,018	67,147±7,496	0,78 ^{ns}
NDF	62,036±2,056	62,026±2,622	60,642±10,010	59,962±5,714	0,93 ^{ns}
ADF	47,850±1,582	48,073±2,609	46,773±12,355	44,150±7,739	0,83 ^{ns}
Neraca Nitrogen	1,609±0,645	1,638±0,775	1,552±0,655	1,615±0,865	0,99 ^{ns}

Note: ^{ns} no significant effect p>0.05

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Discussion

Dry Matter Consumption

Feed that has good physical qualities such as aroma, taste and texture will increase palatability so that it can stimulate livestock to increase consumption and nutrients for body tissue synthesis. The nutritional content, especially protein and energy, will also greatly influence palatability. The results of the variance analysis showed that the treatment had no significant effect (P>0.05) on Dry Ingredient consumption. Factors that influence feed consumption are palatability, crude protein content, body weight, retention time of organic matter in the rumen and the physiological condition of the animal [8]. In this study, contents of cow rumen fermentation were used in concentrate as a treatment given in the same mesh shape as the other concentrate feed forms and the nutritional value of each treatment was relatively the same, especially in terms of dry matter content. The palatability value of contents of cow rumen fermentation in this study is the same as other concentrate ingredients so that the higher supplementation of fermented cow rumen content has no effect on the dry matter consumption of goats. Dry matter consumption ranged from 284,065 to 335,887 grams/head/day. Nutrient requirements for goats weighing 10 to 12 kg are dry matter between 320-432 g/d [8].

Organic Matter Consumption

Organic materials are closely related to dry materials because organic materials are part of dry materials [9]. If the level of dry matter consumption in livestock is low, organic matter consumption will also be low. Thus, it can be understood that livestock organic material consumption follows the habit of consuming dry material every day. The results of the analysis of variance showed that the treatment had no significant effect (P>0.05) on organic material consumption. Consumption of dry matter from contents of cow rumen fermentation in concentrate has no effect, so consumption of organic matter also has no effect. Organic matter consumption and dry matter consumption are interconnected because feed ingredients based on their chemical composition are divided into organic matter and ash. [10] organic material is material that is lost during combustion and is related to the compounds contained in feed (PK, LK, SK and BETN). If the level of dry matter consumption in livestock is low, this will be followed by a low level of organic material consumption and vice versa.

Nitrogen Consumption

Nitrogen consumption follows the pattern of protein consumption. An increase in crude protein consumption will be followed by an increase in nitrogen consumption, and vice versa, this is because one of the constituent elements of crude protein is nitrogen [10]. The results of the varince analysis showed that the treatment had no significant effect (P>0.05) on nitrogen consumption. These results were influenced by the large crude protein content in the concentrate which contained almost the same contents of cow rumen fermentation, namely 14.187% and 14.647% (Table 2). The treatment ration also had almost the same crude protein value (iso-protein), namely 10.836% - 10.878% (Table 2) so that the nitrogen consumption value did not have a significant influence. Crude protein is composed of the element nitrogen, thus increasing the consumption of crude protein in the ration can increase nitrogen consumption. According to [11] stated that increasing protein consumption is influenced by the protein content in the feed, namely the higher the protein content, the more protein consumed.

Consumption of Neutral Detergent Fiber (NDF)

NDF has a high correlation with the amount of forage consumed by livestock [12]. The higher the NDF, the lower the quality of forage for livestock. The NDF content in feed is bulky and will require more space in the rumen, ultimately reducing consumption. NDF represents the cell wall content which consists of lignin, cellulose, hemicellulose and proteins that bind to the cell wall. The results of the analysis of varince showed that the treatment using contents of cow rumen fermentation in concentrate had no significant effect (P>0.05) on NDF consumption. contents of cow rumen fermentation is feed that has been degraded by microbes, especially the complex value of feed fiber so that nutrients from rumen contents are more available and easily digested so that higher supplementation of fermented cow rumen contents does not have an effect on NDF consumption. [13] stated that the NDF content in feed can influence NDF consumption in livestock. According to [14] it is reported that the NDF content can influence consumption levels through physical influences, so that it can be used as a variable in predicting consumption.

Palatability factor is a factor that influences consumption levels. The higher supplementation of contents of cow rumen fermentation in concentrate does not affect palatability. Fermentation by anaerobic bacteria will produce organic acids, thus forming lactic acid, which will eventually remove the unpleasant odor from the rumen contents. [7] Factors that influence consumption levels include the appearance and shape of food, aroma, taste, texture and environmental temperature. [15] stated that in the fermentation process anaerobic bacteria actively work and produce organic acids so that lactic acid can form and produce a sour aroma.

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Consumption of Acid Detergent Fiber (ADF)

Acid Detergent Fiber (ADF) can be used to estimate the dry matter digestibility and energy of animal feed. Acid Detergent Fiber (ADF) is determined using an acid detergent solution, where the residue consists of cellulose and lignin [12]. The results of the varince analysis showed that the supplementation treatment, namely cow rumen fermentation in concentrate, had no significant effect (P>0.05) on ADF consumption.

Feed consumption by ruminants is influenced by the nutrition and digestibility of the cell walls of the feed provided. The ADF content had no effect also because the ADF content in the treatment rations was almost the same, namely P0 33.312%, P1 33.393%, P2 33.671% and P3 33.740% (Table 2). If the feed given to livestock has a relatively homogeneous or similar ADF content, then the difference in ADF consumption is not clearly visible. Local male goats also adapt easily to feed and can adjust consumption patterns based on feed availability and nutritional needs. If the difference in ADF content is not large enough, livestock do not show significant changes in consumption. Feed palatability is also an influence, the contents of cow rumen fermentation have similar palatability values to the ingredients that make up the treatment concentrate, so ADF consumption may not show a big difference. Feed palatability is often the main factor in determining how much feed is consumed by livestock. [13] ADF content in feed can influence ADF consumption in livestock. ADF is part of crude fiber which consists of lignin and silica, while NDF consists of cellulose, hemicellulose and cell wall proteins.

Digestibility of dry matter

Digestibility of feed ingredients is the process of breaking down feed both physically and chemically which occurs in the digestive tract. Digestibility indicates the initial availability of nutrients contained in feed ingredients. [16] stated that high digestibility will determine the amount of nutrients that can be utilized to meet basic living needs and growth. The results of the varince analysis showed that the supplementation treatment, namely cow rumen fermentation in concentrate, had no significant effect (P>0.05) on dry matter digestibility.

The dry matter digestibility coefficient produced in this study could be caused by the consumption of relatively the same dry matter per treatment so that nutrients were available in the same quantities for use by the goats. The length of stay of feed in the rumen is also one of the factors that influences livestock digestion. The nutritional balance of protein and energy is sufficient for livestock needs and the particle size of the ration is uniform from the feed treatment. [17] the level of consumption of good quality food is higher and the quality of the feed is relatively the same, so the level of consumption is also no different. [18] added that feed degradation in the rumen is influenced by rumen microbes, microbial growth, the length of time the feed is in the rumen and the particle size of the feed consumed by livestock.

Digestibility of Organic Materials

Digestibility of organic matter is a parameter that shows the quality of feed digested by the body. The digestibility of organic matter shows the amount of nutrients such as fat, carbohydrates and protein that can be digested by livestock. Factors that influence the digestibility of organic materials are the crude fiber and mineral content of feed ingredients. The digestibility of organic matter is related to the digestibility of dry matter because some dry matter consists of organic matter. The results of the analysis of variance showed that the supplementation treatment, namely cow rumen fermentation in concentrate, had no significant effect (P>0.05) on the digestibility of organic matter. The digestibility value of organic matter is closely related to the dry matter of the ration. Dry materials consist of organic materials and inorganic materials. The largest part of dry matter is organic matter, which includes components such as proteins, fats and carbohydrates. Dry cow rumen contents have a high value and are easier to digest due to the initial degradation process by rumen microbes, which produces proteins, fats and carbohydrates in simpler and more easily absorbed forms. The fermentation process during feed making also increases the digestibility of organic materials, producing efficient and high-value feed for livestock. [9] states that increasing the digestibility of organic matter is in line with increasing the digestibility of dry matter so that factors that influence the high and low levels of dry matter will influence the high and low levels of organic matter. The level of feed digestibility can determine the quality of the ration consumed. The difference between the substance content in the ration eaten and the food substances excreted or in the feces is the digestibility of the feed.

The digestibility value of organic materials tends to be higher than the digestibility of dry materials, this is because dry materials still contain ash, whereas organic materials do not, so ash-free materials are relatively easier to digest. [19] ash content slows down or inhibits the digestion of the dry matter of the ration. Factors that influence digestibility are feed treatment (processing, storage and method of administration), type, quantity and composition of feed given to livestock. The contents of the contents of cow rumen

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fermentation organic material in the form of protein, fat and simpler carbohydrates which can be more easily digested and absorbed by the digestive system. During fermentation, certain enzymes break down indigestible substrates such as cellulose and hemicellulose, and into simple sugars for easy digestion

Nitrogen Digestibility

The digestibility of nutrients in the ration is a measure of the ability of livestock to meet basic needs, growth and production. Supplementation of concentrate feed increases the availability of energy and nitrogen needed for rumen microbial activity. Some of the nitrogen that enters the body is retained and some is excreted through feces. The less nitrogen is wasted through feces and urine in the same nitrogen consumption, the more nitrogen is stored in the animal's body as suspended nitrogen.

The magnitude of the nitrogen balance shows the effectiveness of nitrogen use by livestock. The results of the analysis of variance showed that the supplementation treatment, namely cow rumen fermentation in concentrate, had no significant effect (P>0.05) on nitrogen digestibility. This is because the crude protein content of the rations of all treatments is the same (iso-protein), namely 10.83-10.87% (Table 2) and the level of nitrogen consumption is the same in each feed treatment, because nitrogen comes from protein so that if the protein content of the ration all treatments are the same, then nitrogen digestibility will show the same results. The protein content of feed ingredients and the amount of protein entering the digestive tract contribute to the level of nitrogen digestibility. In addition, the higher the consumption of crude protein, the higher the activity of rumen microbes in digesting nutrients. Thus, the higher the feed protein consumption, the more nitrogen is absorbed and the rumen microbes hydrolyze all the protein from the feed. [10] stated that the factors that influence crude protein digestibility are feed composition, feed preparation, livestock factors and the amount of feed consumed. [20] state that protein digestibility depends on the amount of protein content in the feed.

Digestibility of Neutral Detergent Fiber (NDF)

NDF digestibility is used to measure the nutritional absorption of feed ingredients in livestock. [21] stated that measuring the digestibility of feed ingredients is an effort to determine the amount of nutrients from a feed ingredient that are degraded and absorbed in the digestive tract, the results of which will be known by looking at the difference between the amount of nutrients consumed and the nutrients excreted in feces. The results of the varince analysis showed that the supplementation treatment, namely cow rumen fermentation in concentrate, had no significant effect (P>0.05) on the digestibility of NDF. This is caused by various factors which include similarities in feed composition, especially protein and fiber content, feed particle size, feed retention time in the rumen and environmental conditions. Crude protein consists of two categories: proteins that are easily degraded (Rumen Degradable Protein) and proteins that are not degraded (Rumen Undegradable Protein). Degraded RDP functions to produce ammonia, which is used by microbes to produce nitrogen for microbial protein synthesis and a smaller crude fiber content can increase digestibility because rumen microbes will more easily digest feed. [22] stated that high protein content in feed ingredients can cause ammonia concentration and pH in the rumen to increase. [22] said that the lower the fiber component, the less energy the microbes need to digest cellulose, hemicellulose and lignin so that this can increase digestibility. The rumen pH value in this study ranged from 6.3-6.5, this indicates higher cellulolytic and hemicellulolytic bacterial activity, which will increase fiber digestibility. [24] stated that at pH 5.5–6.2 the activity of cellulolytic and hemicellulolytic bacteria will be inhibited and the activity of amylolytic bacteria will increase so that fiber digestibility decreases; conversely, at pH 6.2–7.0 the activity of cellulolytic and hemicellulolytic bacteria will increase and be more dominant than the activity of amylolytic bacteria so that fiber digestibility increases.

Digestibility of Acid Detergent Fiber (ADF)

Acid detergent fiber (ADF) can be used to estimate the dry matter digestibility and energy of animal feed [12]. The higher the ADF content in the feed consumed by livestock, the lower the digestibility of the feed. The results of the varince analysis showed that the supplementation treatment, namely cow rumen fermentation in concentrate, had no significant effect (P>0.05) on the digestibility of ADF. ADF digestibility was not affected because all feed treatments contained almost the same crude fiber of 22.778-23.581% (Table 2). In this study, the content of the treated SK feed was almost the same so that the digestibility of the ADF produced was not significantly different. High feed digestibility and a faster flow rate of feed out of the rumen make the rumen empty more quickly, which results in increased consumption. [10] added that the speed and level of feed degradation can influence feed consumption because it is related to the length of time the feed stays in the rumen. The digestibility of each feed ingredient or ration is influenced by the animal species, the physical form of the feed, the composition of the feed ingredient or ration, and the level of feeding [25]. Higher feed protein content will also affect the digestibility of ADF. Protein feed will increase the development and

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activity of rumen microbes. Increased rumen microbial activity causes ADF digestibility to increase. The treatment feed given to goats has almost the same value (iso-protein), namely 10.83-10.87% (Table 2). High levels of protein in feed will also cause high digestibility [26]. The digestibility of ADF is lower than NDF, because the ADF part no longer contains hemicellulose which has a high enough digestibility value.

CONCLUSION

The conclusion of this research is that concentrate supplementation containing fermented cow rumen waste up to a level of 30% gives relatively the same effect between each treatment on the consumption and digestibility of dry matter, organic matter, nitrogen, NDF and ADF of local male goats.

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