

Improving the Quality of Fermented Tofu and Coconut Pulp Waste Using *Saccharomyces Cerevisiae*

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ABSTRACT: The aim of the study was to assess the quality of tofu waste and coconut waste that had been fermented using baker's yeast to be used as animal feed. Tofu pulp waste was obtained from a tofu factory located in Oesapa Village, Kelapa Lima Subdistrict, Kupang City, while coconut pulp was left over from coconut milk processing in households and stalls in Kupang city and surrounding areas. The research method used direct experimental method and duration of fermentation time through proximat analysis. The results of this study were tested using Student's t test with treatment R1 (tofu pulp waste and coconut pulp fermented for 12 hours), R2 (tofu pulp waste and coconut pulp fermented for 24 hours) and R3 (tofu pulp waste and coconut pulp fermented for 48 hours). The variables studied were changes in the nutritional content of dry matter (BK), organic matter (BO), crude protein (PK), crude fat. The results showed that the treatment had a significant effect on the research variables ($P < 0.05$) and fermentation using baker's yeast. The conclusion of the study results shows that the fermentation of tofu pulp and baker's yeast fermented coconut pulp can significantly increase nutrition, so that it can be used as an ingredient in animal feed

KEYWORDS: tofu pulp waste, coconut pulp, fermentation, *saccharomyces cerevisiae*

INTRODUCTORY BACKGROUND

The high price of concentrate makes farmers provide potluck feed without looking at the daily needs of pigs. Where feed costs reach 65-80% of total production (Warouw et al., 2014; Sihombing, 2010). Feed is an important factor because feed plays a very important role in producing fast and efficient growth (Nguru et al., 2024). So that potluck feeding provides a longer and inefficient maintenance time. High feed costs are a problem that is often faced by farmers. This is in connection with Nguru et al., (2022) who reported that one of the problems faced by farmers is the difficulty of meeting the availability of feed on a sustainable basis, both in quality and quantity. One solution in reducing feed costs is to take advantage of waste which is cheap and abundant in availability. Tofu pulp and coconut pulp are waste whose nutritional content can still be used as animal feed and their utilization is not optimal. This is because these two wastes are easily decomposed and their use is still limited.

Tofu pulp is a solid by-product produced during tofu production (Nastiti et al., 2014). Tofu pulp is waste from the extraction of its juice or starch (Yuliani & Mardesci, 2017). The high content of water and fiber makes its use limited (Mahfudz, 2018). Furthermore, Sina et al., (2021) reported that tofu pulp can emit an unpleasant odor if not used within a time bracket of 12 hours. This is due to the significant protein content because not all soy protein is extracted during the tofu making process. (Putri et al., 2022). Tofu pulp waste still contains high nutrients, namely protein (26.6%), fat (18.3%), carbohydrates (41.3%), phosphorus (0.29%), calcium (0.19%), iron (0.04%) and water (0.09%) (Masyhura et al., 2019).

There are two types of coconut pulp, namely coconut pulp that remains after coconut milk extraction for household purposes and coconut pulp produced as a by-product of cooking oil production (Azis & Akolo, 2018). The coconut pulp used is coconut pulp left over from household coconut milk processing. Coconut pulp still has a high fat and protein value (Syah et al., 2004; Angelia, 2016). Coconut pulp has sufficient nutritional value to be used as an alternative feed ingredient because it contains 5.78% protein; Fat 38.24 and crude fiber 15.07% (Putri, 2010; Kurniawan et al., 2016). One of the disadvantages of coconut pulp is that it rots easily due to the presence of pathogenic microbes (Karina et al., 2019).

The main limitation in the use of tofu pulp and coconut pulp as feed ingredients is their limited shelf life so that they require further processing to extend the shelf life. The right solution to overcome this problem is fermentation, because it not only extends the shelf life but can also increase the nutrient content, thus optimizing its use as a feed ingredient. The fermentation process involves chemical changes in the organic substrate, facilitated by enzymes produced by microorganism. (Suprihatin, 2010; Suryani et al., 2017). Yeast microorganisms can be utilized in the fermentation process. *Saccharomyces cerevisiae* is one of the

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yeasts that can be used for fermentation (Suwandiyastuti, dkk., 2012; Widiarso et al., 2020). The use of baker's yeast (*Saccharomyces cerevisiae*) has been shown to be effective in fermentation and can IJIRME, Volume 3 Edisi 02 Februari 2024 increase the beneficial value of feed ingredients (Nguru et al., 2022). Fermentation can inhibit the growth of putrefactive bacteria and can increase the nutritional value of feed ingredients. The duration of fermentation time greatly affects the development of microorganisms in converting substrate components into simpler components and affects the opportunity for microorganisms to develop (Kasmiran, 2011). Therefore, the use of baker's yeast is expected to decompose and increase the nutritional content and can increase the storage capacity of tofu and coconut pulp waste so that its use is more optimal as an ingredient in animal feed.

MATERIALS AND METHODS

MATERIAL

The research was carried out at the Feed Chemistry Laboratory, Faculty of Animal Husbandry, Marine and Fisheries, Nusa Cendana University from November to December 2023 from the collection of ingredients, fermentation and proximate analysis in the Laboratory. The material used is tofu pulp waste from a tofu factory located in Oesapa, Kelapa Lima Village, Kupang City, and coconut pulp is obtained from the rest of household processing and stalls in Kupang City and its surroundings.

METHOD

RESEARCH DESIGN

The research design uses a direct experimental method with 3 different fermentation times (t student test). The treatment consists of:

R1 = Tofu pulp waste and baker's yeast fermented coconut pulp waste (LATLAKF) with a fermentation period of 12 hours

R2 = Tofu pulp waste and baker's yeast fermented coconut pulp waste (LATLAKF) with a fermentation period of 24 hours

R3 = Tofu pulp waste and baker's yeast fermented coconut pulp waste (LATLAKF) with a fermentation time of 48 hours

RESEARCH PROCEDURE

Fermentation research procedure using baker's yeast based on fermentation procedures from Nguru et al., (2022). Fermentation stage of tofu pulp and coconut pulp waste

- Collection of tofu pulp and coconut pulp waste
- After the collection of the two materials are dried in the sun
- After the drying process, 500grams of each is mixed with the baker's yeast solution ✓ Baker's yeast solution is a mixture of 3grams of baker's yeast dissolved in 600ml of water.
- After the mixture is evenly distributed, the campran is put into a container and tightly closed.
- Fermentation is distinguished from 3 different time durations, namely 12 hours, 24 hours and 48 hours
- After that, the fermentation results were analyzed proximate at the Feed Chemistry Laboratory, Faculty of Animal Husbandry, Marine and Fisheries, Nusa Cendana University

VARIABLES STUDIED AND DATA ANALYSIS

The variables studied in this study were changes in the nutritional content of tofu pulp waste and baker's yeast fermented coconut pulp waste through proximate analysis in the form of dry matter (BK), organic matter (BO), crude protein (PK). After obtaining the laboratory results, the data will be analyzed using the student test using the Microsoft excel application.

RESULTS AND DISCUSSION

Nutritional content of tofu pulp waste and fermented coconut pulp waste

The results of the proximate analysis gave different results on the duration of fermentation time of tofu bagasse waste and coconut bagasse waste. Changes in the results of the prosimat analysis of fermented tofu and coconut pulp waste are listed in the Table 1

Table 1. Changes in the nutritional content of fermented tofu pulp and coconut pulp waste

Research Variables	K1 (12 jam) ± SD	K2 (24 jam) ± SD	K3 (48 jam) ± SD
BK	63.046 ± 1.02	59.049 ± 2.40	58.018 ± 2.85
BO	95.75 ± 0.53	97.755 ± 1.33	97.822 ± 1.36
PK	20.788 ± 2.44	22.728 ± 2.24	24.069 ± 2.31

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Description: * Results of proximate analysis of the Feed Chemistry Laboratory, Faculty of Animal Husbandry, Marine and Fisheries, Nusa Cendana University, 2023.

** Treatment with real effect ($P < 0.05$)

DRY MATERIALS (BK)

The results of the analysis showed that fermented tofu pulp waste and coconut pulp waste with fermentation time duration had a real effect ($P < 0.05$) on the dry matter content. The decrease in the dry matter content of tofu pulp waste and fermented coconut pulp waste was 4.97% with a duration of 48 hours, when compared to the duration of fermentation time of 12 hours and 24 hours. A decrease in dry matter content can occur because microbes in the fermentation process can break down complex compounds into simpler compounds (Sari et al., 2019). And it is suspected that it is due to an overhaul of the dry matter substrate where organic matter undergoes decomposition by microorganisms found in the inculum *Saccharomyces cerevisiae* (Maliani et al., 2019). Dalle et al., (2022) It is also reported that the decline in dry matter is thought to be due to the metabolic process and conversion of macromolecular compounds into simpler compounds during the fermentation process. Fermentation can also increase nutrient content and palatability (Nguru et al., 2022). In addition, the length of the fermentation process affects the ability of microorganisms to grow depending on the nutrients contained in the ingredients (Kasmiran, 2011). The increasing multiplication of microbes can cause the water molecules produced to increase and the decrease in dry matter (Mirzah & Muis, 2015). Water molecules are formed from a process of catabolism that remodels complex compounds into simpler materials (Astuti et al., 2017). The duration of fermentation affects the nutrient content because the availability of nutrients in the fermentation medium is exhausted, so it will die and become a source of protein (Hadisutanto et al., 2020).

ORGANIC MATTER (BO)

The results of the analysis showed that fermented tofu pulp waste and coconut pulp waste with fermentation time duration had a real effect ($P < 0.05$) on the content of organic matter. This is because the organic matter content of tofu pulp waste and fermented coconut pulp waste with a fermentation time duration of 2.07% 48 hours has increased when compared to the fermentation time of 24 hours and 12 hours. The increase in organic matter content is influenced by the duration of fermentation time, where the longer the fermentation lasts, the more food substances are overhauled, such as dry matter and organic matter (Maliani et al., 2019). Organic matter is part of dry matter where a decrease in dry matter can increase the content of organic matter and vice versa. The increase in organic matter can be due to the availability of soluble carbohydrates consumed by bacteria that are in charge of digesting crude fiber (Desnita et al., 2015). The increase in organic matter content is greatly influenced by microbial activity during the fermentation process which facilitates the decomposition of the substrate so as to increase the ability of microorganisms to digest the material more effectively (Astuti et al., 2017). The length of fermentation time affects the degradation process of substrate materials by microbes (Hadisutanto et al., 2020).

CRUDE PROTEIN (PK)

The results of the analysis showed that tofu pulp waste and fermented coconut pulp waste with fermentation time duration had a real effect ($P < 0.05$) on crude protein content. The increase in protein content of tofu pulp waste and fermented coconut pulp waste was 3.28% with a fermentation time duration of 48 hours, when compared to the fermentation time of 24 hours and 12 hours. The length of the duration of fermentation time has been proven to increase the protein content. This is in line with the opinion of Amin et al., (2016) who reported that the increase in protein content is influenced by the length of fermentation time. Microorganisms in the fermentation process need time to decompose complex materials into more conscious materials. Nahariah et al., (2013) reports that the longer the fermentation time, the more opportunities the microorganisms have to adapt. Microbes in the fermentation process are able to convert macromolecules of proteins into micromolecules that are easily digestible (Thaariq, 2018; Bidura, 2007). The ability of microbes to adapt to the substrate to be used as nutrients to grow and develop determines the success of the fermentation process (Astuti et al., 2017; Zakaria et al 2013). Fermentation involves an enzymatic reaction produced by microorganisms that are able to change the physical and chemical form of organic matter into simpler (Moede et al., 2017; Nguru et al., 2024). During the fermentation process, the enzyme amylase is produced to break down carbohydrate components (Suryani et al., 2017). The increase in crude protein is due to the ability of *Saccharomyces cerevisiae* to secrete extracellular enzymes namely protease, amylase, cellulase, and lipase (Widiarso et al., 2020).

CONCLUSION

The conclusions obtained from this study are

1. The use of baker's yeast as a fermentation medium for tofu and coconut by-products can reduce the content of dry matter, as well as increase the content of organic matter and crude protein
2. The use of fermented tofu pulp and coconut pulp with a fermentation time duration of 48 hours has a real influence on the content of dry matter, organic matter and protein.

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3. The use of fermented tofu pulp and coconut pulp significantly increases the nutrient content, so that it can be used as an ingredient in animal feed.

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