The biological quality of multinutrien blocks with the addition of green betel leaf juice in terms of feed intake and digestibility in Jawarandu goats

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Abstract

Multinutrient block is an intermediate moisture feed product that can facilitate bacterial growth so that it can reduce its quality. The addition of betel leaf has the aim of inhibiting the growth of bacteria. This study aims to examine the biological quality of multinutrient blocks with the addition of betel leaf juice in terms of feed intake and digestibility of dry matter and organic matter. This study used a completely randomized design with 4 treatments. Each treatment consisted of 3 replications; T0:Basal feed, T1:Basal feed+multinutrient block+0% betel leaf juice, T2:Basal feed+Multinutrient block+3% betel leaf juice, T3:Basal feed+multinutrient block+6% betel leaf juice. The parameters observed were feed intake and digestibility of dry matter (DMD) and organic matter (OMD). The data obtained were analyzed using analysis of variance, if there is a significant effect, it is continued with Duncan's test. The results showed that there was no significant effect of treatment on feed intake and digestibility and had a significant effect ($P<0,05$) on OMD per metabolic body weight. The conclusion of the study was that the addition of betel leaf juice to the multinutrient block did not interfere with feed intake and digestibility and even increased OMD per metabolic body weight.

Keywords: digestibility, feed intake, green betel leaf, multinutrient block

Introduction

The problem that is often encountered in the provision of feed in Indonesia is the low quality of feed so that it affects the available nutrient content. Lack of nutrients in feed will disrupt the body's metabolic processes and reduce livestock productivity [1]. Ruminants such as goats are usually given a diet consisting of forage and concentrates. The provision of forage is obtained directly from nature and if found on land that is less fertile or lacks mineral elements, it will cause forage to lack minerals [2]. The dry season is also a problem that causes forage production to decline, so that the amount of feed given to goats will decrease. The solution to this problem is to do nutrient supplementation. Good nutritional supplementation is energy, protein, vitamins and minerals.

Feed processing technology in the form of Multinutrient Block (MNB) is a good solution as a complementary feed or feed supplement containing energy, protein, vitamins and minerals. The water content in MNB reaches 24.46% so that it can be classified as an Intermediate Moisture product, which has a water content of 10-40% and the value of water activity ranges from 0.6 to 0.9 [3]. High water content in materials and products is known to accelerate the occurrence of damage by microorganisms. Decrease in feed quality due to bacterial or mold growth can be prevented by adding antibacterial and anti-mold ingredients. Green betel leaf as an antibacterial material and can be used as a natural preservative as if it does not reduce the physiological condition of livestock. Green betel leaf contains essential oils that are antibacterial with the main components being phenolic compounds and phenolic derivatives (eugenol and kavikol) [4]. The addition of green betel leaf has the aim of inhibiting the growth of bacteria and molds in MNB so that the quality of MNB will be maintained, especially important nutrients for goat livestock needs.

New feed products such as MNB before being given to livestock require testing to find out how the impact is given. Tests on MNB with the addition of green betel leaves that have been carried out are physical, microbiological and chemical tests. Physical tests conducted by Alexander et al. [5] stated that the addition of green betel leaves to MNB did not affect the hardness, color and texture values but could increase the aroma value in MNB. The microbiological test conducted by Pujaningsih et al. [6] stated that the addition of green betel leaf to MNB could reduce the total bacteria and total mold during a storage period of 40 days. Chemical tests conducted by Pujaningsih et al. [7] stated that the addition of betel leaf juice reaching 6% could increase the flavonoid content in MNB. Biological feed testing on MNB with the addition of green betel leaf has not been studied.

The purpose of this study was to examine the biological quality of MNB with the addition of betel leaf juice in terms of feed intake and digestibility of dry matter and organic matter. The benefit of the research is to obtain information about the importance of giving natural preservatives in the form of betel leaf to the MNB in the basal ration of Jawarandu goats. The established hypothesis was that supplementary feeding in the form of MNB with the addition of green betel leaf juice to the basal ration of Jawarandu goats did not interfere with the feed intake and digestibility of dry matter and organic matter.

Materials and Methods

The research entitled "The Biological Quality of Multinutrient Blocks with Addition of Green Betel Leaf Juice in the Terms of Feed Intake and Digestibility in Jawarandu Goats" was conducted from October to December 2020 at the Goat Cage, Feed Technology Laboratory, Faculty of Animal Husbandry and Agriculture, Diponegoro University, Semarang. Analysis of dry matter and organic matter samples was carried out at the Nutrition and Feed Science Laboratory, Faculty of Animal Husbandry and Agriculture, Diponegoro University, Semarang.

Materials

The material used in this study were 12 male Jawarandu goats aged 6 months with an average initial body weight of about 11.06 ± 1.1 kg. The materials used for the manufacture of MNB are molasses, fermented rice straw, salt, shellfish flour, urea and bentonite as well as the addition of betel leaf juice made from green betel leaf and aquades. The materials used for rice fermentation were rice straw, EM4, rice bran and water and 0.2 N HCl for the total collection. Basal feed given to livestock consisted of concentrate consisting of coconut meal, cassava starch, rice bran, pollard, coffee bean shell and soybean meal with a crude protein content of 13.13% and TDN 68.7% and field grass.

The tools used consisted of a mold with a diameter of 8 cm and a thickness of 4 cm, plastic packaging, juicer, mixer, grinder, fermenter, analytical scale, sanitation equipment, sprayer and a series of tools to collect feces.

Methods

The research design used in this study was a completely randomized design (CRD). Goats were given 4 treatments with 3 replications. The treatment given is as follows.

TO : Basal feed (forage and concentrate)
T1 : Basal feed + (MNB + 0% green betel leaf juice)
T2 : Basal feed + (MNB + 3% green betel leaf juice)
T3 : Basal feed + (MNB + 6% green betel leaf juice)

The research was conducted through 4 stages consisting of preparation, adaptation stage, treatment stage and data collection and analysis stage.

The preparatory stages carried out in the study were the preparation of the cage, the purchase of livestock, the preparation of tools and materials, the manufacture of concentrates and the manufacture of MNB. Making concentrate includes mixing coconut meal, cassava starch, rice bran, pollard, coffee bean shell and soybean meal until homogeneous, mixing is done from the largest to the smallest amount of feed ingredients using a mixer.

The following is a table of the basal feed formula used with a Crude Protein (CP) content of 13.13% and Total Digestible Nutrients (TDN) 68.7% with goat's needs as much as 9.6% CP and 62% TDN (Kearl, 1982) and an MNB formula.

Table 1. Concentrate Formula

No.	Feed Ingredients	Formulation	CP	TDN
		-----(%)-----	----------(g)----------	
1.	Coconut meal	10	2,16	7,3
2.	Cassava starch	25	0,3	17,25
3.	Rice bran	20	2,76	16,2
4.	Pollard	10	1,29	7
5.	Coffee bean shell	25	2,49	12,65
6.	Soybean meal	10	4,13	8,32

The process of making MNB begins with anaerobically fermented rice straw. The materials used for fermentation were EM4 100 ml, 2.5 kg rice bran and 10 liters of water. All ingredients are mixed evenly until homogeneous. The mixture is dissolved again using water after which the rice straw is watered using the mixture until it is evenly distributed. The rice straw is then put into a bucket, closed tightly and stored for 14 days. After storing the fermented rice straw, it was aerated first and then ground using a disk mill with a mesh of 80. All tools and materials for MNB were prepared and weighed according to the composition of each MNB constituent (Table 2.).

Tabel 2. Multinutrien Block Formula

No.	Feed Ingredients	Formulation
		------(%)------
1.	Molasses	50
2.	Fermented rice straw	30
3.	Salt	3
4.	Clamshell flour	6
5.	Urea	4
6.	Bentonite	7

The stage of making MNB begins with heating molasses for 10 minutes at a temperature of 40°C – 50°C. Furthermore, bentonite is mixed into molasses in a container. Salt and urea are dissolved using distilled water. All ingredients are mixed until homogeneous in one container. The homogeneous MNB dough was then weighed 100 g and the treatment stage, namely fresh green betel leaves, was mashed using a blender and added 50 ml of distilled water, then green betel leaf juice which was in accordance with the treatment, namely 3% of 3 g or 6% of 6 g was added to the mixture. in the dough until homogeneous then printed. The printed MNB was then dried in the sun for 3-4 days. MNB is then packed into plastic packaging.

The adaptation stage is carried out so that the livestocks are accustomed to the surrounding environment, cages and feed with additional treatments. Basal feed consisting of forage and concentrate is given in stages. The introduction of MNB was also carried out in stages. Drinking water is provided ad libitum. Adaptation was carried out for 2 weeks.

The treatment stage was carried out for 5 weeks with feed that was adjusted to the needs based on body weight. Livestocks are fed twice a day, in the morning at 07.00 and in the afternoon at 15.00. The feeding of MNB treatment with the addition of green betel leaf juice was carried out every morning before basal feeding. Basal feed is given starting from concentrate then forage with a ratio of 70%: 30%. Giving MNB with the addition of green betel leaf juice as much as 100 g which is then crushed so that livestock can easily consume it. The total collection was carried out in the last week for 7 days.

Parameters Observed

The parameters observed were dry matter feed intake, organic matter feed intake, dry matter digestibility (DMD) and organic matter digestibility (OMD).

Data Analysis

The research data were analyzed using ANOVA (Analysis of Variance) to determine the effect of treatment on the parameters. If there is a significant effect, it is continued with Duncan's Test to determine the difference in the mean value between treatments.

Statistical Hypothesis

The statistical hypotheses that will be used in this study are:

H0 = $\tau 0 = \tau 1 = \tau 2 = \tau 3 = \tau 4 = 0$; There was no significant effect of adding green betel leaf juice on dry matter feed intake, organic matter feed intake, dry matter digestibility and organic matter digestibility.

H1 = there is at least one $\tau i \neq 0$; there is at least one significant effect of adding green betel leaf juice to dry matter feed intake, organic matter feed intake, dry matter digestibility and organic matter digestibility.

If F count < F table then H0 is accepted and H1 is rejected

If F count > F table then H0 is rejected and H1 is accepted

Results and Discusion

Effect of Treatment on Dry Matter Feed Intake

Table 3. Dry Matter Feed Intake Analysis Results

Treatments	Dry Matter Feed Intake	Metabolic Body Weight	Metabolic Dry Matter Feed Intake
	-----(g)----	---($BW^{0,75}$)---	---(g/kg $BW^{0,75}$)---
T0	445,62	6,9	64,97
T1	476,61	6,6	72,06
T2	482,69	6,6	73,23
T3	545,35	7,45	73,28

T0 : Without the addition of multinutrient blocks and green betel leaf juice
T1 : MNB without the addition of green betel leaf juice
T2 : MNB with the addition of 3% green betel leaf juice
T3 : MNB with the addition of 6% green betel leaf juice

The results of the analysis of variance showed that MNB with the addition of green betel leaf juice to the ration in each treatment showed an insignificant effect (P>0.05) on dry matter feed intake, meaning that MNB with the addition of green betel leaf juice was up to 6% in the ration. on dry matter feed intake was the same and did not increase livestock dry matter feed intake, thus causing no difference in each treatment. The average dry matter feed intake obtained in the treatments were T0 445.62 (g/day/head), T1 (476.61 g/day/head), T2 (482.69 g/day/head) and T3 (545.35 g/day/head). The treatment did not affect the feed intake of dry matter, this was because the feed intake of ration and dry matter for each animal was almost the same and the energy content of each treatment was the same. Usman et al. [8] stated that dry matter feed intake is influenced by feed intake and available energy content.

The results of statistical analysis of metabolic dry matter feed intake (g/kg $BW^{0,75}$) from the four treatments showed no significant differences,

respectively T0 (64.97 g/kg $BW^{0,75}$), T1 (72.06 g/kg $BW^{0,75}$), T2 (73.23 g/kg $BW^{0,75}$) and T3 (73.28 g/kg $BW^{0,75}$). This insignificant difference occurs because the low protein and TDN balance in the ration will positively affect feed intake. Halim et al. [9] stated that the level of crude protein in the ration will affect the feed intake and weight gain of goats. feed intake of dry matter feed is also influenced by crude fiber content. The higher the crude fiber in the ration, the lower the digestibility of the ration, this is in line with the low dry matter feed intake. In addition to TDN, high crude fiber content in the ration will affect livestock dry matter feed intake which will cause low digestibility [10].

Dry matter feed intake in Jawarandu goats obtained ranged from 393.02 - 600.74 g. Research with MNB on rations conducted by Fardana et al. [10] it was found that the dry matter feed intake was 895 – 1,066 g. Feed intake of dry matter is also influenced by the size and weight of livestock, the larger the body size of livestock, the higher the feed intake of dry matter of feed. Sumardianto et al. [11] stated that the body size of livestock affects the ability of the amount of feed intake.

Effect of Treatment on Organic Matter Feed Intake

Table 4. Organic Matter Feed Intake Analysis Results

Treatments	Dry Matter Feed Intake	Metabolic Body Weight	Metabolic Organic Matter Feed Intake
	----(g)----	---($BW^{0,75}$)---	---(g/kg $BW^{0,75}$)---
T0	57,10	6,9	7,07
T1	78,62	6,6	8,98
T2	75	6,6	8,94
T3	82,79	7,45	8,09

T0 : Without the addition of multinutrient blocks and green betel leaf juice
T1 : MNB without the addition of green betel leaf juice
T2 : MNB with the addition of 3% green betel leaf juice
T3 : MNB with the addition of 6% green betel leaf juice

The results of the calculation of analysis of variance showed that MNB with the addition of green betel leaf juice to the ration in each treatment showed a non-significant effect (P>0.05) on the organic matter feed intake, meaning that MNB with the addition of green betel leaf juice in the ration on material of organic matter is the same and is not able to increase the feed intake of livestock organic matter, thus causing no difference in each treatment. The average of organic matter feed intake was T0 (57.10 g/head/day), T1 (78.62 g/head/day), T2 (75 g/head/day) and T3 (82.79 g /head/day). The feed intake of organic matter that was not significantly different was thought to be caused by the feed intake of dry matter which was not significantly different and the balance of nutrients contained in the rations, especially energy and protein, fiber and the amount of feed intake was almost the same in each animal. The palatability and energy content of the ration were factors that influenced the feed intake of organic matter [12].

The results of statistical analysis of metabolic organic matter feed intake (g/kg $BW^{0,75}$) from the four treatments showed no significant

differences, respectively T0 (7.07 g/kg $BW^{0,75}$), T1 (8.98 g/kg $BW^{0,75}$), T2 (8.94 g/kg $BW^{0,75}$) and T3 (8.09 g/kg $BW^{0,75}$). This non-significant difference was caused by the feed intake of dry matter per metabolic body weight which was also not significantly different so that the feed intake of organic matter per metabolic body weight was not significantly different, in addition the organic matter content between basal rations and MNB which did not differ also affected the feed intake of organic matter per body weight. Metabolic body weight becomes no difference. The high and low of dry matter feed intake in livestock is also followed by the level of organic matter feed intake because dry matter and organic matter have a positive correlation. Suwignyo et al. [13] stated that the feed intake of organic matter follows the result of dry matter feed intake because organic matter is part of dry matter. This unreal dry matter feed intake resulted in the same organic matter feed intake.

Effect of Treatment on Dry Matter Digestibility

Table 5. Dry Matter Digestibility Analysis Results

Treatments	Dry Matter Digestibility	Metabolic Dry Matter Digestibility
	----------(%)---------	-----(g/kg $BW^{0,75}$)----
T0	60,46	39,60
T1	64,51	46,56
T2	66,43	48,65
T3	65,65	48,10

T0 : Without the addition of multinutrient blocks and green betel leaf juice
T1 : MNB without the addition of green betel leaf juice
T2 : MNB with the addition of 3% green betel leaf juice
T3 : MNB with the addition of 6% green betel leaf juice

The results of the calculation of analysis of variance showed that MNB with the addition of green betel leaf juice to the ration in each treatment showed a non-significant effect (P>0.05) on dry matter digestibility, meaning that MNB with the addition of green betel leaf juice in the ration on digestibility dry matter was the same and could not increase the dry matter digestibility of livestock, thus causing no difference in each treatment. The average dry matter digestibility obtained was T0 of 60.46%, T1 of 64.51%, T2 of 66.43% and treatment of T3 of 65.65%. The value of digestibility in livestock depends on digestibility, feed given and the physiological condition of livestock. Tillman et al. [14] stated that digestibility was influenced by various factors, including feed intake, apparent digestibility of protein, fat, the feed provided and the condition of the livestock themselves.

The results of statistical analysis of metabolic dry matter digestibility (g/kg $BW^{0,75}$) of the four treatments showed no significant differences, respectively T0 (39.60 g/kg $BW^{0,75}$), T1 (46.56 g/kg $BW^{0,75}$), T2 (48.65 g/kg $BW^{0,75}$and T3 (48.10 g/kg $BW^{0,75}$). The use of MNB with the addition of green betel leaf juice in the basal ration of goats did not affect the dry matter digestibility per metabolic body weight. This is due to the relatively equal feeding of grass and concentrate in each treatment, especially the low fiber content and facilitates the overhaul of the crude fiber complex bonds. One of

the factors that affect the digestibility value is the ADF content of a feed ingredient such as lignin, cellulose and silica [15]. The higher the crude fiber content, the lower the digestibility value and vice versa. Riswandi et al. [16] stated that the more crude fiber in the feed, the thicker and more resistant the cell walls were and consequently the digestibility value would be reduced.

Based on the results of the study, the dry matter digestibility values ranged from 60.46% - 66.43%. The value obtained is not lower than the research conducted by Belo et al. [17], which is 63.51% - 72.78% using Urea Molasses Multinutrient Block supplementation from various types of agricultural waste and field grass. Widodo et al. [18] stated that feed digestibility is a value that reflects the quality of a feed ingredient. Digestibility can be assumed with nutrients that are not present in the feces are used up to be digested.

Effect of Treatment on Digestibility of Organic Materials

Table 6. Organic Matter Digestibility Analysis Results

Treatments	Organic Matter Digestibility	Metabolic Organic Matter Digestibility
	----------(%)----------	--------($g/kg\ BW^{0,75}$)-----
T0	47,57	$35,43^{b}$
T1	59,37	$84,63^{a}$
T2	58,95	$80,51^{a}$
T3	60,33	$70,59^{a}$

^{a,b} Different superscripts in the same column showed significant differences ($P<0.05$)
T0 : Without the addition of multinutrient blocks and green betel leaf juice
T1 : MNB without the addition of green betel leaf juice
T2 : MNB with the addition of 3% green betel leaf juice
T3 : MNB with the addition of 6% green betel leaf juice

The results of the calculation of analysis of variance showed that MNB with the addition of green betel leaf juice to the ration in each treatment showed a non-significant effect ($P>0.05$) on the digestibility of organic matter, meaning that MNB with the addition of green betel leaf juice in the ration on digestibility organic matter was the same and had no effect on the digestibility of organic matter in livestock, thus causing no difference in each treatment. The results of the average digestibility of organic matter showed that T0 (47.57%), T1 (59.37%), T2 (58.95) and T3 (60.33%). The content of crude protein in the existing ration will cause increased rumen microbial activity and the digestion of organic matter will increase. The digestibility of organic matter reflects the amount of digested substances such as carbohydrates, fats and vitamins [14].

The treatment of adding green betel leaf juice to MNB into the ration yielded results ranging from 47.57% - 60.33%. The results of research by Bui et al. (2020) stated that the organic digestibility value in goats ranged from 54.77% - 63%. The most influential factor on the digestibility of organic matter is the activity of rumen microorganisms in the fermentation process. Suardin et al. [19] stated that rumen microbial activity plays a role in the

fermentation process which will affect digestibility, while rumen microbial activity itself is influenced by feed ingredients.

The digestibility of organic matter in the study was closely related to the digestibility of dry matter. The degradation process of organic matter is closely related to the degradation of dry matter, this is related to the composition of dry matter consisting of organic matter [20]. Forage feed, concentrates and MNB are composed of dry matter and organic matter, organic matter is composed of the main nutrients needed by livestock in metabolic processes for growth and development. Riswandi et al. [16] states that increasing the digestibility of existing organic matter will increase organic matter, namely protein and carbohydrates which are needed in the metabolic process of livestock.

Based on the results of the analysis of variance, it showed that the treatment had a significant effect ($P<0.05$) on the metabolic digestibility of organic matter (g/kg $BW^{0,75}$). Further test results showed that in T1, T2 and T3 treatments, the digestibility of organic matter per metabolic body weight increased compared to T0. The digestibility of organic matter per metabolic body weight given the addition of green betel leaf juice to MNB in the ration of the Jawarandu goat was 0% to 6% higher than the treatment with only basal ration. The increase in the value of organic matter digestibility per metabolic body weight caused by supplementation with MNB with the addition of green betel leaf juice can provide essential nutrients, namely protein needed by rumen microbes to reproduce and digest organic matter. Maaruf et al. [21] stated that microbes in the rumen will remodel amino acids into ammonia which will be used for microbial development.

Conclusion

Based on the results of the research conducted, it can be concluded that the addition of green betel leaf juice to MNB does not interfere with feed intake and digestibility in Jawarandu goats, even the addition of green betel leaf juice to MNB can increase the digestibility of organic matter per metabolic body weight.

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