The International Conference on Education, Social, Sciences and Technology (ICESST)
Vol.2, No. 2 July-December 2023
e-ISSN: 2964-2671; p-ISSN: 2964-2701, Pages 257-265

Content of Crude Protein, Crude Fiber, and Crude Fat Kepok Banana Peel Fermented with SOC at Different Times

Risdawati Br. Ginting
Universitas Pembangunan Panca Budi, Indonesia
Email: risdawati@dosen.pancabudi.ac.id
Puteri
Universitas Pembangunan Panca Budi, Indonesia

Corresponding author: risdawati@dosen.pancabudi.ac.id

Abstract*. Banana peel is banana processing waste that can be used as poultry feed, but because of its high crude fiber content, it is necessary to do processing to reduce it, one way is by processing processes such as fermentation. The fermentation process takes time to get good nutritional results. This study aims to determine the content of crude protein, crude fiber and crude fat of banana peels fermented with SOC at different times. This study used an experimental method with a Complete Randomized Design with three treatments and six repeats. The three treatments are W0= (0 hours), W1= 24-hour fermentation, and W2= 72-hour fermentation. The observation parameters are crude protein content, crude fiber, and crude fat. The results showed that the SOC Fermented Kepok banana peel nutrition showed the highest crude protein analysis results were P2 with an average crude protein of 22.14% and differed very markedly from P1 and P0, with the lowest crude protein average at P0: 10.20%. The results of the analysis of the highest crude fiber content were P0 with an average crude fiber of 22.38% and differed very significantly from P1 and P2 with the lowest average crude fiber at P2: 15.30%. The highest crude fat content analysis was P2 with an average crude fat of 16.67% and differed markedly from P1 and P0, with the lowest average crude fat at P0; 13,71%. Fermentation of kapok banana peel with SOC for 72 hours produced 22.14% protein, 15.30 crude fiber, and 16.67% crude fat.*

Keywords*: Banana Peel, Crude Fiber, Crude Proterin, Fermentation Time*

INTRODUCTION

Based on data from the Central Statistics Agency (2017), total banana consumption per capita in Indonesia in 2016 reached 5.89 kg/year followed by rambutan fruit at 4.38 kg/year and oranges at 3.59 kg/year, with an annual production of 7.17 million tons. One of the most consumed types of bananas is the kapok banana (Musa paradisiaca) which is usually used as a basic ingredient for making fried bananas and banana chips.

This banana peel waste is widely found in areas that produce chips and banana sales (Satria and Ahda, 2008). Waste is usually used by residents as animal feed ingredients (Macklin, 2009). Koni (2013) suggests that a mixture of banana peel and coconut pulp

Received on Oktober 29, 2023; Revised on November 15, 2023; November 22, 2023
*Corresponding author, risdawati@dosen.pancabudi.ac.id

with a ratio of 2: 1 can be used up to 7.5% in free-range chicken feed. Anggriawan et al. (2013) showed that feather plantain peel flour (Musa paradisiaca L. var sapientum) can be used at 5% during the finisher phase without any significant effect on body weight and broiler ration consumption.

Koni et al., (2013) stated that kapok banana peel contains crude protein 3.63-18.01%, crude fat 2.52-5.17%, crude fiber 18.01-18.71%, calcium 0.36-7.18%, and Fospor 0.10-2.06%. Furthermore, Koni et al. (2013); and Salombre et al. (2018) stated that the high content of crude fiber and tannin content of banana peel became a barrier for use in poultry rations.

An alternative solution that can be done to increase the nutritional value of banana peels is biological processing or fermentation. This technology has been known for quite a long time and is often done to improve the use value of low-quality feed ingredients. The principle of application of fermentation is to maximize the work of microorganisms that can change the components of feed ingredients such as reducing crude fiber content (Mandey et al., 2015); and reducing anti-nutritional substances in feed ingredients (Koni et al., 2010).

Anaerobic fermentation can create acidic conditions to support the development of lactic acid bacteria. The acidic atmosphere in the fermentation process can be modified by using various additives of carbohydrate sources that are easily fermented (Utomo et al., 2013). Previous research results reported that there was an increase in the use of banana peels after fermentation as reported by Koni et al. (2013) that banana peels fermented with Rhizopus oligosporus can be used up to 10% in broiler rations, and Salombre et al. (2018) stated that kepok banana peel silage (Musa paradisiaca formatypica) is used 15% in broiler rations.

The fermentation process can reduce the crude fiber content in banana peels, from 18.71% to 15.75 after fermentation with tempeh mushrooms (Koni, 2013); and from 37.64% to 15.25% after fermentation with rumen liquid (Hudiansyah et al., 2015).

Liquid organic supplements (SOC) are supplements that can facilitate the manufacture of fermentation without the addition of urea. SOC serves to increase growth and meat production because SOC has an appetite-stimulating effect on native chickens. The advantage of using SOC in the fermentation process when compared to other types

e-ISSN: 2964-2671; p-ISSN: 2964-2701, Pages 257-265

of bioactivators is that it can be done in a short period, which is about 3-24 hours (Vienna, 2005).

SOC contains Lactobacillus sp bacteria that can convert lactose and sugar into lactic acid, Acetobacter sp plays an important role in increasing plant and animal growth, and Pseudomonas aeruginosa which is negative because it can cause disease and infection in animals and humans. Although this bacterium is negative, it is useful as a decomposer of food debris or dirt. Saccharomyces sp is a yeast-like bacterium and can be used in the fermentation process of various foods including animal food, while Bacillus sp is an antibiotic that plays a role in inhibiting the growth of negative bacteria (PT. HCS).

The benefits of fermented banana peel are as feed for poultry and ruminants. Fermentation will be carried out using Liquid Organic Supplements (SOC), to facilitate the manufacture of animal feed fermentation. SOC is very suitable for fermentation of animal feed, besides that SOC is also beneficial in terms of livestock production because it can fatten livestock. This study aims to determine the content of crude protein, crude fiber, and crude fat of banana peels fermented with SOC at different times.

RESEARCH METHOD(S)

Place and Time of Research

The research was conducted in Tanjung Anom village, Pancur Batu district, Deli Serdang Regency, and Loka Sei Putih Laboratory of North Sumatra Province. This research was conducted from April to May 2021.

Material

The ingredients used in the study were kepok banana peels from fried food sellers in Medan Sunggal City, liquid organic supplements (SOC), Bran, Molases, Tofu Dregs, Salt, and water. The equipment used is buckets, cutting tools, sacks, plastic, and rapid ropes.

The method used for this study is Complete Randomized Design (RAL). This study was designed in 4 treatments, where each treatment was repeated 5 times and there were 20 experimental units.

The treatment given is:

W0 = Control (no treatment)

W1 = 24 hours (1 day)

W2 = 72 hours (3 days)

Research Procedure

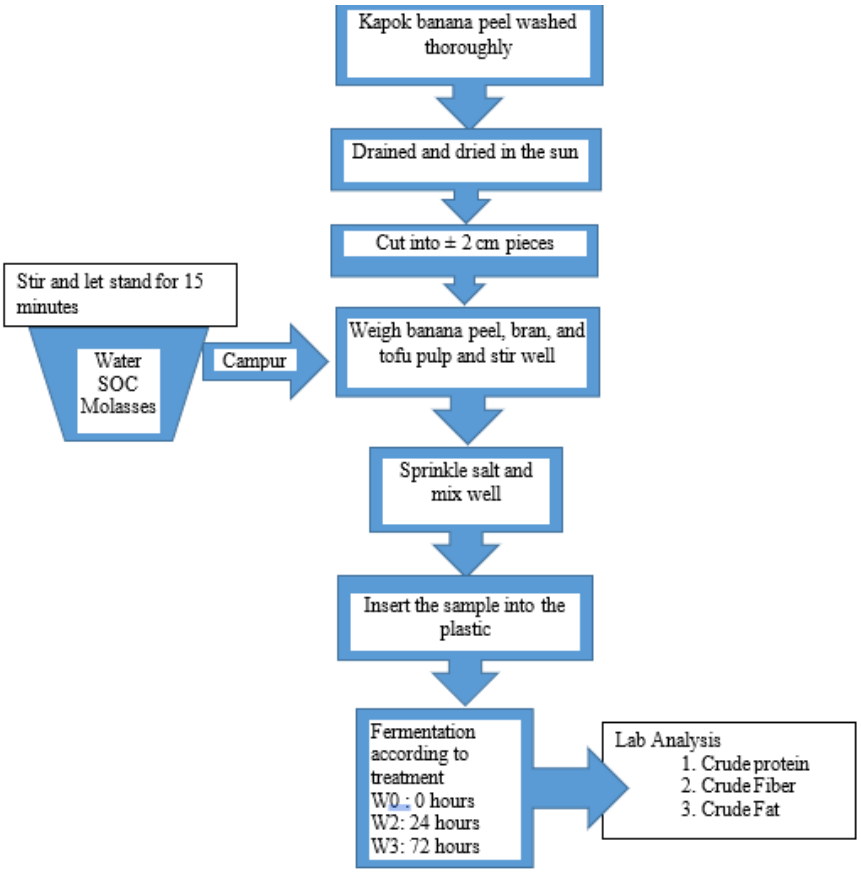

Figure 1. Research Flow

The fermentation process of kapok banana peel

1. The banana peel is washed with running water to remove dirt attached to the banana peel.
2. Banana peel drained then dried in the sun ± 1 day
3. The banana peel is then cut into 2 cm ± pieces
4. Put the banana peel in a bucket to mix the ingredients
5. Combine pieces of Banana Peel, Tofu Dregs and Bran
6. In a separate container put Liquid Organic Supplement (SOC) = 3 cc into 100 ml of water, mix sugar/molasses = 10 gr, stir, and let stand for 15 minutes.
7. After letting stand ± 15 minutes, pour into the fermented ingredients until smooth, then sprinkle salt and mix thoroughly.

e-ISSN: 2964-2671; p-ISSN: 2964-2701, Pages 257-265

8. Put in plastic and tie with a rope until airtight (anaerobic), store according to treatment.
9. After harvesting, air first ± 0.5 hours, and then the lab analyzed Variabel

Nutrient Content Measurement

Nutrient Content Measurement The content of crude protein, crude fat, and crude fiber is determined based on the method (AOAC 2005).

Data Analysis

Nutrient content data is analyzed using one-way analysis of variance (ANOVA) and if there is a noticeable difference proceed with BNT Test.

FINDINGS AND DUSCUSSION

The results showed that kapok banana peels fermented with SOC at different times had a very real effect (P<0.01) on crude protein, crude fiber, and crude fat. The results of research on the fermentation of kapok banana peel with SOC at different times, are presented in the table as follows:

Table 1. Flattened Kapok Banana Peels Fermented With SOC at Different Times

Nutritional Content	Treatment (hours)		
	W0 (0 hours)	W1 (24 hours)	W2 (72 hours)
Crude Protein (PK)	10,20^{A}	19,20^{B}	22,14^{C}
Crude Fiber	22,38^{C}	17,17^{B}	15,30^{A}
Crude Fat	13,71^{A}	15,91^{B}	16,67^{B}

Remarks: Superscripts with different letters on the same line show a very noticeable difference (P≤0.01).

The Effect of SOC Fermentation at Different Times on the Protein Content of Crude Kapok Banana Peel

The increase in crude protein goes hand in hand with the increase in fermentation time. The highest crude protein was found in the P2 treatment (72-hour fermentation) which was 22.14% and the lowest was found in the P0 treatment (0 hours) which was 10.20%. Suparjo (2010) also stated that the increase in PK content is caused by increased microbial activity in binding nitrogen as a basic material for protein synthesis so this increase in nitrogen levels is very beneficial for bacteria to grow and carry out activities optimally so that banana peel crude protein levels increase until 72 hours fermentation. The lowest Crude Protein content is found at P0 (without treatment) which is 10.20%.

The increase in crude protein content is due to an increase in the activity of various types of microbes contained in SOC, namely Lactobacilli sp, Acinetobacter sp, Pseudomonas aeruginosa, Saccharomyces sp, Bacillus sp in binding N as a basic material for protein synthesis so that this increase in nitrogen levels is very beneficial for bacteria to grow and carry out activities optimally so that the crude protein content of banana peel increases.

Increased protein levels in fermentation up to 72 hours can also be caused by an increase in decomposing microbes that die because they cannot survive in an acidic atmosphere (Asngad, 2015). Then Istighfarin, (2010), also states that microbes are single-cell proteins so that they can indirectly increase crude protein content. The success of the fermentation process is determined by the ability and ability of microbes to adapt to the substrate to be used as nutrients for microbial growth and development (Zakaria et al., 2013).

The Effect of SOC Fermentation at Different Times on the Crude Fiber Content of Kepok Banana Peel

Crude fiber is the residue of foodstuffs or agricultural products after being treated with boiling acid or alkali and consists of cellulose, with small amounts of lignin and pentose. Crude fiber is also a collection of all indigestible fibers, the components of this crude fiber consist of cellulose, pentoses, lignin, and other components.

The results of the fingerprint analysis showed that the use of SOC with different fermentation times had a very real effect ($P<0.01$) on the crude fiber content of the kepok banana peel. This shows that SOC fermentation at different times significantly decreases the fiber content of banana peels, although the results show a decrease in crude fiber. The average crude fiber in this study ranged from 15.30-22.38%. The highest crude fiber was found in the P0 treatment (0 hours) which was 22.38% and the lowest was found in the P2 treatment (72 hours) which was 15.30%.

The decrease in crude fiber content in SOC treatment up to 72 hours fermentation time is possible because of the ability of Lactobacillus sp, Acinetobacter sp, Pseudomonas aeruginosa, Saccharomyces sp and Bacillus sp bacteria contained in SOC to be able to secrete various enzymes, especially cellulase enzymes to degrade fiber in banana peels in the form of cellulose and hemicellulose to produce single cell protein (SCP) or single cell

e-ISSN: 2964-2671; p-ISSN: 2964-2701, Pages 257-265

protein (PST), which is pure protein so that it will be able to contribute to increasing the protein content of palm fronds (Biyatmoko and Lendhani, 2017).

Rahman (2013) stated that the low content of crude fiber makes it easier for bacteria to penetrate feed material for the digestive process, while high crude fiber inhibits microbes from degrading the carbohydrate content of the fermented banana peel.

The treatment that shows the best results with the lowest crude fiber content is P2 (15.30%), this is because the number of doses during fermentation and dosage is by the available nutritional sources so that there is no competition between microbes, and microbes can grow optimally so that cellulose degradation activities in feed ingredients are more optimal. Yang et al al., (2005) stated that most bacteria can produce ligninase enzymes and cellulase enzymes, which are enzymes that can decompose lignin and cellulose. This component of crude fiber has no nutritional value but this fiber is very important for the process of facilitating digestion in the body so that the digestive process is smooth (peristalsis) (Hermayanti, 2006).

The Effect of SOC Fermentation at Different Times on the Crude Fat Content of Kapok Banana Peel

Fats are a large group of natural molecules consisting of carbon, hydrogen, and oxygen elements including fatty acids, nights, sterols, fat-soluble vitamins (e.g. A, D, E, and K), monoglycerides, diglycerides, phospholipids, glycolipids, terpenoids (including sap and steroids) and others. Fat is specifically a term for animal oil at room temperature, apart from its solid or liquid form, which is found in body tissues called adipose (Sudarmadji et al, 2010).

Fats are hydrophobic organic substances that are difficult to dissolve in water but can dissolve in organic solvents such as chloroform, ether, and benzene. The constituent elements of fat include Carbon (C), Hydrogen (H), Oxygen (O), and sometimes Phosphorus (P) and Nitrogen (N) (Hardinsyah, 2014).

The results showed that crude fat at W0 was very significantly different ($P<0.01$) from W1 and W2, while W1 was not significantly different from W2. The average crude fat content in this study ranged from 13.71-16.67%. Fingerprint analysis showed that the highest crude fat was found in the W2 treatment (72 hours fermentation time) which was 16.67% and the lowest was found in the W0 treatment (0 hours) which was 13.71%. The

results are different from previous studies, namely, crude fat on banana peels is 5.17% (Widjastuti and Hernawan, 2012), 2.52% (Koni et al., 2013), and 6.2% (Wadhwa and Bakshi, 2013) depending on the type and level of ripeness of bananas.

Crude fat increases until 72 hours of fermentation, this shows that the bacteria contained in SOC can produce lipase enzymes during the fermentation process. This is supported by Rarumangkay (2002), who states that during the fermentation process, oxidation-reduction occurs which produces energy as an electron donor and acceptor, and chemical changes occur and are further changed by reactions with enzyme catalysts. In many foods, fat components play an important role that determining overall physical characteristics, such as aroma, texture, taste, and appearance (Hart, 2003).

CONCLUSION AND RECOMMENDATION

Fermentation with SOC can increase crude protein, and crude fat and reduce crude fiber banana peel. The longer fermentation time causes a decrease in crude fiber of banana peel, and an increase in crude protein and crude fiber. Thus fermentation of banana peels with SOC with a time of up to 72 hours can improve the nutrition of banana peels.

Fermentation of banana peel with SOC within 72 hours resulted in nutrients Crude Protein 22.14%, Crude Fiber 15.30% and, Crude Fat 16.67%.

REFERENCES

Anggriawan, R, P Srianto and S D Warsito. 2013. The benefit of additional banana (Musa paradisiaca l.var sapientum) and mangosteens (Garcinia mangostana l.) skins flour toward weight gain and feed conversion in male broiler. Agroveteriner, 1(2): 29–36.

AOAC. 2005. Official Methods of Analysis of the Association of Official Analytical Chemists. 18th ed. Washington, DC.

Aro, S.O. 2010. Improvement in the nutritive quality of cassava and its by-products through microbial fermentation. African Journal of Biotechnology, 7(25): 4789–4797.

Handayani, S, A E Harahap, E. Saleh. 2018. Kandungan fraksi serat silase kulit pisang kepok (Musa paradisiaca) dengan penambahan level dedak dan lama pemeraman yang berbeda. J. Peternakan, 15(1): 1–8.

Koni, T.N.I. 2013. Effect of fermented banana peel on broiler carcass. Jurnal Ilmu Ternak Dan Veteriner 18 (2): 153–157.

Koni, T. N. I., J. Bale-Therik dan P. R. Kale. 2013.Utilizing of fermented banana peels by Rhyzopus oligosporus in ration on growth of broiler. J. Veteriner, 14(3): 365–370.

Koni, T.N.I., T.A.Y Foenay and Asrul. 2019. The nutrient value of banana peel fermented by tape yeast as poultry feedstuff. J. Ilmu-Ilmu Peternakan, 29(3): 211–217.

Macklin, B. 2009. Pemanfaatan Limbah dari Tanaman Pisang. Fakultas Teknologi IndustriPertanianUniversitasPadjajaran. Bandung.

http://onlinebuku.com/2009/01/29/pemanfaatan-limbah-dari-tanaman- pisang/html. hal. 1-3.

Maria, B. 2002. Identification, production, and assay for trichoderma. http://biofuelvaportechnologies.com/files/ethanol_trichoderma_fungus_st ory.pdf. [13 Januari 2010].

Muchtadi, T. dan F. Ayustaningwarno. 2010. Teknologi Proses Pengolahan Pangan Institut Pertanian Bogor Press. Bogor. 260 Hlm

Muis, A., C. Khairani., Sukarjo dan Y.P. Rahardja. 2008. Petunjuk Teknis Teknologi Pendukung Pengembangan Agribisnis Si Desa PAMI. Badan Penelitian. Balai Pengkajian Teknologi Pertanian. Sulawesi Tengah. Hal 44.

Rangkuti, J. H. 2011. Produksi dan kualitas susu kambing peranakan etawah (pe) pada kondisi tatalaksana yang berbeda.departemen ilmu produksi dan teknologi peternakan. Fakultas Peternakan. Jurnal Ilmiah. Institut Pertanian Bogor.Vol.3 :7-10.

Rarumangkay, J. 2002. Pengaruh Fermentasi Isi Rumen Sapi oleh Trichoderma viride terhadap Kandungan Serat Kasar dan Energi Metabolis pada Ayam Boiler. Program Pasca Sarjana, UNPAD, Bandung.

Satria, B. Dan Y. Ahda. 2008. Pengolahan Limbah Kulit Pisang Menjadi Pektin Dengan Metode Ekstraksi. Fakultas Teknik Universitas Dipenorogo. Semarang. hal 5-7.

Sudarmadji, S., B. Haryono dan Suhardi. 2010. Prosedur Analisa Untuk Bahan Makanan dan Pertanian. Liberty, Yogyakarta.

Salombre, V.J., M. Najoan, F.N. Sompie dan M.R. Imbar. 2018. Pengaruh penggunaan silase kulit pisang kepok (Musa paradisiaca formatypica) sebagai pengganti sebagian jagung terhadap karkas dan viscera broiler. J. Zootek, 38(1): 27–36

Suprihatin. 2010. Teknologi Fermentasi. Penerbit UNESA University Press

Supriyadi, Ahmad dan Suyanti Satuhu. 2008. Pisang, Budidaya, Pengolahan dan Prospek Pasar. Jakarta: Penebar Swadaya.

Susanti, Lina. 2006. Perbedaan Penggunaan Jenis Kulit Pisang Terhadap Kualitas Nata Dengan Membandingkan Kulit Pisang Raja Nangka, Ambon Kuning Dan Kepok Putih Sebagai Bahan Baku. Tugas Akhir. Semarang: UNNES.

Tandi, E. J. 2010. Pengaruh Tanin Terhadap Aktivitas Enzim Protease. Proseding Seminar Nasional Teknologi Peternakan dan Veteriner, Fakultas Peternakan Universitas Hasanuddin, Makasar. 567-570.

Yang. J. S, H. L,. Yuan, H. X. Wang and W. X Chen. 2005. Purification and Characterization of Lingnin Peroxidases from Penicillium decumbens P6. World Journal of Microbiology and Biotechnology 22 (4), 317-324.