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EVALUATION OF THE NUTRITIONAL CONTENT OF FEED AND MICROSTRUCTURE OF BREM DRUGS AS AN ALTERNATIVE FOR BROILER FEED

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ABSTRACT : This study aims to analyze the nutritional composition of brem dregs as a potential substitute energy source to feed broiler chickens. The method used in the research methodology is laboratory experiments. The variables examined in the study were the nutrient composition (dry matter, crude protein, crude fiber, crude fat, ash, and gross energy), pH levels, and microstructure of brem dregs. The data collected from observations were analyzed using descriptive methods. The research findings indicate that the proximate examination of brem dregs revealed the following nutritional composition: 87.67% dry matter, 0.89% ash, 24.28% crude protein, 0.79% crude fiber, 1.72% crude fat, 4344.18 Kcal/Kg gross energy, and a pH of 3.52. The microstructural studies conducted on brem dregs revealed that the amylopectin linkages in brem dregs were visually less dense, and the starch granules seemed empty compared to glutinous rice and yellow corn. Brem dregs are a potential replacement for corn in broiler chicken feed as an alternative energy source.

KEYWORDS –Brem dregs, energy source feed substitution, microstructure, proximate analysis, broiler chickens.

I. INTRODUCTION

Feed is a crucial factor that influences the outcome of a poultry-raising business. Feed expenditures account for 70% of production costs. Nutrition is a crucial factor in the breeding of pigs and broiler chickens. Feed is a mixture of several components that provide energy and essential nutrients, such as crude protein, fat, fiber, minerals, and vitamins necessary to develop broiler chickens and pigs [1]. The need for domestic feed components in Indonesia is growing each year in tandem with the expansion of the poultry sector. Corn is a feed component that has restricted availability. Corn, a feed element, can constitute up to 60% of feed rations, according to [2]. Corn serves as the primary component of animal feed. However, the availability of corn is constrained due to its utilization in many sectors, such as feed ingredients, industrial, food, and fuel, leading to competition with other resources. In the study conducted by [3], Approximately 63% of corn is utilized worldwide as the primary component in animal feed. At the same time, the remaining portion is employed as a source of oil, starch, and fuel. Hence, it is imperative to incorporate an alternative feed ingredient into chicken feed formulations that can partially replace corn. This ingredient should not compete with human consumption, be economically viable, and possess high nutritional value acquired from waste sources. [4] Alternative feed items capable of substituting corn should provide nutrients nearly equal to those found in corn. By employing local raw resources, particularly agricultural and industrial by-products, as alternative feed ingredients for energy sources, corn can be replaced in poultry feed.

Brem is a traditional Indonesian dish that ferments glutinous rice with tape yeast (Saccharomyces cerevisiae). This fermentation involves pressing the rice, resulting in 70% fermented glutinous rice water as the main ingredient for manufacturing brem, along with 30% solid brem dregs [5]. Brem is manufactured in multiple Indonesian locations, including Madiun, Jogjakarta, Solo, Wonogiri, Bali, West Nusa Tenggara Island, and the East Nusa Tenggara Region. In Wonogiri, the production of brem is 400-600 kg per month, with brem dregs amounting to 180 kg per month [6]. In Madiun, the production is 1000-1500 kg per month, resulting in brem dregs that can be utilized, amounting to 450 kg per month or 5.4 tonnes yearly [7]. Other regions in Indonesia that produce brem also have the potential to produce brem dregs. Brem dregs have yet to be utilized despite their potential as ingredients for chicken feed. In considering this, it is imperative to research proximate analysis to ascertain the nutritional composition of brem dregs, evaluate the pH levels, and examine the micros.

II. MATERIALS AND METHOD

Location and time: Proximate analysis and pH measurements were conducted at the Nutrition and Animal Feed Laboratory of the Faculty of Animal Science, Brawijaya University, Malang. Microstructural testing using SEM (Scanning Electron Microscopy) was performed at the Biology Laboratory of the Faculty of Biology, Muhammadiyah University, Malang. The research was conducted from June 2023 to September 2023.

Materials: The dried brem dregs collected from the brem-producing industry in Caruban, Madiun, were used to conduct nutritional content, acidity level (pH), and microstructure tests. The research employed a laboratory experiment to examine the nutritional composition of brem dregs using proximate analysis, which included assessing the dry matter, ash, crude protein, crude fat, crude fiber, and gross energy. The analysis was conducted according to the AOAC [8] guidelines. Additionally, the acidity level was measured using a pH meter. Examine the microstructure of brem dregs through the utilization of Scanning Electron Microscopy.

Observed variables and data analyzed: The research analyzed the nutrient composition (dry matter, crude protein, crude fiber, crude fat, ash, and gross energy), pH levels, and microstructure of brem dregs. The data obtained in the study were analyzed descriptively.

III. RESULT

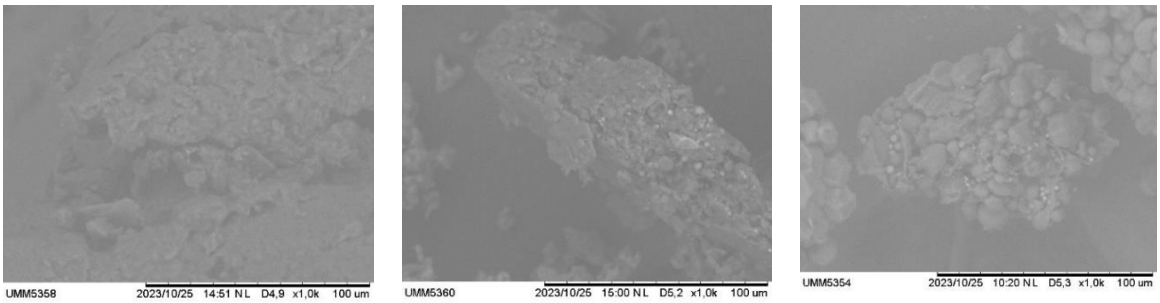
Table 1. Nutrient Content of Brem Dregs

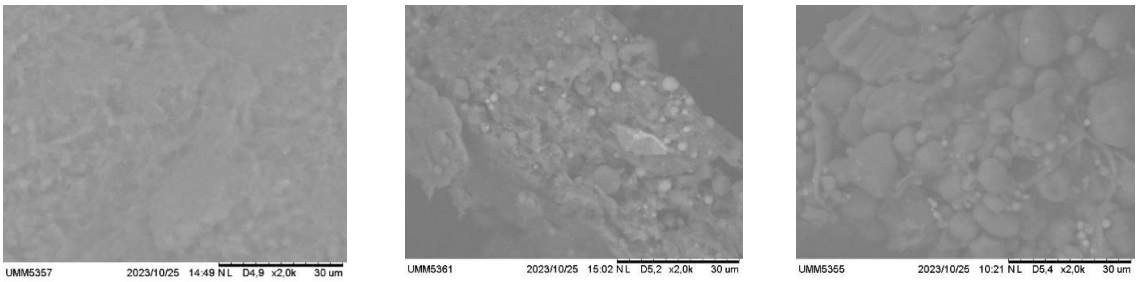
Sample	Brem dregs
Dry Matter (%)	87,67
Ash*	0,89
Crude protein* (%)	24,28
Crude Fiber* (%)	0,79
Crude Fat* (%)	1,72
Gross Energy (Kcal/kg)	4344,18
pH	3,52

*) Based on 100% dry matter

(a) (b)

Fig 1. Brem dregs before drying (a); Brem dregs after drying (b)





Brem dregs (a) Glutinous rice (b) Yellow corn (c)

Fig 2. Displays the results of a microstructure test using scanning electron microscopy (SEM) on three different samples: (a) brem dregs, (b) glutinous rice, and (c) yellow corn

IV. DISCUSSION

The proximate analysis results presented in **Table 1** show that the brem dregs possess a dry matter content of 87.67%, ash content of 0.89%, crude protein content of 24.28%, crude fiber content of 0.79%, crude fat content of 1.72%, gross energy of 4344.18 Kcal/Kg, and a pH value of 3.52. Demonstrates that brem dregs **Figure 1.**, which include nutrients, can serve as an alternative feed item to replace corn for energy production. The brem dregs have a gross energy content of 4344.18 Kcal/kg, indicating that they can be utilized as a feed element to replace corn as an energy source. According to [4], various feed items can be used as substitutes for corn. These substances have nutrient profiles that are nearly equal to corn. Alternative raw materials that can substitute for any or all of the corn must meet specific criteria as energy sources for poultry. The raw materials for energy sources must meet certain criteria, including a crude protein percentage of less than 20%, a crude fiber content of less than 18%, and a cell wall content of less than 35% because the digestive system in chickens is physically and physiologically simple. [9] asserted that a significant portion of the metabolic energy for poultry is derived from starch, a type of simple carbohydrate. This energy source is preferred due to its low crude fiber content and palatability. The simplicity of the poultry digestive system's anatomy and physiology makes it challenging to digest complex carbohydrates such as cellulose and hemicellulose efficiently. With a crude fiber level of 0.79%, brem dregs meet the necessary criteria to be used as a replacement for corn. In addition, the brem dregs have a pH of 3.52, resulting from the fermentation process of tape yeast with glutinous rice. This acidic feed element aids in maintaining the pH of the chicken's digestive system. [10] Acidic feed ingredients help regulate the pH of the digestive tract, creating optimal conditions for the absorption of nutrients. Additionally, they inhibit harmful microbes' growth while promoting beneficial microbes' growth.

Brem, a traditional beverage, is mostly made from glutinous rice, which contains a high proportion of starch, serving as its main source of carbohydrates. The glutinous rice has an amylose content of just 1-2% and an amylopectin content of 88-89% [11]. In contrast, corn has an amylose component of 25-30% and an amylopectin component of 70-75% [12]. [13] an increase in amylopectin content leads to decreased digestibility and utilization of feed by chickens. Glutinous rice brem undergoes a fermentation process where yeast, with the help of the enzyme amylase, breaks down starch into simple sugars. This transformation changes carbohydrate molecules (starch) into simpler compounds (glucose and alcohol) [14]. The fermentation process led to a decrease in the amylopectin content and an increase in the amylose concentration in brem dregs. The research conducted by [5] reveals that brem dregs contain a total sugar content of 39.86%, with amylose accounting for 4.61% and amylopectin accounting for 26.14%. The amylopectin level in brem dregs reduces as starch undergoes enzymatic conversion into sugar during the fermentation of sticky rice tape. Evidence suggests that brem dregs are believed to be digestible by a basic chicken digestive system and can serve as a viable alternative to corn in poultry feed formulations.

The microstructural studies conducted on brem dregs indicate that the amylopectin linkages in brem dregs appear less dense and empty than glutinous rice or yellow corn. Microstructural test findings from [15] show glutinous rice possesses a dense composition, and the starch granules in the branched glutinous rice are predominantly spherical and oval. Glutinous rice has a compact structure with minimal gaps between the grains due to the presence of holes and cavities on the grain surface. These pores act as channels that facilitate water binding. The disparity in starch composition between brem dregs and glutinous rice is attributed to the fermentation process, resulting in a more porous and less compact amylopectin structure in fermented glutinous

rice. Starch is a versatile substance that is widely used in several industries. Starch consists of polysaccharides derived from α – D – glucose molecules. The molecule comprises linear amylose fractions and branching amylopectin. These two molecules contribute to starch's physical and chemical characteristics, affecting the solubility and swelling of starch granules. The findings from [16] examination of cassava starch microstructure indicate that starch granules with higher amylopectin levels exhibit greater compactness and density. These granules assume round and oval shapes, similar to the microstructure observed in sticky rice and yellow corn, as shown in **Figure 2.**

V. CONCLUSION

Proximate analysis, pH measurements, and microstructural testing of brem dregs suggest that it could be a viable substitute for corn in broiler chicken feed as an alternate energy source.

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