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EFFECT OF FEEDING ODOT GRASS (PENNISETUM PURPUREUM CV. MOTT) SILAGE WITH RICE STRAW AS ABSORBENT ON FEEDING BEHAVIOR OF KACANG GOATS

(Pengaruh Pemberian Silase Rumput Odot (Pennisetum Purpureum cv. Mott) dengan Jerami Padi Sebagai Absorban Terhadap Tingkah Laku Makan Kambing Kacang)

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ABSTRAK

Penelitian ini bertujuan mengetahui pengaruh pemberian silase rumput odot dengan jerami padi sebagai absorban terhadap tingkah laku makan kambing kacang. Sebanyak 4 ekor kambing jantan dengan kisaran umur ± 1-1,5 tahun dengan kisaran bobot badan 20,2 kg -22,9 kg digunakan dalam penelitian yang mengikuti Rancangan Bujur Sangkar Latin (RBSL) yang terdiri dari 4 perlakuan dan 4 periode sebagai ulangan. Perlakuan tersebut yaitu JP0 = silase yang terdiri dari 100% Odot, JP10 = yang terdiri dari 90% Odot dan 10% Jerami Padi, JP20 = Silase yang terdiri dari 80% Odot dan 20% jerami padi, JP30 = Silase yang terdiri dari 70% Odot dan 30% Jerami Padi. Parameter yang diukur adalah tingkah laku makan yang mencakup lama dan frekuensi makan, lama dan frekuensi ruminasi, serta lama dan frekuensi istirahat. Data yang diperoleh dianalisis menggunakan Analysis of Variance (ANOVA). Hasil penelitian ini menunjukan bahwa perlakuan tidak berpengaruh nyata (P>0,05) terhadap parameter yang diukur. Lama dan frekuensi makan berkisar antara 4,34-5,42 jam dan 16,50-19,87 kali/hari. Sementara itu lama dan frekuensi ruminasi berkisar antara 11,39-14,25 jam dan 39,62- 41,87 kali/hari serta lama dan frekuensi istirahat berkisar antara 5,43 – 7,56 jam dan 30,62- 32,50 kali/hari. Disimpulkan bahwa pemberian silase rumput odot dengan jerami padi sebagai absorban tidak mempengaruhi tingkah laku makan kambing kacang.

Kata-kata kunci: kambing kacang, silase rumput odot, jerami padi, tingkah laku makan

ABSTRACT

The aim of this experiment was to determine the effect of feeding odot grass silage (Pennisetum Purpureum cv. Mott) with different levels of rice straw as absorbant on feeding behavior of Kacang goats. Four kacang goats, ranging from 1-1.5 year old with initial body weight of 20.2 kg-22.9 kg, were used in this study using Latin Square Design (RBSL) 4 x 4 with 4 treatments and 4 periods as replications. The treatments were JP0: 100% odot grass silage, JP10: 90% odot grass and 10% rice straw silage, JP20: 80% odot grass and 20% rice straw silage and JP30: 70% odot grass and 30% rice straw silage. The measured variables included the frequency and eating time, frequency and ruminating time, and frequency and resting time. The data obtained were analyzed using Analysis of Variance (ANOVA). The results showed that treatment had no significant effect (P>0,05) on the measured variables. The duration and frequency of feeding ranged from 4.34 to 5.42 hours and 16.50 to 19.87 times per day, duration and frequency of rumination ranged from 11.39 to 14.25 hours and 39.62 hours to 41.87 times per day, and the length and frequency of rest ranged from 5.43 to 7.56 hours, and 30.62 to 32.50 times per day. In conclusion, feeding odot grass silage with different levels of rice straw as an absorbant did not affect the feeding behavior of kacang goats.

Keywords: kacang Goats, Odot Grass Silage, Rice Straw, Eating Behavior

INTRODUCTION

The low productivity of goats and the occurrence of weight loss during the dry season are primarily caused by nutritional deficiencies due to the decline in the quality and quantity of

available feed during this period. During the dry season, the forage is low in quality, characterized by low protein and mineral content and high fiber content (Jelantik and Malelak, 2023). Such feed generally has low digestibility and palatability, with protein content as low as 3% and in vitro digestibility close to 40% (Jelantik, 2001). Goats consuming this type of forage experienced low energy and protein intake, leading to poor growth performance (Manousidis et al., 2018).

To address nutritional deficiencies during the dry season, preserving forage as silage is a crucial strategy for improving the productivity of ruminants in dryland areas such as East Nusa Tenggara (NTT). With this technology, the surplus forage production during the rainy season could be preserved as silage and later used as basal feed or supplement during the dry season (Ntakyo et al., 2020). The successful application of silage technology for improving livestock productivity heavily depends on the ability of farmers to produce high-quality silage.

The quality of silage depends upon several factors particularly the quality of forages and processing technique. High quality silage can be produced when made of high-quality grasses such as Odot grass (*Pennisetum purpureum cv. Mott*), and harvested at a young age as containing highest crude protein level. Preserving young forage can result in higher-quality silage. Young forages, including Odot grass, have high moisture content in which requires a wilting process to reduce the water content before ensiling. Inadequate wilting would lead to silage spoilage. Wilting is typically done by cutting Odot grass and sun-drying it for a period of time. However, during the early to mid-rainy season, when the grass quality is at its peak, wilting is difficult, requiring alternative methods to reduce moisture content during ensiling.

Various studies have been conducted to prevent silage spoilage due to high forage moisture content. One possible solution to this issue would be the use of low-moisture feedstuffs as absorbents. By adding absorbents to high-moisture forage, the moisture content could be maintained within the optimal range therefore improving silage quality. Common materials used for absorbents in silage production were cereal straw, such as barley straw, sorghum straw, corn straw, wheat straw, and others (Barmaki et al., 2018). However, limited research have been conducted on the use of rice straw as an absorbent in the production of silage from high-moisture Odot grass, particularly its effects on the feeding behavior of Kacang goats. Therefore, a study was conducted to evaluate the effects of feeding Odot grass silage (*Pennisetum purpureum cv. Mott*) using rice straw as an absorbent on the feeding behavior of Kacang goats. Our hypothesis was that the optimal level of rice straw in the silage of odot grass would increase the quality and acceptance of the silage hence reducing the eating and rumination duration and frequency.

METHODS

Location and Duration

This study was conducted at the PT. AA Pratama Agrifarm, located in Binilaka, Oeltua Village, Taebenu District, Kupang Regency, East Nusa Tenggara. The research was carried out for two months, from October 15 to December 15, 2021, divided into four 15-day periods, each consisting of 10 days of adaptation and 5 days of data collection.

Research Materials

Four male Kacang goats 1–1.5 years old, with body weights ranging from 20.2 to 22.9 kg, were involved in this experiment. They were housed in individual pens (0.5 m x 1.2 m) equipped with feeding and drinking containers. Feed materials used included odot grass silage (*Pennisetum purpureum* cv. Mott), rice straw, chicken manure, ground corn, rice bran, and water.

Equipment used included pens equipped with feeding and drinking containers, brooms for cleaning, digital scales for weighing feed, mini silos for storing silage, and smartphones for manually recording feeding behavior such as duration of eating, rumination, resting, and feeding frequency. Forms were used to record feeding behavior data.

Experimental Design

The study employed a Latin Square Design (LSD) with four treatments and four periods as replicates. Goats were fed *ad libitum* on different odot grass silage containing increasing level of rice straw as the treatments: JP0: silase made of 100% odot grass, JP10:

silase made of 90% odot grass + 10% rice straw, JP20: silase made of 80% odot grass + 20% rice straw, JP30: silase made of 70% odot grass + 30% rice straw. In addition, the animals were supplemented with concentrate at 1% LW. The nutrient composition of Odot silage and concentrate are presented in Table 1 and 2.

Research Procedures

The research procedures involved the preparation of silage, concentrate, and the administration of feed and water, as described below:

Silage Preparation. Odot grass and rice straw were processed to prepare the silage. Odot grass was harvested at 60 days post-planting and, along with the rice straw, chopped into 0.5–1 cm length using a chopper (Mahkota MCC 6-200). The ingredients were then weighed based on the treatment formulations. On dry matter bases, for JP0, the mixture included 3 kg of odot grass. JP10 consisted of 2.7 kg of odot grass and 0.30 kg of rice straw, JP20 included 2,4 kg of odot grass and 0.6 kg of rice straw, and JP30 contained 2.1 kg of odot grass and 0.9 g of rice straw. The weighed ingredients in all treatments were added with 250 g rice bran as additive and packed into labelled mini silos. The silage was compacted to create anaerobic conditions and allowed to ferment for 21 days.

Concentrate Preparation. The concentrate was prepared using a mixture of 50% ground corn, 20% rice bran, and 30% chicken manure on dry matter bases. The chicken manure was first dried under sunlight to reduce its moisture content, ammonia odor, and the presence of harmful microorganisms. Once dried, the manure was ground into a fine powder. All ingredients were then mixed according to the predetermined proportions to produce the final concentrate.

Feed and Water Administration. Silage was provided *ad libitum* and concentrates were given at 1% of live weight, divided into two daily feedings at 7:00 AM and 3:00 PM. Water was made available to the goats *ad libitum* throughout the study period.

Table 1. Chemical composition of the silage used in the study

Treatment	Chemical Content					
	DM (%)	OM (% DM)	CP (% DM)	EE (% DM)	CF (% DM)	CHO (% DM)
JP0	10.60	91.963	12.610	10.729	26.128	55.657
JP10	18.74	89.367	11.437	10.177	26.766	57.688
JP20	26.88	90.424	9.604	7.622	27.587	58.588
JP30	35.02	90.044	8.766	5.025	28.648	61.405

Table 2. Nutritional Composition of the Concentrate Used in the Study

Ingredient	Proportion (% DM)	DM (%)	OM (%)	CP (%)	EE (%)	CF (%)	CHO (%)
Ground Corn	50	98.0112	44.6505	4.9235	3.975	2.0015	35.752
Rice Bran	20	83.3164	15.4312	1.8678	1.3014	5.0148	12.262
Chicken Manure	30	78.2219	21.3891	5.1423	1.1097	5.3334	15.137

Note: JP0: 100% odot grass silage; JP10: 90% odot grass silage + 10% rice straw; JP20: 80% odot grass silage + 20% rice straw; JP30: 70% odot grass silage + 30% rice straw.

Measured Variables and Data Collection

Feeding behaviour data were collected over two 24-hour periods using the method by Woodford and Murphy (1988), with observations recorded at five-minute intervals. Parameters measured included: 1) Eating duration: Total time (hours) spent eating in 24 hours. 2) Eating frequency: Number of eating occurrences in 24 hours. 3) Rumination duration: Total time (hours) spent ruminating in 24 hours. (4) Resting duration: Total time (hours) spent resting (not eating, ruminating, or walking) in 24 hours.

Statistical Analysis

Data collected were analysed using Analysis of Variance (ANOVA) with SPSS 21.

RESULTS AND DISCUSSION

Effect of Treatments on Eating Duration and Frequency

Eating behaviour, which includes eating and rumination, is closely linked to feed intake, rumen fermentation patterns, feed digestibility, and product quality, such as milk fat content (Abijaoude et al., 2000; Woodford and Murphy, 1988). Therefore, evaluating eating behaviour could provide insights into the quality of silage made of Odot grass with increasing level rice straw as absorbent aiming to reduce the moisture content of the silage. The average eating duration of goats offered silage with increasing level of rice straw as absorbent is presented in Table 3.

Table 3. Effect of rice straw on feeding behaviour of goats fed odot grass silage

Paramaters	Treatments				P-value
	JP0	JP10	JP20	JP30	
Eating duration (h/d)	4.34	5.04	4.44	5.02	0.618
Eating Frequency (times/d)	18.75	19.88	16.50	19.63	0.417
Rumination duration (h/d)	13.18	11.40	14.13	11.49	0.292
Rumination Frequency (times/d)	40.50	39.63	41.88	40.00	0.827
Resting duration (h/d)	6.49	7.56	5.44	7.49	0.276
Resting Frequency (times/d)	32.50	30.63	32.38	32.00	0.876

Note: JP0: 100% odot grass silage; JP10: 90% odot grass silage + 10% rice straw; JP20: 80% odot grass silage + 20% rice straw; JP30: 70% odot grass silage + 30% rice straw.

The eating duration observed in the present experiment ranged from 4.34 to 5.04 hours/day. These findings are shorter than those reported in earlier studies, such as by Jiang et al. (2017), who observed longer daily eating durations in ruminants fed diets with higher fiber content. Such differences can be attributed to variations in dietary formulation, particularly the forage-to-concentrate ratio, which has been shown to influence feeding behaviour significantly (Muhammad et al., 2016). Diets with a higher proportion of forage generally increase eating time due to the physical characteristics of the feed, such as particle size and fiber composition, which stimulate rumination and chewing activity (Grant and Cotanch, 2023).

The result of this experiment showed that increasing the level of rice straw in the silage did not significantly affect ($P > 0.05$) the time spent eating by Kacang goats, despite the increase in crude fiber content with higher levels of rice straw (26.12–28.64%; Table 2). This finding is contrary to the general expectation that dietary fiber content increases chewing and eating time, as fiber-rich feeds typically require more mastication to reduce particle size for digestion (Beauchemin and McGinn, 2006).

Several factors may explain this unexpected result. One critical aspect to consider is the potential influence of fermentation products in the silage. Poor-quality silage as in the present experiment could be in high moisture silage (JP0) can produce undesirable fermentation by-products such as excessive lactic acid, butyric acid, or ammonia, which can negatively affect palatability and feeding behavior (Bandla et al., 2024). Goats may reduce their eating time as an adaptive response to avoid ingesting silage with off-flavors or odors caused by poor fermentation. High levels of ammonia or volatile fatty acids (VFAs) in silage are known to impact feed acceptance, even when the nutritional composition appears adequate (Scherer et al., 2019).

Another factor is the physical characteristics of the silage. Rice straw, when ensiled, undergoes structural changes due to fermentation and chopping, which can reduce particle size and fiber rigidity. These changes may lower the time required for chewing and eating, even as crude fiber content increases (Jiang et al., 2017). This effect might partially explain why eating duration was not significantly affected in this experiment, as the physical effort required to consume the silage was reduced by the ensiling process.

In contrast to these findings, previous studies have demonstrated that eating duration

tends to increase with dietary fiber content in diets containing unprocessed or coarse fibrous materials (Banakar et al., 2018). However, the discrepancy observed here emphasizes the role of silage quality in modulating feeding behavior. High-quality silage, characterized by proper fermentation and optimal nutrient preservation, may produce different results compared to silage with fermentation issues.

Overall, these results suggest that factors beyond crude fiber content, such as the physical form of the feed, the presence of fermentation by-products, and the overall palatability of the silage, are critical determinants of feeding behavior in goats. Future research should investigate the interactions between silage quality, fermentation by-products, and feeding behavior to optimize dietary strategies for small ruminants.

The eating frequency ranged from 16.5 to 19.87 times/day, higher than values reported by Abijaoude et al. (2000) (6.6–8.4 times/day) and Geoffroy (1974) (8.1 times/day) but lower than those by Manehat et al. (2020) (22.9–26.1 times/day) and Jalali et al. (2012) (21–31 times/day). The statistical analysis showed no significant differences among treatments in eating frequency (P>0.05). This outcome might result from effective fermentation of concentrate and consistent basal feed provision, which contributed to stable intake and feeding behaviour. Furthermore, the variation in eating frequency observed in previous studies may reflect differences in feed type, particle size, and environmental factors, underscoring the adaptability of Kacang goats to different dietary conditions.

Effect of Treatments on Rumination Time and Frequency

Rumination behaviour, characterized by the regurgitation and re-chewing of feed, is influenced by dietary physical form and fiber content (Beauchemin and McGinn, 2006). In this study, rumination duration ranged from 11.39 to 14.12 hours/day, which was notably higher than the findings of Abijaoude et al. (2000) (5.35–6.8 hours/day) and Reece (1997) (5–9 hours/day in sheep). This discrepancy could be attributed to differences in dietary composition, particularly the fiber and moisture levels of the feed, as well as measurement methods. No significant differences in rumination duration were observed across treatments (P > 0.05), likely due to consistent protein levels (>8%), which play a vital role in enhancing microbial activity and fiber digestion in the rumen (Gidenne, 2015).

However, the silage quality in treatments with higher moisture and lower rice straw content may have posed challenges. High-moisture silage, particularly with reduced structural fiber from rice straw, can lead to poor fermentation quality, lower effective fiber, and increased acidity, potentially impacting rumination efficiency. Despite these potential drawbacks, the goats in this study maintained effective rumination behaviour and nutrient utilization, suggesting that the inclusion of rice straw at even minimal levels supported adequate structural fiber for rumination. Additionally, the consistent protein levels likely compensated for the suboptimal fermentation quality in the high-moisture silage, stabilizing microbial activity in the rumen and ensuring sufficient fiber breakdown. These findings indicate that variations in rice straw content in silage, while influencing silage quality, did not significantly impair rumination efficiency in goats

Rumination frequency ranged from 39.62 to 41.87 times/day, higher than values reported by Afzalani and Raguati (2006) (12–35 times/day) and Jalali et al. (2012) (18–25 times/day). This result aligns with the idea that higher feed intake correlates with increased rumination (Krone et al., 2024). The higher frequencies observed in this study indicate that goats effectively adapted to the diet and maintained efficient digestive processing, with no apparent limitations imposed by the inclusion of rice straw in the silage.

Effect of Treatments on Resting Duration and Frequency

Resting behaviour is essential for goats to recuperate from daily activities such as chewing, walking, and grazing. In this study, goats exhibited resting durations ranging from 5.43 to 7.49 hours per day, which is shorter than the 10.77–13.5 hours per day reported by Woodford et al. (1986) and the 9.9–12.3 hours per day observed by Jalali et al. (2012). This reduced resting time may be attributed to the high dietary fiber content, which necessitates increased chewing and rumination efforts. High-fiber diets require more extensive mastication and rumination to effectively break down fibrous components, thereby increasing the time allocated to these activities and consequently reducing the time available for rest (Kleefisch et

al., 2017). This relationship between dietary fiber intake and chewing time has been quantified, indicating that total chewing time increases with higher acid detergent fiber (ADF) intake. Additionally, the efficiency of chewing during eating in breaking down feed particles to less than 1.0 mm has been found to be greater in goats (85%) compared to sheep (48%), suggesting species-specific differences in chewing efficiency.

These findings underscore the physiological demands imposed by high-fiber diets on goats, where the necessity for prolonged chewing and rumination to process fibrous feed reduces the time available for resting. Understanding this trade-off is crucial for optimizing feeding strategies to ensure the well-being and productivity of goats.

Statistical analysis showed no significant differences in resting duration or frequency ($P > 0.05$). Total chewing time, a combination of eating and rumination, significantly influences resting behaviour (Jiang et al., 2017). As chewing time increases, rest time typically decreases. In this study, the balance between eating, rumination, and resting suggests that goats successfully adapted to their dietary regimen without undue stress or disruption to their natural behaviour patterns.

CONCLUSION

The study concluded that incorporating rice straw as an absorbent in odot grass silage does not significantly affect the feeding behaviour of Kacang goats. The consistent eating, rumination, and resting behaviours observed across treatments indicate that rice straw can be effectively utilized in silage to reduce water content of odot silage.

RECOMMENDATIONS

Future research should investigate higher levels of rice straw as an absorbent to explore its potential benefits for goats and other ruminants. Additionally, studies examining long-term impacts on health and productivity could provide a more comprehensive understanding of the dietary implications of rice straw inclusion in silage.

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