# Supplementing Energy and Protein at Different Degradability to Basal Diet on Total Protozoa and Microbial Biomass Protein Content of Ongole Grades Cattle

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**ABSTRACT:** This research aimed to determine energy and protein proportion as feed supplement on total protozoa (TP) and microbial biomass protein (MBP) in the rumen of cattle fed by basal diet of corn ear and coffee pods. In vivo research was done at barn and laboratory of Animal husbandry faculty of GMU. As of four fistulated Ongole Grades Cows (aged I2, live weight 250 + 15 kg) were used. Animal were placed into individual pens. Research was held in four period (P1, P2, P3 and P4), each period consisted of 10 days including adaptation. Feed was the basal diet (BF) and supplement at ratio of 60:40 (3% of LW). At P1= animal-1 fed by BF without supplement (feed A), animal-2 fed by BF supplemented by HDE+LDP (feed B), animal-3 fed by BF supplemented LDE+LDP (feed C) and animal-4 fed by BF supplemented HDE+HDP (feed D). Within P2, P3 and P4, simultaneously animals were received the same feed. Feed was given two times a day and water was given ad libitum. Rumen fluid was taken at 0700, 1200, and 1600. Determination of TP according to Diaz *et al.,* (1993). Meanwhile the Lowry methods was followed by to evaluate MBP. The data of each sample were analysed by One way analysis of variance using SPSS program ver13.0. Result showed that amount of TP at before feeding (0700) was vary from 17.3 to 47.7 cell x 103/ml. Within feed treatments was no significant different, but it can be indicated that the high increase of amount of TP was occur at four hours after feeding time. The feed treatments was also had same yield of MBP which was vary from 195.21 mg/ml to hingga 297.84 mg/ml. The highest of MBP yields was at BF + (HDE+HDP) (297.84 mg/ml), followed by BF + (LDE+LDP) (269.56 mg/ml), BF + (HDE+LDP) (215.59 mg/ml), and BF (189.25 mg/ml). There was indicated that supplementing energy and protein source of high degraded at basal diet had the best response to the amount of TP and MBP.

**Keywords**: Supplementation, Protozoa, Microbial biomass protein, Ongole grades.

## INTRODUCTION

The weakness of crop residues as feed was low palatability and low digestibility aside low quality. The feedstuff of agricultural crop residues were rich of cell wall content but low nitrogen and there was imbalance nutrient. So its rumen degradability were low (Soeharto, 2004; Ginting, 2005). These characteristics led to decrease and digestibility. The level of digestibility, consumption and nutrient use efficiency of feed material origin of crop residue is influenced by the levels of some chemicals that are inhibiting compounds (inhibitors). Supplementation is usually also carried out in order to meet the need of metabolic energy for maintenance and production. Supplementation of the feed materials in the form of energy and protein theoretically was able to increase the use of N in feed (Broderick, 2003).

Microbial proteins represent 50 -75% protein actual (true protein) that is absorbed from the small intestine and is the main supply of amino acids (Preston and Leng, 1987; AFRC, 1992). The presence of Protozoa highly considered in determining the digestibility of feed ingredients high in fiber. Protozoa in the rumen is dominated by ciliate. As well as bacteria, ciliate able to ferment almost plant components contained in the rumen as cellulose, hemicelluloses, fructose, pectin, starch, sugar and fat soluble.

According to the statement above this research aimed to determine energy and protein proportion as feed supplement on total protozoa (TP) and microbial biomass protein (MBP) in the rumen of cattle fed by basal diet of corn ear and coffee pods as basal diet which supplemented by different character of degradation of the mixture of energy and protein sources. This will be the initiate action in order to confirm the best option of feed formulation in the form of total mix ration.

## MATERIALS AND METHODS

The study was conducted in four periods (P1, P2, P3 and P4). Each period consisted of 10 days including adaptation period. Feed given was in the form of basal feed (BF) and supplements at 60:40 (3% weight of DM). At P1, Animal-1 was given BF or without supplementation (A), Animal-2 was fed BF supplemented by HDE + LDP (B), Animal-3 fed by BF and supplemented by LDE + LDP (C) and Animal-4 was fed BF and supplemented by HDE + HDP (D). At P2, P3 and P4 in sequence all animal received the same feed in accordance with the design of the experiment, as shown in Table 1. The rumen fluid sampling was done three times as follows: one hour before feeding in the morning, four hours after feeding in the morning and one hour after feeding in the afternoon. Feeding was done twice a day, at 08.00 and 15.00. Samples of rumen fluid were taken directly using an aspirator for the determination of microbial protein biomass and protozoa. Feed regimes given were BF which consisted of corn pericarps (80) and coffee pods (20) , known as BF (treatment A). Meanwhile treatment B consisted of BF + (HDE:LDP = 50:50) = 60:40, treatment C = BF + (LDE : LDP= 50:50) = 60:40, and treatment D = BF + (HDE : HDP= 50:50) = 60:40. HDE: high degraded energy, LDE : low degraded energy, HDP : high degraded protein, LDP : low degraded protein.

**Tabel 1**. Layout of the experiment

| Period | Animal | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| P1 | A | B | C | D |
| P2 | D | A | B | C |
| P3 | C | D | A | B |
| P4 | B | C | D | A |

**Legend:**
A : BF (TJ : KK = 80:20) , B : BF + (HDE : LDP= 50:50) = 60:40
C : BF + (LDE : LDP= 50:50) = 60:40, D : BF + (HDE : HDP= 50:50) = 60:40

**Table 2.** Chemical composition basal feed supplement (%DM)[1]

| Feedstuff | DM | OM | CP | CF | TDN2 | NDF | Ca | P |
|---|---|---|---|---|---|---|---|---|
| BF | 87.70 | 77.10 | 8.20 | 0.85 | 50.55 | 61.9 | 0.46 | 0.10 |
| BF + (HDE+LDP) | 90.35 | 88.39 | 11.38 | 1.52 | 62.64 | 57.37 | 0.56 | 0.16 |
| BF + (LDE+LDP) | 88.28 | 85.10 | 8.71 | 2.11 | 60.99 | 55.39 | 1.86 | 0.51 |
| BF + (HDE+HDP) | 89.37 | 85.51 | 13.67 | 1.74 | 65.60 | 51.54 | 3.44 | 0.50 |

[1] : Result from Feed and Nutrititon Laboratory of Beef Cattle Research Station
[2] Prediction was calculated base on Harris (1970)

**Microbial Biomass Protein**. Determination of the protein content of microbial biomass using Lowry method according to Plummer (1987).
**Total Number of Protozoa.** Determination of the total protozoa carried out by following the procedure performed by (Diaz et al., 1993)
**Data analysis.** Data of microbial protein biomass and total protozoa at three sampling points each animal were analyzed by One way analysis of variance using SPSS ver13.0.

## RESULTS AND DISCUSSIONS

### Total Number of Protozoa

The total number of protozoa at before feeding time (07.00) ranged from 17.30 to 47.72 x 103 cells / ml. Inter respective feed showed no difference, but there are indications that an increase in the total number of protozoa during the four hours after feeding (12.00). Such circumstances reflect that the growing population of protozoa is affected by the conditions of time after feeding and additional substrates derived from supplementation of the basal feed.

**Table 3.** The total number of protozoa in the rumen of cattle fed basal PO and supplement different sources of energy and protein degradation (cells x 103 / ml)

| Feedstuff | Time of Obsertvation | | | Average (mean ± SD) |
|---|---|---|---|---|
| | 07.00 | 12.00 | 16.00 | |
| BF | 26.82 ± 12.09 | 30.69 ± 9.98 | 32.25 ± 8.27 | 29.92 ± 2.79 |
| BF + (HDE+LDP) | 21.31 ± 6.64 | 36.15 ± 16.31 | 12.50 ± 4.13 | 23.32 ± 11.95 |
| BF + (LDE+LDP) | 17.30 ± 5.74 | 39.02 ± 21.38 | 18.66 ± 7.31 | 24.99 ± 2.17 |
| BF + (HDE+HDP) | 26.97 ± 9.27 | 47.72 ± 19.58 | 15.39 ± 5.76 | 30.03 ± 16.38 |

These results were relate to a report of Faichney et al. (1996) that the proportion of rumen protozoa would increase three times (61-76%) when the concentrate is added in the basal feed hay to the sheep, along with the increasing contribution of duodenal N flow by 15%. Veira (1986) adds that protozoa have an indirect role in the formation of methane gas. Number of protozoa and methanogenesis decreased at low pH.

**Microbial biomass protein**

The feed given to cattle did not give a different effect on the protein content in the rumen microbial biomass, which varied between 195.21 mg / ml up to 297.84 mg / ml. The highest result found in BF + (HDE + HDP) (297.84 mg / ml), followed by BF + (LDE + LDP) (269.56 mg / ml), BF + (HDE + LDP) (215.59 mg / ml), and BF (189.25 mg / ml). When compared with the results of the analysis of the chemical composition of the feed mixture basal and supplements (as shown in Table 1), there is the same relationship, that the addition of the BF supplements increased the content of microbial biomass protein.

**Table 4**. The microbial protein biomass content in cow rumen microbial biomass PO by basal feed supplements and different sources of energy and protein degradation (mg/ml)

| Feedstuff | Time of Obsertvation | | | Average (mean ± SD) |
|---|---|---|---|---|
| | 07.00 | 12.00 | 16.00 | |
| BF | 189.26 ± 52.16 | 242.76 ± 97.00 | 153. ± 28.85 | 195.21± 56.41 |
| BF + (HDE+LDP) | 191.86 ± 76.00 | 235.71 ± 86.00 | 219.21 ± 92.27 | 215.59 ± 82.01 |
| BF + (LDE+LDP) | 225.61 ± 77.88 | 284.01 ± 89.86 | 299.06 ± 50.77 | 269.56 ± 100.49 |
| BF + (HDE+HDP) | 270.71 ± 88.84 | 312.11 ± 37.41 | 310.71 ± 71.65 | 297.84 ± 18.92 |

At one hour before feeding (0700), microbial biomass protein was the lowest and this was occurring in all feedstuff. Meanwhile the highest protein content of microbial biomass was found in the observation of four hours after feeding time except the BF + (LDE+LDP). This reflected the mass activity of microbes to ferment in the rumen. Rumen microbial biomass that is left is the supply of protein for ruminants. Sauvant *et al*. (1995) mentions that the 2/3 - 3/4 part of the protein which is absorbed by ruminant derived from microbial protein.

There was an indication that the feed of BF + (HDE + HDP) generate the highest microbial biomass protein content compared with other feed, is supported by the results of the rumen fermentation and VFA concentration of NH3 high rumen. Such circumstances appear to be associated with higher digestibility in sacco DM at 24 h incubation (63.06%) and BO (53.92%). Wanderley et al. (1999) reported that in the determination of in situ digestibility, microbial colonization were determined based on the percentage of BK increases with incubation time in the rumen nylon bag and it is influenced by the kinds of feed ingredients and its crude fiber content.

## CONCLUSION

Basal feed which received supplementation mix of high degraded energy and high degraded protein was the best result and can be used in the in vivo test in related to confirm the animal responses.

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