CRUDE PROTEIN CONTENT, CRUDE FAT AND CRUDE FIBER FERMENTED CASSAVA TUBER PEEL (KUUK) WITH ECO ENZYMES

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Abstract: *This study aims to determine the nutrition of cassava tuber skin (KUUK) fermented with eco enzyme. The method used in this study was using a Factorial Complete Randomized Design (RAL), which consisted of 3 treatments, namely P0 = Cassava tuber skin without fermentation; P1= Fermentation of eco enzyme 10 ml; P2 = Fermentation of eco enzyme 20 ml, and repeated as many as 5 repeats. The observed modifiers were changes in crude protein content, crude fiber, and crude fat. The results showed that fermentation of cassava tuber peel (KUUK) had a very noticeable effect (P< 0.05) on crude protein, crude fiber and crude fat. The conclusion of this study is that the best nutritional content is obtained in E2 treatment (fermented eco enzyme 20 ml) with crude fiber nutrient content of 6.960%, crude protein 7.538%, and crude fat 0.321%.*

INTRODUCTION

North Sumatra Province (North Sumatra) is ranked fifth nationally in the largest cassava production after Lampung, Central Java, East Java, and West Java. The production of 1,619,495 tons of cassava is sufficient to meet the needs of other regions and regions. Cassava production centers are in Deliserdang, Serdang Bedagai, Langkat, and Simalungun with a land area of 47,837 hectares (ha) and productivity of 338.54 quintals per ha. North Sumatra Agriculture Office, 2016)

In developing countries, Cassava peels obtained from cassava plant products (*Manihot esculenta Cranz or Manihot utilissima* Pohl) are food waste. The wider the area of cassava plants, it is expected that the production of tubers will be higher so that the higher the skin waste produced. Each kilogram of cassava can usually produce 15 – 20% of cassava tuber skin. The starch content of cassava peel is quite high, allowing it to be used as an energy source for microorganisms (Muhiddin et al, 2000).

Eco-enzyme is a versatile natural liquid, that is the result of the fermentation of brown sugar or molasses, fruit/vegetable waste, and water, in a ratio of 1: 3: 10 (Alkadri and Kristin 2020). This eco enzyme was first discovered by Dr. Rosukon Poompanvong Thai Organic Farming Association. Eco enzyme according to experts is the first according to Atiek eco enzyme is a natural alternative to harmful synthetic chemicals at home. Good eco-enzyme characteristics include having an acidity level below 4.0 and a fresh aroma typical of fermentation (Wibawa, 2021). Arun and Sivashanmugam (2015) found that eco enzyme contains amylase, protease, and lipase activities, which can be utilized to treat waste.

Eco enzymes are the results of processing from fruit and vegetable skin waste that is rich in benefits with various contents contained in the eco enzyme, one of which is organic acids. The organic acid content contained in eco enzymes is expected to be an alternative acidifier that can contribute to the digestive process in livestock due to the content of acetic acid and lactic acid, Panjaitan, (2022).

Viza (2022), states that eco-enzymes contain organic acids in the form of acetic acid and lactic acid where the organic acids contained in eco-enzymes are produced from the fermentation process. Acetic acid is produced from the metabolic process of bacteria that are naturally present in the rest of fruits and vegetables. The use of eco-enzymes is also expected to be an alternative to antibiotics that are currently prohibited from being used in livestock because eco-enzymes also have benefits as antifungal and anti-bacterial.

Based on the description above, cassava tuber skin can improve its nutritional content by using eco-enzymes. So research was conducted to determine the nutrition of cassava tuber skins fermented with eco enzymes.

RESEARCH METHODS

The research was conducted in Sukasari Village, Pegajahan District, Serdang Bedagai Regency, North Sumatra Province. This research will be conducted from January to March 2023.

The materials used in this study were cassava tuber kult (KUUK), and molasses. Eco enzyme, and water, plastic size 10 kg, plastic bucket, boiler, vacuum device, stove, blender, filter, and a set of proximate tools.

The research method used was an experiment using Complete Randomized Design (RAL). This study was designed in 3 treatments, where each treatment was repeated 5 times and there were 20 experimental units.

The research treatment applied in this study is:

E0 = no fermentation (control)

E1 = Fermentation eco enzyme 10 ml

E2 = Fermentation of eco enzyme 20 ml

Research Implementation

I. Making Eco-enzymes

a) Preparation of raw materials the first process begins with collecting raw materials consisting of the following: Molasses, Fruit and vegetable waste, Well water, Measuring cups, and Buckets/containers with lids.
b) The process of making eco enzymes is as follows: 1. All materials are measured in a ratio of 1: 3: 10 namely (molasses: fruit waste and wither: well water).
c) Put the well water into the container.
d) Add the molasses and mix well.
e) Put fruit and vegetable waste that has been washed thoroughly then stirred again.

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f) Cover the container and let it sit for 100 days to start the fermentation process. During the fermentation process, the lid of the container must be occasionally opened to remove the gas in the bucket, namely on day 7 and day 30.
g) Eco-enzyme harvesting is carried out on the 100th day by separating the vegetable and fruit waste pulp from the solution, after which the finished eco-enzyme liquid is filtered and put into the bottle. Dregs from vegetable and fruit waste can be used as fertilizer for plants and agriculture by drying to dry. Then the filtered water will be used as an eco enzyme fermentation biostater in the treatment of this study (modification of Alkadri et al., 2020).

2. Cassava tuber peel treatment (KUUK) Eco enzyme fermentation
a. The skin of cassava tubers (KUUK) is cleaned from the outer skin and thoroughly washed under running water.
b. Then dried in the sun for about 2 days to lower HCN levels.
c. Next, KUUK is cut into sizes of 1 – 2 cm and steamed for 30 minutes at atemperature of 400C for sterilization before fermentation. (Modification of Ayuningtyas et al., 2016)
d. Weigh the KUUK and put it in plastic then mix the eco enzyme solution according to the treatment.
e. Each KUUK according to the treatment is stored in a closed container in an aerobic state for 7 days. (modification Yuhanna et al.,2021).
f. After 7 days the plastic is opened and aerated then in a blender for the proximate analysis process.

Analytics and Data

The data obtained from this study were analyzed for variance (ANOVA) and continued with Duncan's New Multiple Range Test for real different results.

RESULTS AND DISCUSSION

The results showed that fermentation with eco enzyme had a very real effect (P<0.01) on crude protein, crude fiber, and crude fat of cassava tuber skin (KUUK). The results of the study of Cassava Tuber Skin Fermentation (KUUK) with Eco enzyme, are presented in the table as follows:

Table 1. Flattened cassava tuber skin (KUUK) fermented with eco-enzymes.

Treatment (ml)				
Nutrients	E0 (0 ml)	E1 (10 ml)	E2 (20 ml)	
Crude Protein (PK)	$4{,}626^{A}$	$5{,}318^{B}$	$7{,}538^{C}$	
Crude Fiber	$10{,}446^{C}$	$8{,}603^{B}$	$6{,}960^{A}$	
Crude Fat	$0{,}373^{B}$	$0{,}335^{A}$	$0{,}321^{A}$	

Description: Different superscripts on the same line show a very noticeable difference in influence (P<0.01)

Effect of treatment on Crude protein content

The results of fingerprint analysis showed that fermentation with eco enzyme 10 ml to 20 ml was able to increase crude protein in KUUK. The increase in protein content in KUUK after fermentation is thought to come from eco enzymes because eco enzyme contains several enzymes, one of which is the protease enzyme. According to Galintin et al., (2021), eco-enzymes contain protease enzymes, lipase, and amylase. Proteases are enzymes that can hydrolyze proteins into simpler compounds such as peptides and amino acids (Rezakhani et al., 2014). Protease enzymes play an important role in various biochemical reactions that occur in living organisms, including the degradation of proteins into amino acids and peptides so that they can be used as nutrients (Fujiwara &; Masui, 1993).

In addition to eco-enzyme containing protease enzymes, cassava tuber skins fermented with eco-enzyme also undergo a bioconversion process that produces beneficial anaerobic microbes and enzymes, so enzyme production also increases. The method that is widely used for enzyme production is submerged fermentation (Riwayati et. al. 2012) and sugar is a common ingredient used in fermentation. This is because the protein content available in KUUK raw materials is hydrolyzed optimally so that the protein content becomes a simpler molecule. The protein content of amino acids will be hydrolyzed in peptide bonds. While eco enzyme as a fermentor ingredient also contains protease enzymes it can increase the crude protein content in KUUK. According to Kurniati et al. (2018), the more enzymes added, the higher the N levels analyzed.

The effect of treatment on the content of Crude Fiber

The results of fingerprint analysis show that fermentation with eco-enzyme 10 ml to 20 ml can reduce crude fiber in KUUK. The decrease in crude fiber is due to the activity of enzymes found in eco-enzymes. Microbes produced in the fermentation process produce cellulase and other enzymes that are able to break the complex bonds of crude fibers into simpler ones, resulting in decreased crude fibers. The crude fibers in KUUK are cellulose, hemicellulose, and lignin.

In addition to containing several enzymes, eco-enzymes also contain acetic acid. These acids can inhibit the growth of disease-causing bacteria (pathogenic bacteria) and food spoilage bacteria. In addition, lactic acid bacteria can also produce other antimicrobial compounds such as bacteriocin, reuterin, hydrogen peroxide, and diacetyl. As stated by Muliarta and; Darmawan (2021), the content of acetic acid (CH_3COOH) contained in ecoenzymes can kill germs, viruses, and bacteria.

The effect of treatment on the content of Crude Fat.

The results of fingerprint analysis show that fermentation with eco-enzyme 10 ml to 20 ml can reduce crude fat in KUUK. The fat content in cassava tuber skin (KUUK) fermented with eco-enzyme 20 ml is 0.321% lower than the crude fat content in fermentation eco-enzyme 10 ml and fermentation without eco enzyme. Fat levels tend to fall due to the activity of the lipase enzyme. According to Devita et al., (2019), fat levels are decreasing due to bacterial activity in the breakdown of fat into fatty acids.

The longer the fermentation, the lipase enzyme produced by lactic acid bacteria will increase with the increase of lactic acid bacteria, so that more fat is degraded into fatty acids. The decrease in fat content in fermentation is thought to be due to the presence of bacteria that use fat for growth, while the increase in fat content occurs due to the loss of dry matter during the fermentation process increasing the components of a fermentation product (Helmiati et al., 2020).

CONCLUSION

From the results of the study, it can be concluded that fermentation of cassava tuber skin (KUUK) with ec-enzyme has a very real effect on the content of crude protein, crude fiber, and crude fat. The best fermentation is obtained in fermentation with eco-enzyme 20 ml (E2) with a crude protein content of 7.538%, crude fiber of 6.960%, and crude fat of 0.321%.

Suggestion

It is recommended that further research be carried out on the use of eco-enzymes to increase the nutritional value of feed ingredients that have the potential to be animal feed.

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