



Consumption and Digestibility Studies in Goats Fed with Complete Feed Corn Tumpi and Red Dragon Fruit Peel Flour (*Hylocereus Sp.*)

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ABSTRACT

Utilization of unconventional materials such as corn epidermis and red dragon fruit peel flour are as an alternative feed ingredient for ruminants, especially goats. This study aims to examine the effect of providing complete feed containing corn epidermis with dragon fruit peel flour at different levels on consumption and digestibility of goats. This study used 12 local male goats with ages ranging from 1 to 1.5 years which were randomly assigned to metabolic cages. The study used a Randomized Block Design (RBD) method with 3 treatments and 4 groups. The treatments consisted of P1: Complete feed containing 50% corn epidermis, P2: Complete feed containing 45% corn epidermis and 5% red dragon fruit peel flour and P3: Complete feed containing 40% corn epidermis and 10% red dragon fruit peel flour. The results showed that the treatment of complete feed containing corn epidermis with red dragon fruit peel flour at different levels had a significant effect ($P < 0.05$) on dry matter consumption and organic matter consumption. Treatment of complete feed containing corn epidermis with red dragon fruit peel flour at different levels had no significant effect ($P > 0.05$) on dry matter digestibility and organic matter digestibility. It was concluded that based on estimates of dry matter consumption and organic matter consumption, the use of alternative ingredients for corn epidermis with dragon fruit peel flour up to a level of 10% could be used as a complete mix of feed ingredients for ruminants, especially goats.

Keywords: Corn epidermis, red dragon fruit peel flour, consumption level, digestibility, complete feed

INTRODUCTION

Feed is the main source of energy for the growth, generation, reproduction and production of livestock. Livestock productivity is largely determined by the quality and quantity

of feed consumed. Feed quality includes the definition of the content of various nutrients, such as energy, protein, minerals, vitamins as well as the content of anti-nutritional substances such as tannin, lignin and other secondary compounds. The nutrient content needs attention in an effort to develop an efficient feed formula and meet the needs of livestock for high production. One of the efforts that can be made to optimize livestock productivity is the use of additional feed ingredients in the form of energy source feed ingredients and protein sources in the ration given. The use of fibrous feed as feed for ruminants requires supplementation of feed sources of energy and protein, because of its low quality. This is due to the low digestibility value as a result of the high fiber content.

The results of the study Imsya *et al.* [1] reported that high consumption rates will reduce the digestibility of dry matter and organic matter rations due to the increase in the amounts of foodstuffs eaten accelerates the flow of food in the intestines, thereby reducing digestibility.

One of the agricultural wastes that can be used as a complete feed additive is corn epidermis and dragon fruit peel flour. Corn epidermis is waste from the corn gilling process that can be used as a source of fiber and its availability is still abundant. In addition, plantation waste that can be used as a complete feed ingredient is dragon fruit peel. Mardatillah *et al.* [2] states that part of the dragon fruit consists of 65-70% of its fruits and 30-35% of the peel. The peel of the dragon fruit contains crude fiber ranging from 23-26%, this value is higher when compared to the fruit. Prastiya [3] states dragon fruit peel can be used on feed up to 9% level, this means dragon fruit peel can be used as an alternative to increase feed raw materials for existing fiber sources. Based on the description above, the author is interested in conducting research on the substitution of complete feed made from dragon fruit peel waste feed (*Hylocereus* sp.) by tumpi corn by looking at the effect on the consumption and digestibility of nutrients in goats.

MATERIALS AND METHODS

This research will be carried out from March to April 2021 in related units at the Faculty of Animal Husbandry, Hasanuddin University (experimental cages, ruminant laboratories and feed chemistry laboratories), Makassar.

This study was designed using a Randomized Block Design (RBD) with 3 treatments and 4 tests, using 12 male goats aged \pm 1.5 years with a body weight ranging from 11 ± 17 kg. The three feed treatments are as follows:

P1: Complete Feed + Corn Epidermis (50%) without Red Dragon Fruit Peel Flour

P2: Complete feed + Corn Epidermis (45%) + Red Dragon Fruit Peel Flour (5%)

P3: Complete feed + Corn Epidermis (40%) + Red Dragon Fruit Peel Flour (10%)

Research Procedure

The peeled dragon fruit peel is first ventilated with a temperature of 65 °C for 12 hours then mashed, corn and other feed ingredients are ground to change the size of the particle and soften the texture of the ingredients to facilitate mixing then each ingredient is weighed

according to the composition of each treatment, then mixed evenly. The composition of the ingredients in the manufacture of complete feed for each treatment can be seen in Table 1.

Table 1. Composition of ingredients in the manufacture of complete feed

Feed Ingredients	Treatment (%)		
	P1	P2	P3
Corn Epidermis	50	45	40
Red Dragon Fruit Peel Flour	0	5	10
Molasses	6	6	6
Prawn Head Flour	5	5	5
Fine yellow Corn	10	10	10
Rice Bran	20	20	20
Palm Kernel Meal	5	5	5
Salt	1	1	1
Mineral Mix	2	2	2
Urea	1	1	1
Total	100	100	100
Protein Content (%)	14.79	14.81	14.82

This study used 12 plots of stilt cages measuring 110 x 130 x 146 cm (length x width x height) each. Each cage plot has been equipped with a place to eat and drink. Under the cage is fitted with a plastic ram which functions as feces and urine filtration.

Feed is given twice a day at 08.00 am and 16.00 pm. Drinking water is provided ad libitum. The all complete feed treatments were given in stages per 100g with the addition of 100g if the initial feed had been consumed by each group of goats.

Measured Parameter

The parameters observed at this stage of the study were consumption, digestibility of complete feed nutrients (Dry Matter and Organic Matter). Analysis of the chemical composition of complete feed, there are crude protein using the proximate analysis procedure [4]. As for the fiber content, namely ADF and NDF, it was analyzed using the analysis procedure of Van Soest [5]. Measurement of Consumption and Digestibility:

1. Consumption of Dry Matter (g/day)

$$\text{Feed Consumption} \times \text{Feed Dry Matter Percentage}$$

2. Dry Matter Digestibility (%)

$$\frac{\text{Consumption of Dry Matter} - \text{Feces Dry Matter}}{\text{Consumption of Dry Matter}} \times 100\%$$

3. Consumption of Organic Matter (g/day)

$$\text{Feed Consumption} \times \text{Feed Organic Matter Percentage}$$

4. Organic Matter Digestibility (%)

$$\frac{\text{Consumption of Organic Matter - Feces Organic Matter}}{\text{Consumption of Organic Matter}} \times 100\%$$

Data Analysis

The data were analyzed by diversity analysis according to a 3 x 4 Randomized Block Design (RBD), 3 treatments and 4 groups. The analyzed using statistics analysis of variance (Anova), if the treatment had a real effect, further tests were carried out using the Duncan Multiple Distance test [6]. The data were analyzed using the statistical program SPSS 21.0 with the mathematical model $Y_{ijk} = \mu + \tau_i + \beta_j + \epsilon_{ij}$.

RESULTS AND DISCUSSIONS

The nutritional content of the three complete feed treatments studied were analyzed using the proximate and method the results of the analysis are shown in Table 2.

Table 2. Nutrient Content of Complete Feed Treatments

Parameters	Treatment		
	P1	P2	P3
Dry Matter (%)	93.05	93.19	93.07
Organic Matter (%)	89.51	88.42	88.32
Crude Proteins (%)	17.13	17.14	16.89
ADF (%)	13.26	12.65	13.96
NDF (%)	39.21	41.29	44.33

Notes: P1= Complete feed with corn epidermis (50%) without red dragon fruit peel flour,
P2= complete feed and corn epidermis (45%) with red dragon fruit peel flour (5%),
P3= complete feed and corn epidermis (40%) with red dragon fruit peel flour (10%).

The protein content of the complete feed prepared in each treatment averaged around 14%, but the results of laboratory analysis showed that the protein content ranged from 16.89 – 17.14%. This shows that the protein content of complete feed in this study is in accordance with the needs of ruminants, where the minimum requirement of crude protein for ruminant feed is 7.5% [7], as well as the value of ADF and NDF fiber content for complete feed in all treatments in general is relatively low. so big of a difference. For the value of ADF fiber content in each treatment, namely P1 (13.26), P2 (12.65) and P3 (13.93), the low ADF content was due to the decomposition of ADF content into simpler compounds. The content value indicates that the quality of complete feed is included in the very good feed category. This is in accordance with the opinion of Yuliatun [8] which states that feed quality standards based on ADF values are <36% (very good), 36% - 37% (good), 38% - 39% (average), 40% - 45% (enough) and >45% (less).

As shown in Table 2, all treatments produced values for the NDF content which tended to be the same. This indicates that the complete feed of each treatment will be easily digested

by livestock, especially ruminants. This is in accordance with the opinion of Despal *et al.* [9] which states that the value of NDF can determine the quality of feed, the higher the value of NDF content causes livestock to have difficulty digesting the feed. Feed quality standards based on NDF values are <45% (very good), 45%-65% (moderate) and >65% (low) [10].

The value of ADF and NDF can be used to determine the availability of fiber and the level of digestibility of a feed ingredient, where the lower the value of the NDF and ADF levels, the higher the digestibility of the feed. The lower the Neutral Detergent Fiber (NDF) and Acid Detergent Fiber (ADF) fractions, the higher the digestibility of the feed [11].

The results of analysis of the consumption rate of dry matter, the digestibility of dry matter, the consumption of organic matter and the digestibility of organic matter in the treatment can be seen in Table 3.

Table 3. Consumption (Intake) and Digestibility of Dry Matter and Organic Matter

Parameters	Treatment		
	P1	P2	P3
Dry Matter Intake (g/head/day) ^s	318.42 ± 90.30 ^b	343.51 ± 157.26 ^b	493.50 ± 91.54 ^a
Organic Matter Intake (g/head/day) ^s	285.01 ± 80.83 ^b	303.73 ± 139.05 ^b	435.86 ± 80.85 ^a
Digestibility of Dry Matter (%)	82.75 ± 4.64	87.50 ± 3.78	87.25 ± 1.25
Digestibility of Organic Matter (%)	84.5 ± 3.69	88.75 ± 3.30	88.75 ± 0.95

Notes: ^{a,b}Different superscripts showed significant differences (P<0.05)

P1= Complete feed with corn epidermis (50%) without red dragon fruit peel flour,

P2= complete feed and corn epidermis (45%) with red dragon fruit peel flour (5%),

P3= complete feed and corn epidermis (40%) with red dragon fruit peel flour (10%).

Dry matter consumption ranges from 318.43 g/head/day to 493.50 g/head/day with an average of 385.14 g/head/day. Meanwhile, the consumption of organic matter follows the consumption pattern of dry matter. Organic matter consumption ranges from 285.01 g/head/day to 435.86 g/head/day with an average of 341.53 g/head/day. The results of the statistical analysis of treatment data showed that the substitution treatment of complete feed for corn epidermis and red dragon fruit peel flour at different levels had a significant effect (P<0.05) on the consumption of dry matter and the consumption of organic matter.

The digestibility of dry matter of each treatment has varying values. The digestibility of dry matter is highest at 87.50% and the lowest at 82.75%. The lowest digestibility in the complete feed of corn epidermis without red dragon fruit peel flour (P1) compared to other treatments. This is in line with the consumption value of dry matter. The digestibility of organic matter ranges from 88.75% - 84.5%. the highest digestibility of organic matter in the P2 and P3 treatment is a complete feed containing 5%-10% dragon fruit peel flour. The results of statistical analysis showed that the complete feed treatment containing red dragon fruit peel flour had no real effect (P>0.05) on the digestibility of dry matter and the digestibility of organic matter.

The consumption of dry matter of each treatment has varying values. From the results of this study, it can be seen that the average consumption of dry matter from the substitution of

corn epidermis with red dragon fruit peel flour is between 318.42 – 493.50 g/h/ day. The level of dry matter consumption in goats in this study is an average of 2.5% of body weight, this value can already meet the needs of goats. Natsir *et al.* [12] states that the consumption rate of dry matter for goats ranges from 2 – 4% of body weight. There are several factors that affect the value of dry matter consumption including differences in body weight and livestock age so that it can affect feed consumption. In addition, it is also suspected that it occurs because the shape, taste and smell of P3 treatment feed containing dragon fruit peel flour can increase feed consumption. This is in accordance with opinion Jayanegara *et al.* [13] and Siswanto *et al.* [14] states that the high and low consumption of ruminant fodder is influenced by external factors and internal factors (the livestock itself) such as temperature, type of feed, palatability of feed, physiological status, age, body weight and sex.

The high and low consumption of organic matter will always be influenced by the high and low consumption of dry matter. Organic matter will be affected by the high and low consumption of dry matter [15]. In addition, it is also suspected that it occurs because the influence of the ingredients contained in red dragon fruits peel flour is able to increase feed consumption. Ramadani *et al.* [16] states that the peel of the red dragon fruit contains saponins and tannins. Mustika *et al.* [17] added, the peel of the red dragon fruit has a saponin content that can affect the amount of feed consumption.

The results of the variety analysis showed that the use of substitution of corn epidermis and red dragon fruit peel flour in complete feed did not differ markedly ($P>0.05$) to the digestibility of dry matter of complete feed for goats, where by giving red dragon fruit peel flour ranging from 0%-10% it could not increase the digestibility value of dry matter. The digestibility value of feed that did not differ markedly between treatments showed that the flow rate of feed leaving the rumen was equally fast even though the ability to consume feed differed markedly ($P<0.05$). This is in line with the opinion Van Soest [18] that factors that affect the digestibility of feed ingredients include the length of stay in the rumen, the species and age of livestock, feed treatment, fiber and lignin levels, nutrient deficiencies, feed composition, physical form of feed, feed level, frequency of feeding and drinking water.

The digestibility value of organic matter of each treatment showed no difference. In other words, the use of red dragon fruit peel flour in complete feed has no significant effect in increasing the digestibility of organic matter of the ration. Thus the ration with a flour content of red dragon fruit peel up to the level of 10% does not have a negative influence on the utilization of nutrients by goats.

The magnitude of the digestibility value of dry matters is directly proportional to the digestibility value of organic matters, so that the higher the digestibility value of dry matters and organic matters of a feed, the higher the amount of feed left in the body of the livestock. The digestibility rate of organic matters is closely related to the rate of digestibility of dry matters, since most dry matter consists of organic matter [19].

The average value of digestibility of dry matter and organic matter digestibility of complete feed in this study was higher than the study, digestibility of dry matter ranged from 69.82 - 71.74% and digestibility of organic matter ranged from 71.45 - 73.75% in the study of

Ekawati *et al.* [20] using starter *L. planatarum* in the process of making complete ration silage made from water hyacinth as a complete feed for sheep.

CONCLUSIONS

The substitution of corn tumpi with red dragon fruit peel flour at the level of 10% provides the best consumption and digestibility because it has a value above average.

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