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## Feeding behaviour and drinking activities of Kacang goat fed high and low fiber diets

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**Abstract.** Diets for goats in confinement area influence their feeding behaviour. Natural grass (NG) and total mixed rations (TMR) that have different crude fiber content and texture will affect eating, rumination, and chewing activity of the goat. This study was set up to explore the feeding behaviour and drinking activities of Kacang goat fed NG (high fiber diet) and TMR (low fiber diet). A total of 12 Kacang goats was set up in completely randomized design. The treatments were different types of diets included NG containing 35% crude fiber and having natural texture, and TMR containing 29% crude fiber and grounded. The feeding behaviour and drinking activities observed included eating, ruminating, and drinking activities were recorded every 5 minutes for 48 hours. One way of ANOVA using SPSS statistics software version 19 was used to analyse data. The result indicated that NG was eaten slower ( $P=0.03$ ) than TMR that was about 0.74 min/g of dry matter vs. 0.46 min/g of dry matter. There was a tendency ( $P=0.81$ ) that goat fed NG spend eating activities longer than goat fed TMR (352.5 min/d vs. 337.5 and 324.4 min/d). Goats fed TMR spent more drinking activities than goats fed NG (18.8 and 15.0 min/d vs. 0.6 min/d). It can be concluded that high fiber feed needed more time to eat and spent higher meal time (min)/ DMI (g) that caused lower feed intake than low fiber feed. In addition, goat fed TMR have to provide drinking water more than goat fed NG.

### 1. Introduction

Diets for goats in confinement area influenced their feeding behavior [1,2]. Silva et al. [3] reported that feeding behaviors of goats raised in the field were almost same with those raised in the confining area.

Feeding behaviors were influenced by level of concentrate in the ration [4,5] and physical characteristics of fiber, mainly particle size [4,6] and dietary fiber intake [4]. In addition, Koluman et al. [7] stated that eating behavior was varied by body size differences of different genotypes.

Natural grass (NG) and total mixed rations (TMR) that have different crude fiber content and texture will affect eating, rumination, and chewing activity of the goat. Lu et al. [4] stated that the more dietary fiber intake, the longer the chewing time. In this study, NG had different particle size and water content compared to TMR, therefore it might influence the feeding behavior and drinking activities. Rumination process helps reducing feed particle size in the rumen and allow more feed to be consumed [8]. This study was set up to explore the feeding behavior and drinking activities of Kacang goat fed NG (high fiber diet) and TMR (low fiber diet).



## 2. Materials and method

A total of 12 Kacang goats was set up in completely randomized design. The treatments were different types of diets included NG containing 35% crude fiber, 81% water content and having natural texture, and TMR containing 29% crude fiber, 8% water content and being grounded. The TMR contained different source of protein that was fish meal (TMR-F) and soybean meal (TMR-S). Goats were fed NG three times daily, while TMR and drinking water was provided *ad libitum*.

The feeding behavior observed included eating and ruminating activities were recorded every 5 minutes for 48 hours [9] at the week 10<sup>th</sup> of treatment period. The activity was recorded at the first seen [10] and considered to persist for 5-minute interval [6]. Total time for eating and ruminating was calculated as total chewing time [6,8]. One way of ANOVA using SPSS statistics software version 19 was used to analyze data [11].

## 3. Results and discussion

The NG was eaten slower ( $P=0.03$ ) than TMR that was indicated by meal time (min)/DMI (g) in table 1. Roughage containing high crude fiber was digested longer in the rumen than concentrate, therefore the rumen out flow was slower. There was a tendency ( $P=0.81$ ) that goat fed NG spend eating activities longer than goat fed TMR (table 1). This caused the DMI of goats fed NG was lower than those fed TMR-S ( $P=0.02$ ). Ruminal passage rate increased with decreasing particle size, resulting in the increase of feed intake [6,8].

Giger-Reverdin et al. [5] reported that diet containing high concentrate (60%) was eaten more rapidly than diet containing low concentrate (30%), and goats stopped eating sooner. However, Zhao et al. [6] reported that ration containing high physically effective fiber (peNDF) tended to increase eating activity (min/d).

**Table 1.** Feeding behavior, dry matter intake, meal time/g DMI, and drinking activity of goat fed natural grass and total mixed ration.

Parameters	NG	TMR-F	TMR-S	Sig.
Eating (min/d)	352.50±28.06	337.50±70.53	324.38±71.72	0.81
Rumination (min/d)	393.13±100.32	475.00±231.12	495.63±85.03	0.62
Chewing (min/d)	765.63±126.69	812.50±297.05	820.00±65.22	0.83
DMI (g)	481.76 <sup>a</sup> ±66.72	620.71 <sup>ab</sup> ±47.54	742.26 <sup>b</sup> ±152.52	0.02
Meal time (min)/ DMI (g)	0.74 <sup>a</sup> ±0.11	0.54 <sup>ab</sup> ±0.08	0.46 <sup>b</sup> ±0.17	0.03
Drinking (min/d)	0.63 <sup>a</sup> ±1.25	18.75 <sup>b</sup> ±9.68	15.00 <sup>ab</sup> ±8.90	0.02

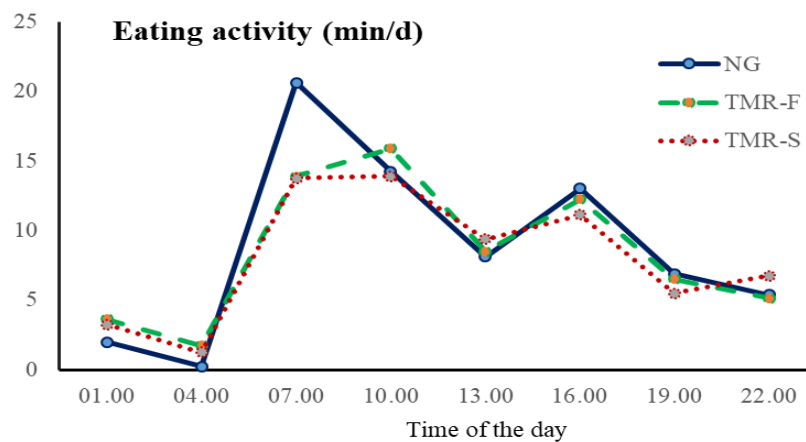
<sup>a,b</sup> Means with different superscripts within a row are significantly different ( $P<0.05$ ).

The average eating activity of goat in this study was 338.13 min/d. Some researchers reported that total eating time in goats were about 178.92 min/d in German crossbred goats and 219.97 min/d in Saanen crossbred goats [7]; 269.56 min/d in Saanen goat [12]; 272.87-306.74 min/d in Bligon goats [13]; 383.04 min/d in Damascus goats [10].

Eating activity was mostly done during the day (fig. 1). The highest eating activity was at 07.00 am in the morning, then decreased with the increasing of time, and tended to slightly increase at 04.00 pm. The high eating activity was in the morning (at the time of feeding), because goats prefer fresh feed, especially those fed natural grass. Keskin et al. [10] reported that the highest eating activity was reached when new feed was provided. Silva et al. [3] also reported that goat ate more frequent in the morning.

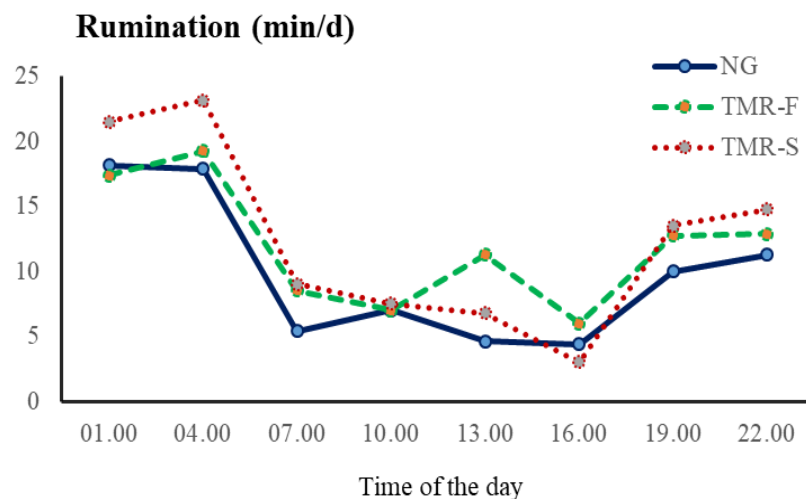
All of the treatments showed that chewing activity was more for rumination than for eating (table 1). The average of chewing activity was 792.71 min/d consisted of 454.58 min/d for rumination (57.35%) and 338.13 min/d for eating (42.65%). Zhao et al. [6] also reported similar pattern; from the chewing activity 535 to 690 min/d, ruminating activity (301 to 476 min/d) was spend more time than

eating activity (214 to 251 min/d). Budisatria et al. [13] stated that total time for rumination was 400.40 to 438.40 min/d and those for eating activity was 272.87 to 306.74 min/d. Lu et al. [4] reported that in lactating goats, eating and rumination activity were ranged from 37 to 46% and 54 to 63%, respectively and they were influenced by forage length, the ratio of forage and concentrate, and the intake of fiber in the diet. Ruminating time increased with the increasing of physically effective fiber [6]. However, in this study, the rumination time in goats fed TMR tended to be higher ( $P=0.62$ ) than those fed NG as presented in the table 1. This was because dry matter intake of goats fed TMR was higher than those fed NG. It can be concluded that rumination time tended to be affected by the amount of DMI as reported by Budisatria et al. [13].



**Figure 1.** Eating activity of Kacang goat fed natural grass and total mixed ration.

Most of the time, rumination was done at night from 19.00 (07.00 pm) until 04.00 am in the morning (fig. 2). Keskin et al. [10] reported that the highest rumination activity was during the night.



**Figure 2.** Rumination activity of Kacang goat fed natural grass and total mixed ration.

Goats fed TMR spent more drinking activities than goats fed NG (table 1). This was caused by the differences of water content in the diets. The natural grass contained 81.42% of water, while TMR-F 8.74% and TMR-S 8.47%. Keskin et al. [10] observed that goats tended less drinking and higher eating activities than sheep. Water intake was influenced linearly with dry matter intake [3,10,14,15] and water content of feed [15,16]. The higher goat consumed water taken from the feed, the less their water intake [15]. Ehrlenbruch et al. [17] reported that drinking water of goat fed hay (having water content of 17.60%) was higher than those fed silage (having water content of 74.70%).

#### 4. Conclusion

It can be concluded that high fiber feed needed more time to eat and spent higher meal time (min)/DMI (g) that caused lower feed intake than low fiber feed. In addition, goat fed TMR have to provide drinking water more than goat fed NG.

#### 5. Acknowledgments

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