

Study on Complete Feed Fermentation of Agricultural By-product on Performance of Etawah Goat

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ABSTRACT: Complete feed is nutritious feed that exclusively given to fulfill basic living need and production. A study was conducted to find high quality complete feed with highly digestible can increase animal production. Latin square randomized design was used in the study with 4 treatments and 4 periods upon Etawah goat. The treatments given were as follow: R0 = fresh Elephant grass + commercial concentrate; R1 = fermented rice straw + fermented pod cacao; R2 = fermented rice straw + fermented rice bran; R3 = fermented rice straw + fermented sago. Daily weight gain, nutrition intake and nutrition digestibility were determined. The study indicated that there was no significant different result among the treatments on daily weight gain, crude protein and fiber intake as well as dry matter, crude protein, fiber and ash digestibility. However, dry matter intake showed highly significant different ($P < 0.01$) among treatments, and ash intake result was significantly different ($P < 0.05$). It was found that fermented rice straw can improve palatability as well as digestibility. It is concluded that fermented rice straw was able to substitute fresh forage as a basic diet. Fermented complete feed based on agricultural by product (pod cacao, rice bran and sago) combined with fermented rice straw has no significant different on digestibility and palatability.

Keywords: complete feed, fermentation, agricultural by product, Etawah goat

INTRODUCTION

The availability of agricultural product strongly depends on season and the area of land. These are the reason of not enough stock available that needed to develop animal husbandry sector. In Aceh, agricultural by-product is not properly exploited, such as rice straw, which is burned in the rice cultivation after harvesting, pod cocoa, which is thrown away that give off an odor to the environment. Sago is directly given to livestock without processing does not give maximal result.

Hartadi *et al.*, (1990) said that the complete feed is the feed that contain enough nutrition for a certain animal, which is able to prevent the production without addition of others except water.

Goat has high characteristic selection on type or part of plant as an effort to find the more nutritious feed, which depends on the availability of agricultural stock. Novita *et al.*, (2005) conducted a research on livestock fermentation. The result showed that rice straw fermented by urea and probiotic, which is cut or milled, combined with a concentrate did not give effect on performance of reproduction, production and the quality of Etawah goat. It can replace Elephant grass as the source of crude fiber in feed. Study on fermentation technology on feed showed no reduction in feed quality. Nahrowi *et al.*, (2006) studied on giving 100% fermented feed based on organic waste to cows. Their research showed that no digestion and physiological function disturbance on cows.

Based on the previous researches, study on complete feed fermentation of agricultural by-product on performance of Etawah goat was done. The objective of this research was to find out the complete feed with good quality, increase the daily weight gain, and increase the feed palatability by using agricultural waste.

MATERIALS AND METHOD

Research Materials

Livestock used was 8 male Etawah goats in the age of 15-18 months. The observation was done for daily weight gain, feed consumed (dried material, crude protein, crude fiber, and ash), and feed digestible (dried material, crude protein, crude fiber, and ash). Goats were placed in metabolic stalls based on feed treatment. There were 4 types of treatment, i.e. Control Feed (R0): fresh Elephant grass + commercial concentrate; Complete Feed I (R1): fermented rice straw + fermented pod cocoa; Complete Feed II (R2): fermented rice straw + fermented rice bran; Complete Feed III (R3): fermented rice straw + fermented sago. Daily weight gain was done once every two week, in the morning before feeding. It was done by using digital scale (Alramana, Australia). Nutrient digestibility was estimated with nutrition consumed minus nutrient in feces, divided by nutrient consumed multiplied by 100 %. Feed consumed was determined by subtract the feed given with left overs feed. The daily average dry matter consumed were multiplied with the percentage of proximate analysis of dry matter.

Experimental Design and Statistical Analysis

The experimental design used was Latin Square Design with four Complete feed treatment and kept for four periods. Data collected were statistically analyzed by using Analysis of Variance (ANOVA). The difference among treatments was continue tested by using Duncan's Multiple Range Test (Steel and Torry, 1991).

RESULTS AND DISCUSSION

Average Daily Gain

The average weight gain of male Etawah goats is shown in Table 1. In this research, fermented rice straw was combined with concentrate of fermented agricultural waste.

Table 1. The Daily Average Weight Gain (g/day)

Period	Complete Feed			
	R0	R1	R2	R3
I	41.43	41.43	51.43	47.14
II	71.43	50.00	51.43	50.00
III	41.43	41.43	51.43	51.43
IV	71.43	41.43	61.43	48.57
Average	56.43	43.57	53.93	49.29

The fermented complete feed gave no significant effect on daily average weight gain of male Etawah goat ($P>0.05$). The research found that there was no weight gain different and digestibility of male goat given fermented rice straw + fermented rice bran, fermented rice straw + fermented sago and fermented rice straw + fermented pod cocoa compared to the male goat given fresh forage + commercial consentrate. It proves that complete feed with the variation of concentrate from agricultural by product can replace commercial feed, and fermented rice straw can replace fresh forage. Budiarsana *et al.*, (2006) reported that there was no weight gain different of male goat given fermented rice straw and fresh forage. This was probably caused by nutrition content in fermented rice straw with urea and probiotic increase compared to unfermented one, as stated by Broudisco *et al.*, (2003) that urea can improve crude protein content from 36.9 to 102.6 g/kg

dried material. Some researches established that fermentation can increase nutrition content of agricultural wastes, such as fermented pod cocoa can increase its crude protein content from 8.35 to 9.96% (Laconi, 1998), fermented rice bran can increase its crude protein content from 12.65 to 15.18% (Wahyuni, 2003).

Feed Consumption

Amount of feed consumed by livestock illustrates palatability value of the feed, as shown in Table 2.

Table 2. The average of Nutrition Consumed from Complete Feed (g/day)

Nutrition Composition	Complete Feed			
	R0	R1	R2	R3
Dry matter	748.78 ^c	425.96 ^a	539.09 ^{ab}	581.68 ^b
Crude protein	72.11	39.11	42.33	35.48
Crude fiber	144.46	120.21	96.06	85.66
Ash	99.64 ^a	72.54 ^b	73.53 ^{ab}	65.78 ^b

Note : ^{ab}Different superscript on the same row showed the most significant value (P<0.05)

Table 2 showed that control feed (elephant grass + commercial concentrate) has significant value (P<0.01) on consumption of dry matter, compared to the other three complete feed. This was probably caused by palatability of Elephant grass and commercial concentrate better than the other three treatments. But, this result was not followed by daily weight gain and digestible sector. Syamsu (2003) said that weight gain was affected by quality of feed and ability of livestock in treating the feed.

Consumption of dry matter of complete feed R1 (fermented rice straw and fermented pod cocoa) has the lowest value, parallel with complete feed R2 (fermented rice straw and fermented rice bran), but different from complete feed R3 (fermented rice straw and sago). It illustrate that palatability of complete feed R1 lower than the other two complete feed (R2 and R3).

The analysis results showed that there were no different of crude protein and crude fiber among four treatments. This was probably caused by the increasing amount of crude protein in fermented rice straw (using urea and probiotic) and agricultural waste concentrate (using probiotic). Novita (2005) reported that rice straw which was fermented by urea and probiotic increased crude protein content from 4.2 to 6.1%. Laconi (1998) said that fermented pod cocoa increase crude protein content from 8.35 to 9.96% and decrease crude fiber from 55.67 to 45.56%. Wahyuni (2003) also said that rice bran which was fermented by *Aspergillus ficuum* increased crude protein from 8.07 to 8.43% and decreased crude fiber from 18.37 to 11%. The proximate analysis of sago showed that there was the increasing amount of protein from 4.5 to 5.06%, before and after fermentation process. Fermentation was also able to decrease crude fiber content in rice straw through probiotic activity by breaking β -1.4 glycosidic chain in complex carbohydrate into simple one. It is said that there was a decrease of crude fiber content from 31.38 to 28.93% on rice straw which was fermented by using *T. reseed* and *T. plantarum* (Rachmadi, 1995). The proximate analysis of fermented sago showed a decrease of crude fiber content from 6.59 to 4.01%.

The varian analysis showed the significant different of ash consumption among all four treatments. Control treatment (Elephant grass and commercial concentrate) was different from the other three treatments. There were no different among R1, R2, and R3. This was probably caused by the same palatability value among these three treatments.

Digestibility

Digestibility or pseudo-digested coefficient of all nutrient is the standard ability of livestock

in using given feed to fulfill their basic need, growth and production.

Table 3. The average of digestibility (g/day)

Nutrient composition	Complete feed			
	R0	R1	R2	R3
Dry matter	33.73	21.41	29.97	40.44
Crude Protein	68.89	57.98	54.06	50.72
Crude fiber	45.01	52.92	35.63	29.72
Ash	27.50	22.53	17.85	22.93

Table 3 showed that there were no effect of treatments on digestible of dry matter, crude protein, crude fiber, and ash. This was caused by the increasing of digestible of all three complete feed fermented by urea and probiotic. Urea digested the chain between lignin and cellulose or hemicellulose, so that the carbohydrate become digested, as reported by Prasad *et al.*, (1998), urea increase the digestible of dry matter as big as 2.35%. The enzyme contained in microorganism from probiotic digested the chain between lignin and cellulose or hemicellulose. Biostarter increased digestible of fermented rice straw as big as 12%, compared to unfermented rice straw, as reported by Aryogi and Umiasih (2002). Haryanto *et al.*, (2002) also reported that the addition of 1.0 and 0.5% probiotic in feed concentrate of sheep increased the digestible of dry matter of 50.7 and 49.9%, the digestible of crude protein of 62.9 and 61.9%, respectively, while there was only 61.0% in feed without the addition of probiotic. Suwadyastuti (1986) said that urea increased the digestible of protein and utilization of protein.

Bestari *et al.*, (2003) reported that fermented rice straw with probiotic (Buffalo Rumen microorganism) gave the best effect of digestible of crude protein on bull Ongole, compared to Elephant grass and unfermented rice straw. Yulistiani *et al.*, (2003) reported that urea increased digestible of NDF rice straw of 14%, compared to untreated rice straw. This was caused by urea digested the chain between lignin and cellulose or hemicellulose. Urea increased the digestible of rice straw hemicellulose and cellulose as big as 4.5% and 15.84%, respectively, compared to untreated rice straw, as reported by Prasad *et al.*, (1998). NDF is cell that contain hemicellulose, cellulose, lignin, silica and some protein (Perry *et al.*, (2004). Those components are parts of crude fiber.

The proximate analysis of agricultural waste concentrate showed that there was an increase in dry matter, crude protein, crude fiber, and sago because of fermentation. Dry matter contained in pod cocoa, rice bran, and sago, before and after fermentation were 86.27 and 86.91%, 91.37 and 96.49%, and 49.29 and 93.16%, respectively. Crude protein contained in pod cocoa, rice bran, and sago, before and after fermentation were 5.50 and 9.75%, 8.07 and 8.43%, and 1.45 and 5.06%, respectively. In overall, this condition gave an effect on digestible.

CONCLUSIONS

Male Etawah goats given complete feed based on various fermented agricultural by product showed no significant different in digestible, palatability, and daily weight gain with male Etawah goat given fresh elephant grass and commercial concentrate, indicated that those various complete feed can replace fresh forage and commercial concentrate.

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