Nutrient Digestibilities in Rusa Timor (*Cervus timorensis* de Blainville 1822) Fed on Maize Forage ad libitum Supplemented with Rice Bran and or *Gliricidia sepium*

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Abstract. A study was carried out to investigate nutrient digestibilities in rusa timor (*Cervus timorensis*) fed on maize forage ad libitum supplemented with rice bran and or *Gliricidia sepium*. This was done in Palu, Indonesia from June to December 2011 using five male rusa timor with an age range of 1 - 2 years old and body weight of between 30 - 45 kg. The animals were allocated to five treatments each of which was replicated five times following a latin square experimental design. The treatments tested were R0 = maize forage ad libitum (M)- R1 = M + rice bran 1.5%- R2 = M + rice bran 1.0% + 0.5% *Gliricidia sepium*- R3 = M + rice bran 0.5% + *Gliricidia sepium* 1.0%- R4 = M + *Gliricidia sepium* 1.5%. The supplements were provided as percentages of animal body weight on dry matter basis. Each period consisted of preliminary and data collection phases. Data of feed consumption and faecal excretion samples were collected for seven days, and the samples were bulked at the end of the study and sub sampled for laboratory analysis. Data were analysed with an analysis of variance. Results indicated that the treatments did not affect (P > 0.05) the nutrient digestibility of feed dry matter, organic matter, and crude protein, crude fiber but it did affect (P < 0.05) that of crude lipid. Providing of rice bran as much as 1.5% of the initial body weight of Timor deer in the maize forage can be increasing of nutrient digestibilty.

Keywords: *Cervus timorensis*, Maize Forage, Rice Bran, *Gliricidia sepium*.

1   Introduction

Timor deer (*Cervus timorensis*) is categorized into sub-ordo ruminant which is anatomically wild animal where its main feed is grass and leaf. As protected wild animal and classified into grazer, sufficient green feed availability must be kept because, in turn, it gives vital effect on its preservation. Thus, feed availability to a habitat quantitatively and qualitatively will give positive effect on development and growth of wild population. Development of Timor deer, especially in Palu valley, Province of Central Sulawesi, is closely related to available local feed quality, so that use of local feed source optimally will determine achievement of maximum quality products. One as-

pect which is necessarily considered to develop timor deer is nutrient need aspect of feed provision of the animal.

Potency of a feed material in providing feed substance for animal can be determined through chemical analysis. Unfortunately, several potencies of feed materials cannot be used entirely because real values of feed materials are reflected from some lost parts after digestion, absorption and metabolism processing. Therefore, characteristics of some lost feed materials or substances, after digesting, should be understood urgently. Chemical analysis of feed substances in feed materials should be followed by testing digestion. Difference between consumption of feed materials of feed substances and excretion of feed substances of feces indicated that number of feed substances of feed materials could be digested (digestibility). However, in fact, not all of digestible feed substances can be absorbed; some of them would be disposed through several excretion lines.

Digestibility is a measure of the high or low quality of a feed ingredient because generally feed ingredients that contain food substances that are easily digested will have high nutritional value. Therefore, it is often used to assess the quality of food because it reflects the level of energy availability for livestock. Feed digestibility in ruminant livestock is closely related to the number of microbes in the rumen [1].

According to Hofmann [2] the ability to digest food in animals can be determined by several factors such as type of livestock, chemical composition of food and food preparation. Ruminants, for example, in Timor deer, would excrete energies which are digested as fermentation heat and gases such as CH_4; in addition, not all things existing in feces are feed materials which are not digestible, some are mucus of damaged digestion tools, previous remaining feed, microbe and enzyme of digestion. Some lost parts which can be determined directly are losses because of digestive items. Digestibility is identified as some feed substances of feed materials which are not excreted into feces, namely, totally digested and absorbed. The aim of this study is to investigate nutrient digestibilities in rusa timor (*Cervus timorensis*) fed on maize forage ad libitum supplemented with rice bran and or *Gliricidia sepium*.

2   Materials and Methods

2.1   Study Site and Procedures

The research was conducted at multiple locations/areas maintenance Timor deer (*Cervus timorensis*) in the Valley of Palu, Central Sulawesi province, which started from June to December 2011. Laboratory analysis was conducted in the Laboratory of feed nutrition, Faculty of Animal Husbandry and Fisheries, Tadulako University.

The animals were allocated to five treatments each of which was replicated five times following a latin square experimental design. The treatments tested were R0 = maize forage ad libitum (M)- R1 = M + rice bran 1.5%- R2 = M + rice bran 1.0% + 0.5% *Gliricidia sepium*- R3 = M + rice bran 0.5% + *Gliricidia sepium* 1.0%- R4 = M + *Gliricidia sepium* 1.5%. The supplements were provided as percentages of animal body weight on dry matter basis. Each period consisted of preliminary and data collection phases. Data of feed consumption and faecal excretion samples were collected

for seven days, and the samples were bulked at the end of the study and sub sampled for laboratoty analysis. Data were analysed with an analysis of variance. Determination of feed digestibility is carried out using the indicator method, namely lignin as an internal indicator.

2.2   Chemical Composition of Treatmens and Feed Ingredients

The Results of analysis for the nutrient composition used in this study are presented in Table 1.

Table 1. Nutrient Composition in the Treatment.

Nutrient Composition	Treatment				
	R0	R1	R2	R3	R4
Dry Matter (%)	28.84	30.49	31.82	32.06	33.30
Ash (%DM)	12.71	11.84	10.33	10.69	11.36
Crude Protein (%DM)	7.95	9.98	8.86	8.57	9.42
Crude fiber (%DM)	29.64	31.85	27.44	26.58	25.37
Fat fiber (%DM)	1.89	2.81	1.91	1.52	1.67
BETN (%DM)	47.81	43.52	51.46	52.64	52.18
TDN*	66.12	63.58	57.39	55.17	61.47

* TDN was calculated using the Hartadi et al. [3] Equation

The results of the proximate and fiber analysis of the feed ingredients used in this study are presented in Table 2.

Table 2. Chemical composition of the feed ingredients used in the study (% DM).

Nutrients content	Feed Ingredients		
	Maize Forage	Gliricidia sepium	Rice bran
Dry matters	17.19	28.10	91.57
Crude protein	8.62	24.98	10.58
Crude lipid	2.15	4.19	5.85
Crude fiber	30.18	16.81	8.74
Ash	11.20	13.59	14.70
BETN	47.86	40.43	60.13
NDF	60.91	38.59	51.83
ADF	32.46	22.78	43.24
Hemisellulose	28.45	15.81	8.59
Lignin	2.96	8.77	7.77
Sellulosa	29.50	14.01	35.47

Source. Results of the analysis of Animal Feed and Nutrition Laboratory, Faculty of Animal Husbandry and Fisheries, University of Tadulako, Palu

3   Results and Discussion

3.1   Results

The average of nutrient digestibility of feed dry matter (DM), crude protein (CP), crude Fat (CF), organic matter (OM) and crude fiber (CF) are presented in table 3.

Table 3. The average value of timor deer nutrient digestibilty.

Variabel	Treatments (%)				
	R0	R1	R2	R3	R4
Dry Matter	60.39[a]	74.84[a]	75.02[a]	71.24[a]	66.09[a]
Crude Protein	80.64[a]	86.50[a]	88.49[a]	87.21[a]	86.76[a]
Crude Fat	80.25[a]	93.78[b]	94.29[b]	91.10[b]	86.06[ab]
Organic Matter	79.56[a]	80.52[a]	79.90[a]	81.35[a]	80.28[a]
Crude Fiber	66.65[a]	78.53[a]	78.43[a]	74.99[a]	71.33[a]

[ab] Different superscript letters on the same row indicate significant differences ($P<0.05$)

3.2   Discussion

Dry Matter Digestibilty. The average DM digestibility of Timor deer rations during the study can be seen in Table 3. The DM digestibility value was highest in treatment R2 (75.02%) followed by treatment R1 (74.84%), R3 (71.24%), R4 (66.09%) and R0 (60.39%) (Table 3). The high digestibility of DM in the R2 treatment is thought to be due to the chemical composition of the NDF and ADF of the rations used tending to be higher, namely 46.63% and 43.42%. The results of statistical analysis show that the digestibility of feed DM shows no significant effect ($P>0.05$). This is indicated that, digestibility percentage values for each treatment are almost the same, namely ranging from 60 – 75%. Dry matter digestibility in deer of more than 55% is medium and below 55% is low [4].

Feed quality is determined by the level of digestibility of the food substances contained in the feed. The food substances contained in the rations are not all available to the animal's body, some will be excreted again through feces. Feed digestibility in ruminants is closely related to the number of microbes in the rumen [5].

Crude Protein Digestibility. In ruminant, crude protein has two functions: 1) supplying N for microorganism living in rumen, 2) supplying amino acid to be absorbed in small intestine. Amino acid is supplied from two protein sources. Feed protein degraded by microbe and microbial protein from ruminant ammonia assimilation (NH_3). Those two sources are hydrolyzed to produce amino acid and then absorbed through small intestine for optimum protein biosynthesis. N substance that can be fermented is converted into ammonia by rumen microorganism. If there is an exceed concentration of NH_3 in rumen then this substance will be absorbed into blood and converted into

urea in liver. Urea may be freely discharged or returned into rumen through saliva as NPN [6].

The average of CP digestibility of diets in Timor deer during the study can be seen in Table 3. The highest of CP digestibility in this treatment was R2 (88.49%) followed by treatment R3 (87.21%), R4 (86.76%), R1 (86.50%), and R0 (80.64%). The results of statistical analysis showed that the digestibility of feed CP in Timor deer showed no significant effect (P<0.05). This is indicated that the crude protein digestibility analysis of the feed ingredients used were almost the same in each treatment, ranging between 80% - 88%. There is a small difference in the percentage of crude protein digestibility and the low crude protein content of rice bran and corn forage as well as the high crude fiber in the corn forage given can cause the treatment to have no real effect. This will also affect the contribution of crude protein content in the treated feed. Even though the protein content of Gamal leaves is around 24.98%, however up to 1.5% of body weight (BW) still does not have a significant effect on each treatment.

The apparent digestibility of crude protein depends on the percentage of crude protein in the food ration, and food containing higher crude protein will have a greater effect on the apparent digestibility of protein and vice versa. Relatifly with statement that the protein digestibility of food depends on its protein content. Furthermore, it is stated that food that is low in protein content in deer generally has low protein digestibility as well [6].

Crude Lipid Digestibility. The average of CL digestibility of diets in Timor deer during the study can be seen in Table 3. The highest of CL digestibility in this treatment was R2 (94.29%) followed by treatment R1 (93.78%), R3 (91.10%), R4 (86.06%), and R0 (80.25%). The high digestibility of CL in treatment R2 is thought to be because the fat content of the rice bran given tends to be higher, namely 5.85%, than other feeds. The results of statistical analysis showed that CL digestibility feed on Timor deer showed a significant effect (P < 0.05). The digestibility of a feed ingredient is indicated by the chemical composition of the feed. Feed ingredients with a high fat content will have low digestibility. Although the crude fat content of treatment R2 (Table 3) is higher compared to other treatments.

The results of this study were more due to the effect of nutrient associations from the treated feed ingredients. The digestibility of a feed ingredient also depends on the harmony of the food substances contained in it, known as the association effect [7]. According to Wiseman [8], the digestibility of a feed depends on the quality of the food substances contained in the feed so that it influences the growth of microorganisms. The high digestibility of crude fat is caused by the chemical structure of fat which is easily digested [9]. This is thought to be due to differences in the nutrient content of the treated feed and differences in livestock types. The factors that influence the digestibility of feed ingredients are livestock species, age of livestock, feed treatment, crude fiber content, lignin, influence of feed associations, nutrient deficiencies, feed composition, physical form of feed, plant age and length of stay in the rumen [10].

Organic Matter Digestibility. Increased digestibility reflects an increase of number and activity of microorganisms and also followed by an increase of enzyme works. The increasing of protein level contained in complete feed will increase N-NH3. When TDN is in adequate state, energy and carbon skeleton are expected also sufficient. These two conditions increase the microorganism population and so does the enzyme which then results in an increase of organic matter digestibility. The average of OM digestibility in Timor deer during the study can be seen in Table 3. The highest OM digestibility in this treatment was R1 (78.53%), followed by treatment R2 (78.43%), R3 (74.99%), R4(71.33%), and R0 (66.65%). The high OM digestibility in treatment R1 is thought to be due to the DM consumption of rations tending to be lower than other treatments so that OM digestibility can increase. Apart from that, it is thought to be related to the chemical composition of the treated feed which can affect feed digestibility. Even though the consumption of organic materials shows a real difference, the digestibility is not significantly different.

According to Dryden [10] that the high digestibility of organic matter in deer is probably caused by high consumption of crude fiber and extracts without nitrogen (BETN). Consuming more dry ingredients with high levels of crude fiber can stimulate digestive enzymes to help speed up the digestive process, so that feed digestibility also increases. The digestibility of organic matter decreases due to increased feed consumption because the length of stay in the digestive tract becomes shorter or rumen microbial fermentation decreases [6].

The results of statistical analysis showed that the digestibility of feed OM in Timor deer showed no significant effect. This is thought to be because the results of the digestibility analysis of the organic material obtained were almost the same, namely ranging from 66 – 78%. The digestibility of organic matter more than 55% is medium and below 55% is low. The ability to digest food in animals can be determined by several factors such as type of livestock, chemical composition of food and food preparation. It was further explained that the digestibility of a food ingredient or rations depends on the suitable of the food substances [11].

Crude Fiber Digestibility. The average CF digestibility of rations in Timor deer during the study can be seen in Table 3. The highest CF digestibility in this treatment was R3 (81.35%) followed by treatment R1 (80.52%), R4 (80.28%), R2 (79.90%), and R0 (79.56%). The high digestibility of CF in treatment R3, this indicated that the treatment in chemical composition of the feed ingredients used, especially NDF and ADF, tends to be higher compared to other treatments. According to Church [11] that the fiber fraction of feed greatly determines digestibility both in terms of the amount and chemical composition of the fiber itself. The fermentation pattern in the rumen is largely through the multiplication of crude fiber digesting organisms (cellulolytic microbes) which digest cellulose and hemicellulose (crude fiber) [12].

4   Conclusion

1. The treatments did not affect (P > 0.05) the nutrient digestibility of feed dry matter, organic matter, and crude protein, crude fiber but it did affect (P < 0.05) that of crude lipid.
2. Providing of rice bran as much as 1.5% of the initial body weight of Timor deer in the maize forage can be increasing of nutrient digestibilty.

Disclosure of Interests. The authors have no competing interests to declare that are relevant to the content of this article.

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