

## ***In Vitro* Digestibility of Timor-Leste Native Grass Supplemented with *Leucaena leucephala* and *Corypa elata Robx.***

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### **ABSTRACT**

This research was aimed to study the effect of supplementing *lamtoro* (*Leucaena leucephala*) leaves and/or *putak* (*Corypha elata Robx.*) on *in vitro* dry matter and organic matter digestibility of native grass of Timor-Leste. Native grass used in this study was collected from natural pasture in Balibo sub-district, Bobonaro district, Timor-Leste. In this study, a 3×3 factorial design was used, with the type of supplement (native grass + *Leucaena*, **G+L**; native grass + *putak*, **G+P**; or native grass + *Leucaena* and *putak*, **G+L+P**) and level of supplement (10, 15, or 20%) as the main factors. All dietary treatments were incubated in rumen fluid mixture collected from two fistulated Bali cattle using a 2-stage *in vitro* technique. The supplements (*Leucaena* and/or *Corypha elata Robx.*) were added into grass samples at 4 h after the grasses were incubated. Results showed that the *in vitro* dry matter and organic matter digestibility of the G+P treatments were greater than those on the G+L and G+L+P (43.4 vs. 40.8, 36.6% and 49.9 vs. 46.5, 40.1%, respectively;  $P<0.05$ ), with the greatest values on the G+P treatment. No significant effects were detected among treatments with different levels of supplement, as well as on the interaction between the 2 factors. It can be concluded that supplementing *putak/Corypha elata Robx* at 4 h after feeding can improve the dry matter and organic matter digestibility of native grasses.

**Keywords:** Native grass, *Leucaena leucocephala*, *Putak*, *in vitro* digestibility.

### **INTRODUCTION**

The majority of farmer-breeders in Timor-Leste still practiced extensive cattle breeding (Da Cruz, 2003), meaning that they relied heavily on natural pasturing land as main source of cattle fodder. The extensive breeding was supported by the wide native pasture of about 200,000 ha representing 10% of Timor-Leste territory. Despite of the extensive breeding system, the productivity of the cattle was still low because the existing pasturing land often underwent overgrazing and it was aggravated by prolonging dry season that could last for 7-8 months every year. The lack of cattle fodder during dry season became common problem in the extensive breeding system such as Timor Leste. Such condition encouraged the breeders to look for alternative options to provide nutrition to their cattle during the extended dry season.

*Putak/Corypha elata Robx* was known as a kind of local animal fodder used by breeders in Timor-Leste as a nutritious feed for cattle. It was expected that supplementation of *Putak* could stop the decrease in the cattle body weight in dry season. In addition to the *Putak/ CeR*, the local breeders also knew *Lamtoro (Leucaena)* growing abundantly around the native pasture. However, lack of knowledge of farmers-breeders in Timor-Leste about the benefits of *leucaena* as a nutritious feed for cattle still discussable. As a common knowledge that *Leucaena* was one of important protein sources in the growth of their cattle.

Cattle were ruminant animal where fodder digestive process was helped by ruminant microbes consisting of bacteria, protozoa, fungi and some strains of viruses. The ruminant microbes produced enzymes which is capable to degrading fodders into organic substrate for easy fermentation. One of the enzymes was called cellulose capable of degrading fibers.

Considering the speed of the degradation process in rumen, the animal fodder could be classified into quickly degrading and slowly degrading fodders and pasturing grass was classified into the slowly degrading fodder, while the *leucaena* and the *Putak/CeR* were classified into the quickly degrading fodders. Obtaining optimal degrading level, the combination of the pasturing grass and the *leucaena* leaves and the *Putak/CeR* must be balanced. It was necessary to study the digestibility of fodders in Timor-Leste considering that different climate conditions could have significant impact on the digestibility of the animal fodders.

Based on the problem described above, the researcher was interested in studying “The Impact of the Supplementation of *leucaena* leaves and Putak/CER to Pasturing Grass on *In Vitro* Degradation of Bali cattle”.

### MATERIALS AND METHOD

The study was conducted in the Laboratory of Cattle Fodder Technology and the Laboratory of Cattle Fodder Nutrition, the Faculty of Animal Science, Gadjah Mada University. The fodder samples in the study were rumen liquid collected from 2 male Bali cattle, Timor-Leste native grass, *leucaena* leaves, and Putak obtained from the pasturing land in Posto Administrativo Balibo, Municipio Bobonaro, Timor-Leste.

The study used *in vitro* test. The *in vitro* test was indirect digestibility estimating method carried out in laboratory by imitating the digesting process in the digestive tract of ruminant animals. Method used was *in vitro* 3x3 factorial, completed and randomized digestibility design with the supplement types of Timor-Leste native grass, *leucaena* leaves and *Putak/ CeR*) at the supplementation levels of 10%, 15%, and 20%. All of the supplements were incubated in cattle rumen liquid that has been fistulated through two stages of *in vitro* test. The supplementation of the leaf samples (*leucaena /Lamtoro* leaves and *CeR/ Putak*) to the sample of the Timor-Leste native grass was conducted after incubation for 4 hours before used.

Data collected from the study was analyzed using variant analysis (ANOVA) with SPSS and if there was any significant difference found, then the analysis continued using Duncan’s new multiple range test (DMRT).

### RESULTS AND DISCUSSION

The *in vitro result* of dry matter digestibility of each of the treatments were summarized in Table 1.

**Table 1.** Dry matter digestibility

| Level supplementation (%) | 4 hours supplementation time |                               |                               |                               | Average <sup>NS</sup> |
|---------------------------|------------------------------|-------------------------------|-------------------------------|-------------------------------|-----------------------|
|                           | RL                           | RL + DL                       | RL + P                        | RL + DL + P                   |                       |
| 10                        |                              | 36,14±2,16                    | 42,50±2,14                    | 41,30±1,47                    | <b>39,98±3,38</b>     |
| 15                        |                              | 36,50±1,76                    | 42,74±1,47                    | 40,90±1,80                    | <b>40,05±3,21</b>     |
| 20                        |                              | 37,16±0,68                    | 44,88±1,50                    | 40,04±1,67                    | <b>40,69±3,90</b>     |
| <b>Average</b>            | <b>32,13</b>                 | <b>36,60<sup>a</sup>±0,52</b> | <b>43,37<sup>c</sup>±1,31</b> | <b>40,75<sup>b</sup>±0,64</b> |                       |

The results of the study showed that the digestibility of the dry fodder in the supplementation period of 4 hours of the Timor-Leste native grass supplemented with *leucaena* leaves increased from 32.13% to 36.60% or increased by 14%. The supplementation of the *leucaena* leaves significantly increased the dry fodder digestibility

( $P < 0.05$ ) because of the addition of Crude Protein (CP) resulting from the *leucaena* leaves. The results of the proximate analysis showed that the CP content of the native grass was 10.50%, while the CP content of the *leucaena* leaves was 17.63%. The addition of the protein to the fodder was degraded in the rumen into  $\text{NH}_3$  (Tilman, 1977; Hume, 1982). The ammonia was used to synthesize microbe protein (McDonald et. al., 2011). For that reason, it had significant impact on the microbial development in the rumen of experimental cattle. The increase in the number and the activity of the microbes caused the increase in the digestibility of the native grass because the microbes produced cellulose enzyme that could digested the cellulose of the native grasses. The supplementation of the *leucaena* leaves to the fodder could increase the digestibility of the dry fodder due to the *leucaena* leaves could fulfilled the need for the microbes of the rumen to live and to conduct their digestion activity.

The digestibility of the dry fodder in the supplementation period of 4 hours to the native grass supplemented with the *Putak/ CeR* increased from 32.13% to 43.37% or it is increased by 35%. The supplementation of the *Putak* was able to significantly increase the digestibility of the dry fodder ( $P < 0.05$ ).

The increase in the digestibility of the dry fodder resulted from the presence of more dry matter content of the *Putak/ Corypha elata Robx*. The organic matter content of the native grass was 77.88%, while the *Putak* was 89.96%. As reported by Mulik (2016), *Putak* (CeR) is carbohydrate source. Tabun et. al. (2006) said supplementation of *Putak* containing 87.64% dry matter, 5.21% ash, 82.02% organic matter, 2.53% rough protein, 12.04% rough fiber, and 4210 kcal energy. The supplementation of *Putak/CeR* would increase the population of microbes in rumen that accelerated fermentation process. Ginting (2000) suggested that *Putak* had high rough fiber content and low protein content. The high rough fiber content of the *Putak/ CeR* would have significant impact on the digesting process in the rumen. Additionally, the composition of carbohydrate would also help stimulating the growth of the microbes in the rumen and subsequently enabled more efficient degradation of the fiber during the fermentation process.

The digestibility of the dry matter in the supplementation period of 4 hours to the native grass supplemented with the *leucaena* leaves and the *Putak* increased from 32.13% to 40.75% or increased by 27%. The supplementation of the *leucaena* leaves and the *Putak/CeR* was able to increase the digestibility of the dry matter ( $P < 0.05$ ). However, the increase in the digestibility of the dry fodder was lower than the digestibility of the dry matter if it was supplemented only with the *Putak/CeR*. The results were inconsistent with the hypothesis that the supplementation of *leucaena* leaves and the *Putak* provided the highest digestibility of the dry matter. It was probably because there were some causal factors. One of the causal factors was the capability of the microbes in the rumen in digesting the fodder that was not as good as their capability with the supplementation of the *leucaena* leaves only or the *Putak/ CeR* only.

Concerning the level of supplementation of the *leucaena* leaves, the results of the statistical analysis showed that there was no significant difference among 10%, 15%, and 20% supplementations. The reason was because the native grass contained relatively high CP, which was 10.50%. The 10% supplementation of the *leucaena* leaves only increased the CP content by 1.2%. The same aspect similar to the case of the 15% and 20% supplementations of the *leucaena* leaves. They increased the crude protein content only by 1.8% and 2.4%. It might not resulted in the significant increase in the  $\text{NH}_3$  in the rumen. It was also the case of the supplementation levels of the *Putak/ CeR*. The results of the statistical analysis showed that there was no significant difference among 10%, 15% and 20% supplementations. It might be due to the native grass has had relatively high of organic matter content, which was 77.88%. The 10% supplementation of the *Putak/ CeR* increased

the organic matter only by 9%. Meanwhile, the 15% and 20% supplementation of the *Putak* increased the organic matter only by 13.5% and 18%. It might not cause the significant increase in the number of the microbes in the rumen.

### The Digestibility of Organic Matter

The results of the digestibility of the organic matter *in vitro* of each of the treatments were summarized in Table 2

**Table 2.** The Organic Matter digestibility (KcBO)

| Supplementation Level (%) | 4 hours supplementation time |                               |                               |                               | Average <sup>NS</sup> |
|---------------------------|------------------------------|-------------------------------|-------------------------------|-------------------------------|-----------------------|
|                           | RL                           | RL + DL                       | RL + P                        | RL + DL + P                   |                       |
| 10                        |                              | 39,58±1,77                    | 47,96±2,80                    | 47,38±0,86                    | 44,97±4,68            |
| 15                        |                              | 40,78±2,38                    | 50,38±1,78                    | 46,20±2,69                    | 45,79±4,81            |
| 20                        |                              | 39,78±0,47                    | 51,18±1,71                    | 45,96±1,67                    | 45,64±5,71            |
| <b>Average</b>            | <b>32,13</b>                 | <b>40,05<sup>a</sup>±0,64</b> | <b>49,84<sup>c</sup>±1,68</b> | <b>46,51<sup>b</sup>±0,76</b> |                       |

It was clearly observed in the table that the digestibility of the organic matter of the native grass supplemented with the *leucaena* leaves in the supplementation period of 4 hours increased the digestibility from 32.13% to 40.05% or increased by 25%. The supplementation of the *leucaena* leaves was able to significantly increased the digestibility of organic matter (P<0.05). The supplementation of the *leucaena* leaves significantly increased the digestibility of the organic matter (P<0.05) because of the addition of the CP resulting from the *leucaena* leaves. The results of the proximate analysis showed that the CP content of the native grass was 10.50%, while the crude protein content of the *leucaena* leaves was 17.63%. The addition of the protein to the fodder, it was degraded in the rumen into NH<sub>3</sub> (Tilman, 1977; Hume, 1982). The NH<sub>3</sub> was used to synthesize the microbial protein (McDonald, 1982). For that reason it had significant impact on the development of the microbes in the rumen of experimental cattle. The increase in the number and in the activity of the microbes caused the increase in the digestibility of the native grasses due to the microbes produced cellulose enzyme that would digest the cellulose of the native grass. The supplementation of the *leucaena* leaves to the fodder could increase the digestibility of the organic matter because the *leucaena* leaves could fulfilled the need of the rumen for the microbes to live and to do the digestion activities.

The digestibility of the organic matter in the supplementation period of 4 hours to the native grass supplemented with the *Putak/ CeR* increased from 32.13% to 49.84% or increased by 55%. The supplementation of the *Putak/ CeR* was able to significantly increase the digestibility of the organic matter (P<0.05).

The increase in the digestibility of the organic matter took place because of the presence of higher organic matter content in the *Putak/ CeR*. The organic matter content of the native grass was 77.88%, while the *Putak/ CeR* was 89.96%. As reported by Mulik (2016), *Putak* (CeR) was carbohydrate source. Tabun et. al. (2006) suggested that *Putak/CeR* contained 87.64% dry matter, 5.21% ash, 82.02% organic matter, 2.53% rough protein, 12.04% rough fiber, and 4210 kcal energy. The *Putak/ CeR* increased the population of the microbes in the rumen so that it accelerated the fermentation process. Ginting (2000) suggested that *Putak/ CeR* had high rough fiber content and low protein content. The high rough fiber content of the *Putak/ CeR* would have significant impact on the digestion process in the rumen. Additionally, the composition of the carbohydrate would also help stimulate the growth of the microbes in the rumen that subsequently enabled more efficient degradation of the fiber during the fermentation process.

The digestibility of the organic matter in the supplementation period of 4 hours to the native grass supplemented with the *leucaena* leaves and the *Putak/ CeR* increased from 32.13% to 46.51% or increased by 45%. The supplementation of the *leucaena* leaves and the



*Putak* increased the digestibility of the organic matter ( $P < 0.05$ ). However, the increase in the digestibility of the organic matter was lower than the digestibility of the organic matter in the supplementation of the *Putak/CeR* only. The result was not consistent with the hypothesis that the supplementation of the *leucaena* leaves and the *Putak/ CeR* resulted the highest digestibility of the organic matter. It was probably because of the presence of some causal factors. One of the causal factors was the capability of the microbes in the rumen in digesting the fodder that was not as good as in the supplementation of the *leucaena* leaves only or the *Putak* only.

Concerning with the level of the supplementation of the *leucaena* leaves, the results of statistical analysis showed that there was no significant difference among 10%, 15%, and 20% fodder supplementations. It was because the native grass has contained relatively high crude protein, which was 10.50%. The 10% supplementation of the *leucaena* leaves only increased the Crude protein content by 1.2%. It was also the case of the 15% and 20% supplementations of the *leucaena* leaves. They increased the CP content only by 1.8% and 2.4%. It might not resulted in the significant increase in the  $\text{NH}_3$  in the rumen. It was also the case of the supplementation levels of the *Putak /CeR*. The results of the statistical analysis showed that there was no significant difference among 10%, 15% and 20% supplementations of it. It might be because the native grass has had relatively high organic matter content, which was 77.88%. The 10% supplementation of the *Putak/ CeR* increased the organic matter only by 9%. Meanwhile, the 15% and 20% supplementation of the *Putak/ CeR* increased the organic matter only by 13.5% and 18%. It might not cause the significant increase in the number of the microbes in the rumen.

### CONCLUSION

Based on the results of the study, it can be concluded that:

1. The digestibility of the dry matter and the digestibility of the organic matter of the Timor-Leste native grass were the best if they were supplemented with the *Putak/ Corypha elata* Robx
2. The 10% supplementation could increase the digestibility of the dry matter and the organic matter.
3. The better time for the supplementation to increase the digestibility of the dry matter and the digestibility of the organic mater is the supplementation period of four hours.

### REFERENCES

- Da Cruz, J.C :2003, Livestock development in East Timor, ACIAR Proccedings Pag. 113, Director General Ministry of Agriculture, Forestry and Fisheries, Dili.
- Ginting, Mu: 2000, The influence of fermented putak in pig diets digestibility and growth performance of weaning pigs ( Disertation ), Gotingen/Germany : Instutute of aimals Physiology and animal nutristion, Georg- August University.
- Hume, I. D : 1982, Digestion and Protein Metabolism, In: A Course Manual in Nutrition and Growth, AUIDP and AAUCS, Melbourne.
- McDonald, P., R. A. Edwards, J. F. D. Greenhalgh, C. A. Moran, L. A. Sinclair, and R. G. Wilkinson. 2011. Animal Nutrition. 7<sup>th</sup> ed. Prentice Hall.
- Mulik, M., dan Jelantik, I.G.N. 2009. Strategi Peningkatan Produktivitas Sapi Bali pada Sistem Pemeliharaan Ekstensif di Daerah Lahan Kering: . *Materi Seminar Nasional Pengembangan Sapi Bali Berkelanjutan dalam Sistem Peternakan Rakyat*, Mataram
- Tillman, A. D : 1977, *Ruminant Nutrition*. Fakultas Peternakan. Yogyakarta : Universitas Gadjah Mada.