Effect of urea-cassava waste and protected soybean meal supplementation on dry matter, crude fiber, and crude protein intake of ram

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Abstract. The purpose of this research is to measure the effect of urea-cassava waste and *Leucaena leucocephala* tannin extract protected soybean meal supplementation in ration on dry matter (DM), crude fiber (CF), and crude protein (CP) intake of ram and to determine the best supplementation level based on these three variables. This research was held from October 18th, 2017 until January 10th, 2018 at Experimental Farm and Animal Feed and Nutrition Laboratory, Faculty of Animal Science, Jenderal Soedirman University, Purwokerto. The material used in this research were ± 12 months old ram (initial weight 23-25 kg) as many as 15 heads, control ration (rice straw: concentrate = 30:70), supplement (urea-cassava waste:protected soybean meal = 54 : 46%), and experimental cage. The method of this research was ***in vivo*** experiment with completely randomized design followed by orthogonal polynomial if the treatment had significant effect. Treatments tested in this research was the percentage of supplementation that consist of R_0 (control), $_1$ (R_0 + 5% DM supplement), R_2 (R_0+10% DM supplement), R_3 (R_0+15% DM supplement), and R_4 (R_0+20% DM supplement) with three replications. The result of ANOVA showed that supplementation of urea cassava waste and protected soybean meal in male sheep ration had no significant effect (P>0,05) on male sheep DM and CF intake but had very significant effect (P<0,01) on CP intake with linear shaped curve (Y=113,005 + 1,86X). The conclusion of this research is supplementation of urea-cassava waste and protected soybean meal as much as 20% DM in ration did not affect DM and CF intake and could optimize CP intake of ram.

1. Introduction

Cut and carry feeding system, which implemented in major lamb farms in Indonesia cannot fulfill the energy and protein needs of fattening ram. Supplementing protein-ingredients to ruminants is also not a beneficial, because no more than 40% of the protein escapes the rumen degradation [1]. Therefore, it is necessary to protect protein-rich ingredients to supply the amino acids for the post rumem tract. Condensed tannins of *Leucaena leucocephala* leaf can be used as natural protectants of protein-rich ingredients as substituents of formaldehyde [2]. Protection can increase the protein supply of the post-rumen gastrointestinal tract, but can reduce the concentration of rumen N-ammonia, which results in a reduction in microbial protein synthesis and rumen microbial activity in vitro [3].

Urea can be used as a source of crude protein for ruminants, but its rapid degradation to NH_3 is faster than NH_3 utilization by rumen microbial. Slow released urea can be achieved by mixing it with cassava waste through an extrusion process. The mixture of urea-cassava waste can inhibit the hydrolysis of nitrogen-urea in the rumen up to 14 hours in vitro. The combination of condensed tannin-protected soybean meal and slow release urea (urea-cassava waste) can be combined with a ratio of 46:54% DM and supplemented in low-quality control ration to increase microbial protein synthesis and rumen fermentation products in vitro [4]. The *in vivo* study of this supplements has never been done before. Therfore, this study was aimed to find out how they affect dry matter, crude fiber, and protein intake, and the best percentage of supplements based on these variables.

2. Material and methods

The materials used in this study, were ± 12 months old (23-25 kg) as many as 15 heads, control rations of rice straw and concentrates (30: 70%), concentrate were used in this study consists of 41% cassava waste, 50% pollard, 5% corn flour, 2% soybean meal, 1% mineral mix, and 1% NaCl, urea-cassava waste supplements and protected soybean meal (54: 46%), a set of experimental cages, as well as a set of dry matter, crude fiber, and crude protein analysis tools [5]. The treatments ration ($R_{0,1,2,3,4}$) contain at least 76,07; 80,40; 84,72; 89,05; 93,38% DM, 27,25; 28,19; 29,13; 30,06; 31,00% CF, 9,56; 11,48; 13,39; 15,30; 17,21% CP, and 58,71; 62,36; 66,02; 69,67; 73,32% TDN respectively.

Urea-cassava waste (slow released urea) is produced by steaming 2 kg of cassava waste with urea solution (200 g of urea dissolved in 750 ml of water) using autoclave for 15 minutes. The steaming process in the autoclave was aimed to process starch gelatinization and starch-nitrogen binding. Soybean meal is protected using *L. leucocephala* crude tannin extract by spraying method. As many as 1.68 g of crude tannin extract was used to protect 100 g of soybean meal. Crude tannin extract is obtained by extracting 20 g of *L. leucocephala* leaf flour with a solvent consisting of 70% ethanol, 30% aquadest, and 1% HCl as much as 600 ml. Extraction was carried out using a rotary evaporator for 2 hours 30 minutes at a temperature of ≤80°C to prevent component degradation.

The research method was an in vivo experiment using a completely randomized design (CRD) with 5 treatments and 3 replications. The variables observed in this study were dry matter (DM), crude fiber (CF) and crude protein (CP) intake. Data then analyzed using analysis of variance (ANOVA), if the treatment has a significant effect, analysis followed by orthogonal polynomial tests to determine the best or optimum percentage of supplementation [6].

3. Result and Discussion

Dry matter, crude fiber, and crude protein intake are shown in Table 1. The result showed that there was no significant effect of supplementation urea-cassava waste and protected soybean meal in DM intake (P>0,05). It indicates that the supplementation did not interfere microbial protein synthesis and nutrient digestibility of ram. [2] reported that tannin content in ruminant diet can reduce the concentration of rumen N-ammonia, but in this study, CP in the rumen supplied by urea-cassava waste (slow release urea) to kept N-ammonia concentration in rumen remain stable. This result is in line with the study of [7–8] that stated the usage of slow released urea can provide N-ammonia for microbial protein synthesis, then the microbes increase nutrient digestibility and digestion rate. So that, the tannin content in the diet did not affect DM intake.

Supplementation did not give significant effect on crude fiber intake of ram (P>0,05). CF was the highest constituent of ruminant DM diets, so the intake was depending on DM intake. [9] stated that tannin content in diet could reduce fiber digestability, but [10] reported that addition of tannin containing *T. chebula* as much as 10g/kg DM *T. chebula* increase fiber intake and digestibility. The treatment given in this study was supplementation of CP source ingredients, so that the treatment did not affect the CF intake. This is in line with the statement of [11] which states that feed intake is influenced by its nutrient content.

The result showed that the treatment had a very significant effect (P <0.01) on CP intake. The supplementation treatment had an effect on increasing CP intake of rams with R^2 value=56.75%. The

results of further CP intake shown a linear curve followed the equation Y = 113.005 + 1.86X (Figure 1). The higher the percentage of supplements given, the higher the ram CP intake. [12] reported that the supplementation of CP from soybean meal with 0.09% of body weight in castrated cattle significantly increased the CP intake of *Kentucky buegrass* straw and *Poa pratensis* (C3) based control ration, and *tallgrass prairie*. [13] stated that the higher CP content in the diet increased the CP intake, although DM and OM intake remain stable.

Table 1. Dry matter, crude fiber, and crude protein intake of diet supplemented by urea-cassava waste and protected soybean meal

Treatments	DM Intake^{NS}	CF Intake^{NS}	CP Intake**
R0	897,660 ± 81,93	228,03±23,18	104,79±7,54
R1	888,750 ± 201,53	220,68±51,75	129,82±19,07
R2	977,380 ± 57,89	245,01±25,89	140,37±6,88
R3	867,250 ± 44,14	213,50±7,52	134,23±8,50
R4	820,920 ± 103,27	199,29±6,00	149,09±8,87
Average	890.392 ± 97,75	221,30±28,56	131,66±18,07

^{ns}) not significant; **) significant at 1%

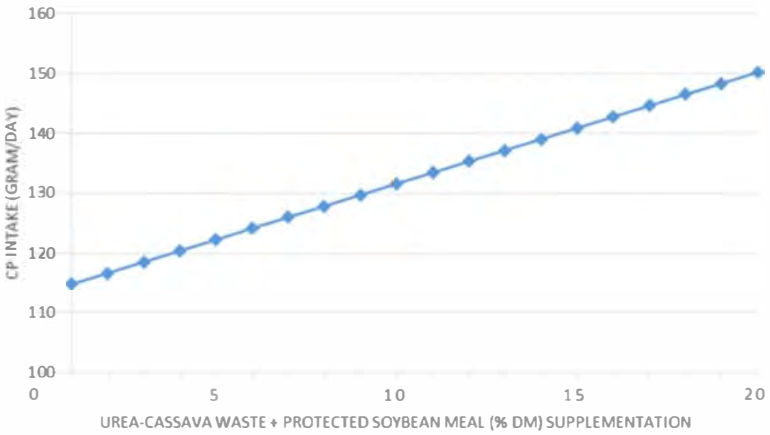

Figure 1. The effect of urea-cassava waste and protected soybean meal supplementation on CP intake

4. Conclusion

Supplementation of slow release urea (urea-cassava waste) and *L. leucocephala* leaf condensed tannin-protected soybean meal with a level of 20% DM in ration rams did not interfere with the intake of dry matter and crude fiber, and could optimize the crude protein intake of the rams.

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