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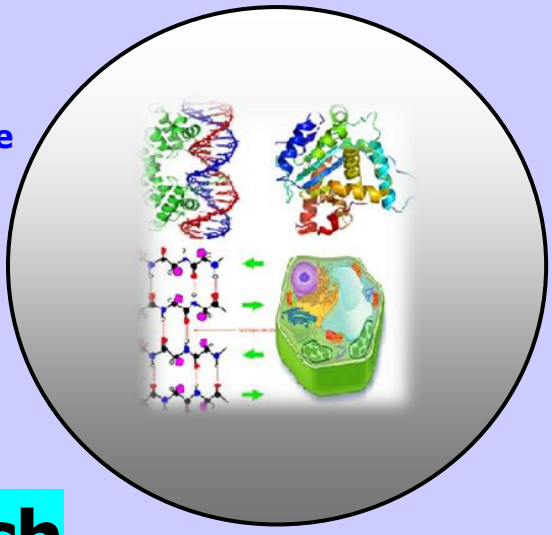

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RESEARCH PAPER

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Digestibility and Rumen Fermentation Product of Crossbred Etawah Goat given *Calliandra calothyrsus* and *Gliricidia sepium* in Ration

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ABSTRACT

The experiment is aim to find the digestibility and rumen fermentation product of etawah crossbreed goat with ± 16 kg of average body weight. The experiment use randomized block design (RBD) with four treatments and four replicates, so it has 16 units experiment. The four treatments are ration treatment A (40% elephant grass+20% rice bran+9.4% cassava+0.5% NaCl+0.1% vitamin mineral+30% gliricidia, 0% calliandra), B (40% elephant grass+20% rice bran+9.4% cassava+0.5% NaCl+0.1% vitamin mineral+20% gliricidia+10% calliandra), C (40% elephant grass+20% rice bran+9.4% cassava+0.5% NaCl+0.1% vitamin mineral + 10% gliricidia + 20% calliandra), dan D (40% elephant grass+20% rice bran+9.4% cassava+0.51% NaCl+0.1% vitamin mineral+0% gamal+30% calliandra). Variables observed are dry matter and nutrient digestibility, pH, NH_3, and vollatyl fatty acid (VFA) of rumen liquid. Results of the experiment showed that treatment the dry matter and nutrient digestibility (organik matter, crude protein, ether extract, crude fiber, and energy bruto), pH (acidity), NH3, dan VFA of liquid rumen showed no significant different among all treatments.

Key words: Calliandra calothyrsus, Gliricidia sepium, Digestibility, Product Fermentation Rumen and Etawah Crossbred Goat.

INTRODUCTION

Calliandra calothyrsus and *Gliricidia sepium* are widely known as protein source from leguminoseae which potential to develop as feed for ruminant such as cow or goat. *Calliandra calothyrsus* rich in protein, but the digestible energy content is relatively low. The

edible part contains 20-25% crude protein so that appropriate as an additional protein for ruminant which the main feedcontain of low protein quality. But the offer should be no more than 30-40% of whole feed in fresh weight, because if morethan 30-40% is not going to be use fully (Paterson, 2001). According Djaja (2007a), nutrient content in *Calliandra calothyrsus* leaves is potential as feed especially as protein source with 20-25% protein Roshetko (2000) stated that digestibility is one of factors that affect the nutritional valueand the extent of forage could be digest and absorbby ruminant. The problem of *Calliandra calothyrsus* as feed is high in tannin content so the digestibility is low (30-60%)and this is the limitting factors of calliandra as feed, however it's not affect if offering 30-40% in ration (Djaja, 2007b).

Calliandra calothyrsus could be used to reduce protein degradation in rumen and increase protein availability in post rumen of soy meal andtofu waste. In vivo evaluation using *Calliandra*as protein source could improve the performance of goat (Winaet al*.,* 2010). Wiryawanet al. (1999) stated that *Calliandra* as leguminoseae plant contains of tannin could be used to protect the protein of feed from rumen microbe degradation. However should be attention to the protein source due to the interaction of tannin and protein is specific for each type of protein.

The roleof Gliricidia as rumen degradable protein(RDP) dancalliandra as rumen undegradable protein(RUP). The forage offer should be varied consist of grass and leguminoseae because could be complementary the nutrient to meet the nutrient requirement of ruminant

According Herdiawan et al. (2005) one of the ways to reduce of tannin content in calliandra is cofeeding system whereas a mixture of legumes that contain high content in tannin such as calliandra with legumes do not contain tannin such as gamal. The purpose of cofeeding is to prevent partially of soluble protein in gliricidia not broken down in rumen and bind with tannin of calliandra. The tannin-protein bind could be broken in a low pH of abomasum so that the protein can be used directly by livestock. Winadan Tangenjaya (2000) found that the addition of cassava or rice bran as energy source could increase 19% weight gain of sheep. The result showed that the importance of cheap energy source addition for sheep which given calliandra. Source of rumen degradable protein such as gliricidia will provide the high nitrogen in rumen to support microbe protein synthesis. Besides, source of rumen undegradable protein is not provide nitrogen for degrading in rumen and not support rumen microbe growth. The utilization of source of degradable protein needs an addition of calliandra as a protection for gliricidia from rumen microbe degradation.

The experimentis aimed to evaluate the ability of calliandra to protect protein from degrading of microbe in rumen.

MATERIAL AND METHODS

Material

Crossbred etawah goat use in this experiment with ± 16 kg of body weight and are placed in 16 cages. Each cage be equipped with feeding and drinking water. The experiment conduct in Sidemen Village, Selat District, Karangasem Regency for three months.

Ration consists of elephant grass, cassava, rice bran, gliricidia, calliandra with red flower, salt and vitamin mineral. Ration is offered twice a day in the morning and afternoon. Drinking water is given ad libitum.

Methods

The experiment use randomized block design (RBD) with four treatments and four replicates, so it has 16 units of experiment. The four treatments are 40% elephant grass+20% rice bran+9.4% cassava+0.5% NaCl+0.1% vitamin mineral+30% gliricidia, 0% calliandra (treatment A), 40% elephant grass+20% rice bran+9.4% cassava+0.5% NaCl+0.1% vitamin mineral+20% gliricidia+10% calliandra (treatment B), 40% elephant grass+20% rice bran+9.4% cassava+0.5% NaCl+0.1% vitamin mineral + 10% gliricidia + 20% calliandra (treatment C), dan 40% elephant grass+20% rice bran+9.4% cassava+0.51% NaCl+0.1% vitamin mineral+0% gamal+30% calliandra (treatment D). Variables observed are dry matter and nutrient digestibility, pH, NH_3, and vollatyl fatty acid (VFA) of rumen liquid.

Variables observe:

1. Nutrient digestibility:

$$\text{Nutrient digestibility (\%)} = \frac{\text{Nutrient consumption (g)} - \text{Faeces nutrient (g)}}{\text{Nutrient consumption (g)}}$$

Note:

Nutrient consumption (g) = Σnutrient consumption (g) $\times$nutrient content (% DM)

Faeces nutrient (g) = faeces nutrient (% DM) $\times$production of DM faeces (g)

2. N-amonia (N-$NH_{3)}$ concentration:

N-NH_3 (mM) = (ml $H_2SO_4\times$ 1000) mM

3. VFA partial dan VFA total:

$$\text{VFA parsial (mM)} = \frac{\text{Sampel high}}{\text{Standard high}} \times \text{standard concentration}$$

VFA total (mM) = (acetic + propionic + butyric) concentration

Data were analyzed with analysis of variance and if the average value of treatment were significantly on variable observe and further analysis was continued using Duncan test on 5% (Steel and Torrie, 1991).

RESULTS AND DISCUSSION

Dry matter digestibility in treatment A, B, C and D indicate no significant difference in all treatment. Dry matter digestibility tend to decrease in treatment B, C, and D because dry matter intake in three treatments not significant different, so that the chance of feed to degraded by microbes in the rumen almost the same. Tannin content in calliandra is an inhibitor of rumen microbes to digest the feed, so that the dry matter tend to be lower with increasingly lower percentage of caliandrain ration B, C, and D respectively. Gliricidiaroleas rumen degradable protein (RDP) and calliandra as rumen undegradable protein (RUP).

Tilman *et al*. (1986) stated that more feed to be digestedin digestive tract, faster rate of passage, more space available for the next consumption. The statement was in line with the opinion of Van Soest (in Wilson, 1991) that the dry matter digestibility positively correlated with feed intake

Table 1. Dry matter and nutrient digestibility of crossbred goat.

Variables	Treatments[1)]				SEM[2)]
	A	B	C	D	
Dry matter digestibility (%)	63.99[a3)]	61.13[a]	62.63 [a]	62.33 [a]	1.86
Organic matter digestibility (%)	64.95 [a]	62.36 [a]	63.83[a]	63.45[ba]	1.82
Crude protein digestibility (%)	56.89 [a]	43.98 [a]	44.57[a]	49.22 [a]	5.99
Ether extract digestibility (%)	59.20 [a]	57.52 [a]	64.03 [a]	63.06 [a]	2.05
Crude fiber digestibility (%)	48.91 [a]	50.94 [a]	49.05[a]	50.89[a]	2.85
Energy digestibility (%)	63.29 [a]	60.88 [a]	63.54[a]	63.95 [a]	1.74

Note:

1) A: 40% elephant grass+20% rice bran+9.4% cassava+0.5% NaCl+0.1% vitamin mineral+30% gliricidia, 0% calliandra, B: 40% elephant grass+20% rice bran+9.4% cassava+0.5% NaCl+0.1% vitamin mineral+20% gliricidia+10% calliandra, C: 40% elephant grass+20% rice bran+9.4% cassava+0.5% NaCl+0.1% vitamin mineral + 10% gliricidia + 20% calliandra, dan D: 40% elephant grass+20% rice bran+9.4% cassava+0.51% NaCl+0.1% vitamin mineral+0% gamal+30% calliandra
2) Standard Error of the Treatment Means
3) Value with the same alphabet in the same line are not significantly different (P>0,05)

The offering of treatment A, B, C, and D not significant difference on organic matter digestibility where organic matter digestibility of ration follows the pattern of dry matter digestibility of ration.

Digestibility of crude protein in treatment A, B, C, and D indicate that there is no significant difference in all treatments.There is an increasing percentage of calliandra from treatment B, C, and Dare 10 % , 20 % to 30 % respectively, while the percentage of gliricidia decrease from 20%, 10 % and 0 % in the ration treatment.

The ether extract, crude fiber and energy digestibility showed the same thing that no significant difference in treatment A, B, C, and D.

Trisnadewi et al. (2014) found that the substitution of gliricidia leaf with calliandra leaf until 20% in ration (in vitro) which consist of forage and concentrates can reduce dry and organic matter digestibility in the rumen, however increase the digestibility of dry matter and organic in pepsin. Furthermore Firdus et al. (2004) found the average value of consumption and digestibility of nutrients is highest in the treatment of a mixture of 15 % fresh calliandra and 15 % fresh gliricidia.

Vollatile fatty acid (VFA) partial is consist of acetic acid, propionic acid, n-butyric acid, isovaleric acid and n-valeric acid showed no significant difference (P>0.05) in treatments A, B, C, and D, while iso butyric acid is significant effect in treatment A which gives the highest yield than other treatments but the treatment B, C, and D show not significant difference (P>0.05). VFA is the final product of fermentation of carbohydrate by rumen microbes and is the main energy source for ruminants (Arora, 1995).

Table 2. Vollatyl Fatty Acid (VFA), NH_3, dan pH liquid rumen of crossbred goat.

Variables	Treatments [1)]				SEM[2)]
	A	B	C	D	
VFA partial:					
- acetic acid (mM)	90.61 [a3)]	96.52 [a]	54.50 [a]	71.47 [a]	16.92
- propionic acid (mM)	27.58 [a]	27.82 [a]	15.078[a]	17.67 [a]	3.60
- iso butyric acid (mM)	2.96 [a]	1.54 [b]	1.62 [b]	1.43 [b]	0.20
- n butyric acid (mM)	16.03 [a]	15.64 [a]	12.00 [a]	14.30 [a]	2.04
- isovalericacid (mM)	1.27 [a]	1.02 [a]	1.24 [a]	0.88 [a]	0.10
- n valeric acid (mM)	0.79 [a]	0.75 [a]	0.76 [a]	0.66 [a]	0.08
VFA total (mM)	139.24 [a]	143.27 [a]	85.19 [a]	106.41 [a]	21.73
NH_3 (mM)	5.36 [a]	4.12 [a]	6.00 [a]	3.70 [a]	0.93
pH	7.11 [a]	7.18 [a]	7.16 [a]	7.04 [a]	0.11

Note:

1) A: 40% elephant grass+20% rice bran+9.4% cassava+0.5% NaCl+0.1% vitamin mineral+30% gliricidia, 0% calliandra, B: 40% elephant grass+20% rice bran+9.4% cassava+0.5% NaCl+0.1% vitamin mineral+20% gliricidia+10% calliandra, C: 40% elephant grass+20% rice bran+9.4% cassava+0.5% NaCl+0.1% vitamin mineral + 10% gliricidia + 20% calliandra, dan D: 40% elephant grass+20% rice bran+9.4% cassava+0.51% NaCl+0.1% vitamin mineral+0% gamal+30% calliandra

2) Standard Error of the Treatment Means

3) Value with the same alphabet in the same line are not significantly different (P>0,05)

Total VFA showed not significant difference (P>0.05) among treatments A, B, C, and D. It caused by energy sources of ration such as elephant grass, rice bran and cassava in the same proportion in all treatments (A, B, C, and D). The amount of VFA is dependedon dry matter and crude fiber digestibility where dry matter and crude fiber digestibility in treatment A, B, C, and D had no significant, so VFA partial andVFA total give not significant effect. Levels of total VFA inthis experiment results ranged from 85.19 to 143.27 mM. According Sutardi (1995) in Putra (2006), optimal VFA levels needed for the optimization of rumen microbial protein synthesis and degradation processes feed ranges between 8-160 mM.

The average of NH3 in treatment A, B, C, and D show not significant difference (P>0.05) 5.36 ; 4.12 ; 6.00 ; and 3.70 mM respectively. According Nuswantara (2009), high concentrations of NH3 and VFA in the rumen will cause higher microbial protein synthesis. However, the presence of anti-nutritive coumarinin gliricidia and tannins in calliandra limited for livestock to consume both types of the feed.

The amount of pH on all treatments A, B, C, and D show not significant difference (P>0.05).It shows that the pH is normal for microbial activity in the rumen. According to Owen and Goetsch (1988) normal pH range is 5.5 to 7.2, and the results showed the pH value is still at normal pH range of between7.04 to 7.18.

CONCLUSSION

Nutrient digestibility (organic matter, crude protein, ether extract, crude fiber, and energy bruto), pH, NH3, dan VFA of liquid rumen showed no significant different among all treatments.

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