



# Evaluation of the nutritional and anti-nutritional content of complete feed based on Durian fruit peel flour as a substitute for rice bran on different levels

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## Abstract

The feed ingredient that is often used as a ration ingredient is rice bran, which has weaknesses in the dry season, namely scarcity, high prices and reduced quality. So, an alternative that can be done is to use locally based feed ingredients that are cheap, easy to obtain, and can meet the nutritional needs of livestock, namely durian fruit peel which has abundant by-products that have not been utilized optimally. This study aims to evaluate the nutritional and anti-nutritional content of complete feed based on durian fruit peel flour as a substitute for rice bran at different levels. The design used in this research was a completely randomized design (CRD) with four treatments and four replications. Treatment includes different formulas, namely F0 = (rice bran 30% + durian fruit peel flour 0%), F1 = (rice bran 20% + durian fruit peel flour 10%), F2 = (rice bran 10% + durian fruit peel flour 20%) and F3 = (rice bran 0% + durian fruit peel flour 30%). The results of the study showed that F2 complete feed, namely rice bran 10% + durian fruit peel flour 20%, had nutritional content, namely ash 18.83%, crude protein 10.01%, ether extract 2.40%, BETN 40.00%, crude fiber 28.74%, and anti-nutrient content ADF 37.29%, NDF 50.31%, lignin 8.34%, cellulose 26.46%, hemicellulose 13.02%. F2 complete feed meets the maximum standards for use when applied to livestock.

**Keywords:** Anti-Nutritional Content, Nutritional Content, Complete Feed, Substitution, Durian Fruit Peel Flour.

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## 1. Introduction

Animal feed is one of the most important factors in livestock cultivation and animal feed will be given directly to livestock with good quality which will also affect the level of livestock production and productivity [1-3]. One type of feed ingredient that is often used as a ration ingredient is rice bran and during the dry season rice production usually decreases so that rice bran production also decreases causing scarcity, price increases and quality reduction [4-5]. It is necessary to strive for the provision and source of substitute animal feed for rice bran, namely cheap, easy to obtain, able to meet the *Hasfuria et al., 2024*

nutritional needs of livestock and based on local feed that is continuously available around the location of the livestock cultivation business in order to obtain maximum profits in supporting the success of the cultivation business carried out [6-7]. Central Sulawesi is one of the provinces in Indonesia that has a local plant, namely durian fruit which can be used as animal feed. Durian fruit production in Central Sulawesi increases every year, in 2021 it reached 410.806 quintals and in 2022 it increased by 633.872 quintals [8]. Durian fruit production increases every year, leaving the skin unused and just thrown away. So, the durian skin can be processed and used as a source of animal feed.

Durian fruit is a plant that has abundant by-products, because the part that is generally consumed is the flesh at 20-25% and the remaining part is the skin at 60-70% and the seeds at 5-15% have not been utilized optimally [9-10]. Based on this, the author conducted research related to evaluating the nutritional and anti-nutrient content of complete feed based on durian fruit peel flour as a substitute for rice bran at different levels.

## 2. Materials and methods

### 2.1. Materials

The ingredients used consist of durian fruit peel flour, rice bran, elephant grass, rese flour, molasses, urea, mineral mix and salt. Durian rind flour is sourced from farmers and traders in Central Sulawesi, elephant grass is sourced from the outskirts of farmers' land in Central Sulawesi while other ingredients, namely rice bran, rese flour, molasses, urea, mineral mix and salt are sourced from poultry in Makassar. The tools used consist of a chopping machine, hammer mill, tarpaulin, digital scale and basin.

### 2.2. Method

This research was carried out experimentally using a completely randomized design (CRD) with four treatments and four replications, so there were sixteen experimental units. The different formula is F0 = (rice bran 30% + durian fruit peel flour 0%), F1 = (rice bran 20% + durian fruit peel flour 10%), F2 = (rice bran 10% + durian fruit peel flour 20%) and F3 = (rice bran 0% + durian fruit peel flour 30%).

### 2.3. Complete Feed Formula

Making complete feed formulas refers to [11]. Provide all the ingredients, namely durian fruit peel flour, rice bran, elephant grass, rese flour, molasses, urea, mineral mix and salt. The elephant grass is chopped and the durian fruit peel is cut using a chopping machine, then dried in the sun for 5 days, then ground using a mill hammer until it becomes fine flour. Next, all ingredients are weighed according to their respective formulas. Salt, urea and mineral mix are put into a basin and stirred first until homogeneous, then rese flour, rice bran and durian fruit peel flour are also put into the basin and then stirred until homogeneous. Next, add the molasses by slowly pouring it into the basin and stirring it with the other feed ingredients until it is homogeneous. The complete feed formula in this study can be seen in Table 1.

### 2.4. Variables

The parameters measured, namely the nutritional content of complete feed consisting of ash, crude protein, ether extract, BETN and crude fiber were analyzed using proximate analysis [12]. Meanwhile, the anti-nutrient content of complete rations consisting of ADF, NDF, lignin, cellulose and hemicellulose was analyzed using Van Soest analysis [13].

### 2.5. Data Analysis

The data obtained will be subjected to analysis of variance (ANOVA) with a 95% confidence interval. If the results show a significant effect ( $p < 0.05$ ), then the Duncan test will be carried out. The applications used for data analysis are Microsoft Excel 2013 software and Statistical Process for Social Science (SPSS) version 22.0.

## 3. Results and Discussions

### 3.1. Complete Nutritional Content of Feed

The nutritional content of complete feed consists of ash, crude protein, ether extract, BETN and crude fiber. The nutritional content of complete feed can be seen in Table 2. The ash content of complete feed produces various values, namely F0 of 20.46%, F1 of 20.33%, F2 of 18.83% and F3 of 19.59%. The ash content of this complete feed is high when compared to the content of durian fruit peel before it is formulated, namely 5.48% according to [14]. Based on the analysis of variations in the ash content of complete feed, it had a significant effect ( $p < 0.05$ ). The ash content in this complete feed is high because of the high mineral content, so the formulation of this complete feed needs to be carefully considered so that livestock do not experience poisoning. This is in accordance with the statement by Bueno et al., (2020) that a high ash content will also have a high mineral content [15]. The crude protein content of complete feed produces various values, namely F0 of 10.06%, F1 of 10.42%, F2 of 10.01% and F3 of 10.54%. The crude protein content of this complete feed is high when compared to the content of durian fruit peel before it is formulated, namely 6.23% according to [14]. Based on the analysis of variations in the crude protein content of complete feed, there was no significant effect ( $p < 0.05$ ). However, the crude protein content in this formulation meets the protein needs of ruminants. This is in accordance with statement that ruminant protein requirements are 11-12% [16]. The ether extract content of complete feed produces various values, namely F0 of 3.85%, F1 of 3.31%, F2 of 2.40% and F3 of 2.02%. The ether extract content of this complete feed is low when compared to the content of durian fruit peel before it is formulated, namely 7.21% according to [14]. Based on analysis of variations in ether extract content, complete feed had a significant effect ( $p < 0.05$ ). The crude fat content in this formulation is very low, not within the required range, so it is necessary to add other ingredients to meet the needs of livestock. This is in accordance with statement of Kearn, (1982) that the crude fat requirement for ruminant livestock is 7-8% [16]. The BETN content of complete feed produces various values, namely F0 of 42.50%, F1 of 39.53%, F2 of 40.00% and F3 of 36.75%. The BETN content of this complete feed is stable when compared to the content of durian fruit peel before it is formulated, namely 41.71% according to [14]. Based on the analysis of various BETN content, complete feed had a significant effect ( $p < 0.05$ ). The BETN content will correlate with the crude fiber content, if the BETN is low or stable because the crude fiber is low. This is in accordance with the statement by Jang et al., (2017) that low crude fiber will also cause low BETN [17]. The crude fiber content of complete feed produces various values, namely F0 of 23.13%, F1 of 26.40%, F2 of 28.74% and F3 of 31.09%. The crude fiber content of this complete feed is low when compared to the content of durian fruit peel before it is formulated, namely 33.87% according to [14]. Based on the analysis of variations in the crude fiber content of complete feed, it had a significant effect ( $p < 0.05$ ). The crude fiber content of complete feed in this study is high, so this formulation has the potential to be used as a fiber source feed that can be utilized by ruminants as an energy source.

This is in accordance with the statement of Tillman et al., (1998) that feed ingredients containing more than 18% crude fiber are classified into the dry forage class [18].

### 3.2. Complete Feed Anti-Nutrient Content

The anti-nutrient content of complete feed consists of ADF, NDF, lignin, cellulose and hemicellulose. The anti-nutrient content of complete feed can be seen in Table 2. The ADF content of complete feed produces various values, namely F0 of 33.15%, F1 of 37.02%, F2 of 37.29% and F3 of 41.07%. The ADF content of this complete feed is stable when compared to the content of durian fruit peel before it is formulated, namely 36.87% according to [14]. Based on the analysis of variations in the ADF content of complete feed, it had a significant effect ( $p < 0.05$ ). The ADF content in this complete feed is stable, indicating that the digestibility of ADF will also be stable. This is in accordance with the statement by Melati & Sunarno (2016) that higher levels of ADF indicate that the quality of the feed ingredients is decreasing, causing the digestibility of ADF to also decrease [19]. The NDF content of complete feed produces various values, namely F0 of 43.90%, F1 of 50.99%, F2 of 50.31% and F3 of 55.63%. The NDF content of this complete feed is stable when compared to the content of durian fruit peel before it is formulated, namely 53.83% according to [14]. Based on the analysis of variations in the NDF content of complete feed, it had a significant effect ( $p < 0.05$ ). The NDF content in this complete feed is neither high nor low. The lignin content of complete feed produces various values, namely F0 of 7.27%, F1 of 9.07%, F2 of 8.34% and F3 of 8.84%. The lignin content of this complete feed is low when compared to the content of durian fruit peel before it is

formulated, namely 12.11% according to [14]. Based on the analysis of variations in the lignin content of complete feed, it had a significant effect ( $p < 0.05$ ). The lignin content in this complete feed is low so it is safe to give to livestock, because the lower the lignin content, the higher the level of food digestibility and the more positive the opportunity to be used as a source of feed ingredients. This is in accordance with the statement by Goering & Soest (1970) that the maximum limit of lignin that can be tolerated by livestock is 7% [20]. Zhong et al., (2021) added that although lignin content is a limiting factor for livestock in feed, it is also beneficial for livestock [21]. The cellulose content of complete feed produces various values, namely F0 of 21.40%, F1 of 25.43%, F2 of 26.46% and F3 of 31.43%. The cellulose content of this complete feed is stable when compared to the content of durian fruit peel before it is formulated, namely 24.76% according to [14]. Based on the analysis of variations in the cellulose content of complete feed, it had a significant effect ( $p < 0.05$ ). The cellulose in this feed does not experience high or low levels so the product is stable. The hemicellulose content of complete feed produces various values, namely F0 of 10.75%, F1 of 13.96%, F2 of 13.02% and F3 of 14.55%. The hemicellulose content of this complete feed is low when compared to the content of durian fruit peel before it is formulated, namely 16.96% according to [14]. Based on the analysis of variations in the hemicellulose content of complete feed, it had a significant effect ( $p < 0.05$ ). Hemicellulose in complete feed is low because NDF is low or stable. This is in accordance with the statement by Mulya et al., (2016) that hemicellulose is part of NDF so that the release of cellulose from lignin causes a decrease in the value of NDF [22].

**Table 1:** Complete feed formula.

Material	Formula (%)			
	F0	F1	F2	F3
Durian fruit peel flour	0	10	20	30
Rice bran	30	20	10	0
Elephant grass	55	55	55	55
Rese flour	4.5	4.5	4.5	4.5
Molasses	7	7	7	7
urea	1	1	1	1
Mineral mix	1.5	1.5	1.5	1.5
Salt	1	1	1	1
Total	100	100	100	100

**Table 2:** Complete nutritional and anti-nutrient content of feed formula.

Parameter	Formula (%)			
	F0	F1	F2	F3
<b>Nutritional Content</b>				
Ash	20.46±0.43 <sup>b</sup>	20.33±0.48 <sup>b</sup>	18.83±0.92 <sup>a</sup>	19.59±0.16 <sup>ab</sup>
Crude Protein (CP)	10.06±0.45	10.42±0.43	10.01±0.30	10.54±0.45
Ether Extract (EE)	3.85±0.63 <sup>b</sup>	3.31±0.18 <sup>b</sup>	2.40±0.37 <sup>a</sup>	2.02±0.61 <sup>a</sup>
Non-Nitrogen Free Extract (NNFE)	42.50±1.90 <sup>c</sup>	39.53±1.60 <sup>b</sup>	40.00±1.22 <sup>bc</sup>	36.75±2.29 <sup>a</sup>
Crude Fiber (CF)	23.13±2.84 <sup>a</sup>	26.40±1.34 <sup>b</sup>	28.74±1.54 <sup>b</sup>	31.09±2.72 <sup>b</sup>
<b>Anti-nutrient content</b>				
Acid Detergent Fiber (ADF)	33.15±2.71 <sup>a</sup>	37.02±0.76 <sup>c</sup>	37.29±0.68 <sup>c</sup>	41.07±2.76 <sup>b</sup>
Neutral Detergent Fiber (NDF)	43.90±4.31 <sup>a</sup>	50.99±0.96 <sup>b</sup>	50.31±0.46 <sup>b</sup>	55.63±3.66 <sup>c</sup>
Lignin	7.27±0.82 <sup>a</sup>	9.07±1.14 <sup>b</sup>	8.34±0.60 <sup>ab</sup>	8.84±0.40 <sup>b</sup>
Cellulose	21.40±3.20 <sup>a</sup>	25.43±0.63 <sup>b</sup>	26.46±1.27 <sup>b</sup>	31.43±3.55 <sup>c</sup>
Hemicellulose	10.75±1.62 <sup>a</sup>	13.96±1.07 <sup>b</sup>	13.02±0.24 <sup>b</sup>	14.55±1.48 <sup>b</sup>

Note: Different superscripts indicate significant differences ( $p>0.05$ ).

#### 4. Conclusions

Based on the research results, it shows that F2 complete feed, namely rice bran 10% + durian fruit peel flour 20%, has nutritional content, namely ash 18.83%, crude protein 10.01%, ether extract 2.40%, BETN 40.00%, crude fiber, 28.74% and anti-nutrient content ADF 37.29%, NDF 50.31%, lignin 8.34%, cellulose 26.46%, hemicellulose 13.02%. F2 complete feed meets the maximum standards for use when applied to livestock.

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