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CONTENTS

ORAL PRESENTATION

Rumen Fermentation and Performance of Sheep Fed Different Level of Cassava Leaf Silage

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ABSTRACT

This experiment aimed to investigate the effects of cassava leaves silage (CLS) addition in substituting concentrate on rumen fermentation characteristics and performance of Javanesse thin tail sheep. Sixteen male sheep of nine months old with average body weight of 15.36 ± 2.59 kg were allocated intorandomized block design consisted of four treatments and four replicates. They were placed in individual cage and had free access to drinking water. They were fed experimental diets twice a day, in equal portion in the morning and afternoon, at level of 3.5% body weight on dry matter basis. The treatments were T0 (100% of napier grass), T1 (60% napier grass + 40% concentrate), T2 (60% napier grass + 20% concentrate + 20% CLS), and T3 (60% napier grass + 40% CLS). The results showed that addition of cassava leaf silage had no effect on dry matter intake. Addition of cassava leaves silage decreased (P<0.05) dry matter digestibility of feed, but increased (P<0.05) VFA and N-NH3 productions. Animal in T2 group (CLS addition at level of 20%) had average daily gain and feed utilization efficiency (FUE) similar to those of T1 group. Animal in T3 group (CLS addition at level of 40%) had daily gain and FUE significantly lower (P<0.05) than those of T1 and T2 groups. Animal in T0 (control group) were inferior in all parameters to those of other groups. It is concluded that CLS can be given at level of 20% of total ration which is equal to half part of concentrate diet with resulting in good performance.

Key Words: Cassava leaves, Sheep, Rumen fermentation

INTRODUCTION

The problem often faced by sheep farmers is the availability of feed. The availability of feed is abundant during rainy season, whereas during dry season feed is very hard to come by. The other problem is that the tropical forage quality is low. This can be overcome by supplementing concentrate diet, but the price of concentrates is expensive resulting in low productivity of sheep. It is therefore necessary to look for feed alternatives that are cheap, easily available all the time, and have good quality. One such alternative feed is cassava leaves.

Cassava leaves contain a high enough protein 21 to 24% (Sokerya and Preston, 2003). Constraints use of cassava leaves as animal feed is itshigh content of HCN (hydrocyanic acid) at 200 to 1300 mg kg-1 fresh weight (Siritunga et al. 2003). HCN content of cassava leaves can be reduced with silage processing. Making silage is also useful for preserving forage so that the availability of food is not volatile. This method is not disturbed by weather condition, neither dry nor rainy season. In addition, silage can also increase the palatability of feed.

The purpose of this research,therefore was to study the effect of cassava leaf silage as a substitution of concentrate on performance, feed utilization and rumen fermentation characteristics in Javanessethin tail sheep.

MATERIALS AND METHODS

Sixteen male sheep of nine months old with average body weight of 15.36 ± 2.59 kg were allocated intorandomized block design consisted of four treatments and four replicates. They were placed in individual metabolic cages and had free access to drinking water. They were fed experimental diets twice a day, in equal portion in the morning and afternoon, at level of 3.5% body weight on dry matter basis. The experimental diets consisted of napier grass (35 days cutting age), concentrate, and cassava leave silage (CLS). Concentrate diet composed of wheat pollard, coconut meal, peanut meal, waste cassava tuber meal, salt, premix, and CaCO3. The treatments were T0 (100% of napier grass), T1 (60% napier grass + 40% concentrate), T2 (60% napier grass + 20% concentrate + 20% CLS), and T3 (60% napier grass + 40% CLS). The nutrient content of experimental diets was shown in Table 1. Data obtained were analyzed using ANOVA, and any mean significant differences were further tested using Tukey test (Steel and Torrie, 1980).

Table 1. Nutrient Composition of Experimental Diets (Dry Matter Basis)

Nutrients	Treatments			
	T0	T1	T2	T3
Dry matter (%)	13.97	41.88	29.92	17.97
Gross Energy(cal/gr)	3971	4078	4163	4249
Ash (%)	7.68	9.04	8.44	7.83
Crude protein (%)	10.71	15.08	15.85	16.62
Ether extract (%)	2.02	3.96	3.94	3.92
Crude fibre (%)	30.41	21.87	24.20	26.54
Ca (%)	0.475	0.664	0.783	0.901
P (%)	0.347	0.408	0.399	0.391

T0 = 100% penisetum; T1 = 60% penisetum + 40% concentrate; T2 = 60% penisetum+20% concentrate+20% cassava leave silage; T3 = 60% penisetum +40% cassava leave silage

RESULTS AND DISCUSSION

Sheep performance

Mean feed intakeand digestibility during the study are presented in Table 2. Treatment did not affected dry matter intake. Dry matter intake in this study ranged from 3.36 to 3.45% DM/BW$^{0.75}$. These results are consistent with the results of Haryanto and Djajanegara (1993) who reported that the dry matter requirement for Indonesian sheep weighing 10 to 20 kg is 3.1 to 4.7% of body weight for a daily gain of 0 to 100 g.

Table 2. Performance of Sheep FedExperimental Diets

Variables	Treatments			
	T0	T1	T2	T3
Dry matterIntake,				
g/kg BW$^{0.75}$/day	69.19±3.35	70.11±2.92	69.56±3.28	69.88±3.12
g/head/day	561.70±103.96	591.04±93.03	586.03±103.14	583.35±101.36
IVDMD, %	78.52±0.99^{b}	80.51±0.47^{a}	75.15±0.54^{c}	70.82±0.67^{d}
IVOMD, %	80.04±0.79^{b}	81.94±0.34^{a}	76.88±0.22^{c}	71.91±0.42^{d}
Daily gain, g/day	38.57±11.81^{c}	76.64±18.08^{a}	75.79±9.24^{a}	66.07±19.06^{b}
Feed efficiency	6.96±2.06^{b}	13.60±4.97^{a}	13.52±3.20^{a}	11.99±4.25^{a}

T0 = 100% penisetum; T1 = 60% penisetum + 40% concentrate; T2 = 60% penisetum+20% concentrate+20% cassava leave silage; T3 = 60% penisetum +40% cassava leave silage. Different superscript in the same row differed significantly (P<0.05)

Treatment significantly affected (P <0.05) the digestibility of dry matter (IVDMD) and organic matter (IVOMD). Giving 40% cassava leaf silage resulted in lower digestibility of dry matter and organic matter than the other treatments. This is presumably due to the tannin content in cassava leaves. Tannins can bind to the cell walls of the rumen microorganisms and can inhibit the growth of microorganisms or enzyme activity (Smith et al. 2005). Tanner et al. (1994) explains that tannins can also interact with proteins derived from the feed and decreases its availability for rumen microorganisms. The content of tannins in cassava leaves and are commonly found in tropical plants, usually in the form of polyphenolics (polyphenols) which are not easily dissolved in water and easily bind to proteins in the form of tannin-protein complexes which are bound by hydrogen bonds.The treatment of 40% concentrate has higher digestibility of dry matter and organic matter than other treatments. This is because the concentrate feed contains low crudefiber, consequently its digestibility is high.

Treatment had significantly (P <0.05) effect on daily gain and feed efficiency (Table 2). Sheep fedwith 40% concentrate (T1) diet had the highest daily gain, while those fed with 100% grass (T0) had the lowest daily gain. This is due to that T1 group had the highest while T0 group had the lowest feed intake and digestibility. Sheep fed supplement either concentrate or CLS had better feed efficiency than control group. This obviously showed that giving concentrate or CLS improved feed quality and is better utilized by sheep.

Rumen fermentation

Effect of the addition of cassava leaf silage on rumen fermentation characteristics are shown in Table 3.Treatment has significant (P <0.05) effect on rumen fluid pH. Treatment of 40% concentrate (T1) has a pH value not significantly different with those of 20% cassava leaves silage (T2). The pH value in the treatment of 40% concentrate is lower than that of control group. This is due to the availability of soluble carbohydrates in the ration of T1 and T2 was high. The high soluble carbohydrate is expected to result in more fermentable carbohydrates by rumen microbes to produce VFA. The high amount of VFA produced resulting in rumen fluid pH to fall.

Treatment significantly (P <0.05) affected the amount of N-NH3. The amount of N-NH3 in the treatments of cassava leaf silage 20% and 40% were higher than other two treatments. This is because the protein content of feed containing20% and 40% cassava leaf silage were higher than those of any other treatment thosewere 15.85% and 16.62%. In addition, the activity of microorganisms during ensilase process also helped break down proteins in the diet of cassava leaf silage added so those were more easily fermented in the rumen and further produce a higher concentration of ammonia (Kurnianingtyas et al. 2012). According to McDonald et al. (2002), optimal N-NH3 concentration range for rumen microbial protein synthesis is 6 to 21 mM. This shows that all treatments have a range of N-NH3 values within normal limits.

Treatment significantly (P <0.05) affected the amount of VFA. The treatment of 40%cassava leaf silage has total VFA higher than other treatments. VFA concentration of feed containing silage is higher due to the activity of microorganisms during ensilase help initially to decompose the feed and cause further fermentation of silage is easier in the rumen (Kurnianingtyas et al. 2012). High total VFA production reflects that the organic matter of feed is broken down easily by microbes in the rumen. Santoso et al. (2009) stated that the silage with the addition of molasses which is a soluble carbohydrate can be utilized easily by cellulolytic bacteria as a stimulant in degrading carbohydrate to produce high VFA concentration. Total VFA concentration in the study was in accordance with the normal limits that stated by McDonald et al. (2002) which ranged from 70-150 mM.

Table 3. Rumen FermentationCharacteristics of sheep fed experimental diets

Variable	Treatments			
	T0	T1	T2	T3
pH rumen	6.88±0.21[a]	6.49±0.16[b]	6.51±0.23[ab]	6.77±0.07[ab]
$N\text{-}NH_3$	8.11±0.55[b]	6.46±0.51[c]	10.25±1.14[a]	11.92±1.34[a]
VFA	93.63±12.74[b]	88.57±9.69[b]	96.16±13.07[b]	131.59±16.53[a]

T0 = 100% penisetum; T1 = 60% penisetum + 40% concentrate; T2 = 60% penisetum+20% concentrate+20% cassava leave silage; T3 = 60% penisetum +40% cassava leave silage; Different superscript in the same row differed significantly (P<0.05)

Treatment of 40% concentrate (T1) has the lowest value of NH3 and VFA among other treatments. This is presumably due to NH3 and VFA formed from highly soluble nutrients in concentrate are already utilized by rumen microbes for microbial protein synthesis.

CONCLUSION

It is concluded that CLS can be given at level of 20% of total ration which is equal to half part of concentrate diet with resulting in good performance.

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