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CHEMICAL COMPOSITION AND PREFERENCE LEVEL OF BUTANA FISH DENDENG PROCESSED BY SLICING AND GRINDING METHODS

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ABSTRACT

All types of fish can be used as raw materials for making dendeng, including Butana fish, which is less consumed by the public due to its sharp bones and fishy smell. Processing Butana fish into dendeng is an alternative to improve the flavor quality and product shelf life. Common dendeng processing methods involve slicing or grinding fish meat, seasoning, and drying. This study aimed to compare the acceptability and chemical composition of butana fish dendeng processed by slicing and ground methods. The dendeng was evaluated organoleptically by 15 panelists using a score sheet with a scale of 1-5 and then tested for chemical composition. The panelists' assessment showed that ground meat dendeng had the highest score. The chemical composition of Butana fish dendeng varied between sliced and ground meat. Sliced dendeng had higher protein (43.62%), ash (7.22%), fat (1.46%), and carbohydrate (14.95%) content compared to ground dendeng. The average moisture content of dendeng exceeded the requirements, but the protein content met the Indonesian National Standard (SNI) quality requirements.

Keywords: *fish, dendeng, chemical composition, preference level*

INTRODUCTION

Fish is a valuable source of animal protein, derived from both freshwater and marine environments, characterized by its high protein content and low fat levels. It is a protein-rich food that is easily digestible and contains essential amino acids that closely resemble the amino acid profile of the human body. In addition to being rich in protein, fish is also a good source of omega-3 fatty acids, vitamins, and minerals. Compared to other animal-based protein sources, fish is relatively affordable and widely accessible to communities. However, due to its high water content—ranging from 70% to 80% of its body weight—fish is highly perishable (Rahma et al., 2024). Therefore, proper handling and preservation methods are essential to maintain its quality and ensure its safety for consumption..

Acanthurus, commonly known as botana or butana, is a genus of marine fish belonging to the family *Acanthuridae*. These fish are typically found in tropical ocean waters, particularly around coral reef ecosystems. Members of the *Acanthuridae* family are characterized by a pair of sharp spines and a strong fishy odor, which has contributed to their lower popularity as a food source (Froese et al., 2016; note: citation validity should be confirmed). Nevertheless, when properly processed, these fish exhibit favorable taste and texture, along with high nutritional value, making them suitable for various culinary applications. Butana fish are rich in protein, vitamins, and minerals, all of which contribute to their potential health benefits. Due to their relatively low market price, they can serve as a valuable source of nutrition for local communities.

Processing butana fish through various methods such as the production of dendeng (a type of dried and seasoned fish) can enhance both their flavor and nutritional properties. Dendeng is a traditional Indonesian food product that represents a form of diversification of processed meat, fish, and livestock products (Ramadayanti et al., 2019). It is often referred to as “dry-cured meat,” typically characterized by low moisture content and high protein levels (Lorenzo et al.,

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2011). In Indonesia, fish-based dendeng is a popular product, commonly prepared by drying thin slices of cleaned fish. Butana fish dendeng can be served as a side dish or snack and is also suitable as a raw material for various culinary creations such as satay, curry, or as a topping for other dishes.

The processing of fish into dendeng offers several benefits, including extended shelf life, increased economic value, and improved food safety. Different processing methods have been employed to produce dendeng, resulting in variations in product quality. Dendeng can be made using either sliced or ground meat. The method of preparation and the composition of spices used significantly influence the final quality of the product. Suryanti (2010) investigated the characteristics of fish dendeng made from ground meat, finding that while it contained relatively low levels of protein and carbohydrates, it demonstrated enhanced physical properties such as tensile strength and elongation. The resulting dendeng had a yellowish-brown color, a characteristic spiced aroma and flavor, and a slightly chewy texture that was resistant to tearing.

There are notable differences in the organoleptic characteristics of dendeng processed using slicing and grinding methods. Husna et al. (2014) reported that ground fish dendeng exhibited a higher texture score in organoleptic evaluations compared to sliced dendeng. On the other hand, sliced dendeng was found to have lower moisture content and higher protein content than ground dendeng. The highest quality of Leubiem fish dendeng was obtained using the slicing method, incorporating white sugar and sun drying, resulting in a moisture content of 8.20%, protein content of 53.94%, acid-insoluble ash content of 0.36%, yield of 51.81%, and organoleptic scores of color (3.28, neutral), flavor (3.33, neutral), and texture (3.15, neutral). In contrast, Sukur (2018) reported that ground dendeng processed using a cabinet dryer had a moisture content of 13.71%, protein content of 30.32%, fat content of 4.58%, ash content of 6.27%, carbohydrate content of 9.27%, and organoleptic scores of texture (8.2), aroma (8.10), flavor (8.20), and color (8.3), all indicating high acceptability. This study aims to compare the acceptability and chemical composition of butana fish dendeng processed using slicing and grinding methods.

RESEARCH METHOD

Materials and Equipment

The main ingredient for making dendeng is fresh Butana fish. The spice ingredients include shallots, garlic, palm sugar, ginger, salt, coriander, galangal, turmeric, tamarind, and water. The equipment used for making dendeng includes knives, scales, plastic containers, meat grinder, mortar, stove, pot, plastic trays, bread trays, cutting boards, and gloves.

Methodology

The method used is experimental. The experiment involves making Butana fish dendeng using two treatments: slicing and grinding.

The procedure for making dendeng includes:

1. Material Preparation: Fresh Butana fish is washed with running water to remove dirt and impurities. The fish is then eviscerated (gutted, fins, bones, skin, tail, and gills removed) and washed again to remove blood, dirt, and mucus.
2. Sliced Dendeng Processing: The washed fish is split into two sides and cut into 4 pieces, then sliced into 3-5 mm thick pieces. The spice ingredients are prepared, including 33 g shallots, 14 g garlic, 175 g palm sugar, 10 g ginger, 20 g salt, 3 g coriander, 6 g galangal, and 18 g turmeric. The coriander is roasted and ground with other spices, then cooked with water according to the weight of the fish (ml). The sugar is added, and the mixture is cooked until the liquid is reduced to half. The liquid is then strained, and the sliced fish is marinated in the spice mixture for 12 hours at 0-5°C. The fish is then dried in an oven at 70°C.
3. Ground Dendeng Processing: For ground dendeng, the fish is ground using a meat grinder, and the same amount of spices as in the slicing method is added. The ground fish is

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marinated in the spice mixture, strained, and molded into 3-5 mm thick pieces. The dendeng is then dried in an oven at 70°C (Souwaine, 2018).

Analysis of Dendeng

The Butana fish dendeng processed using slicing and grinding methods was analyzed for its organoleptic properties and chemical composition (moisture content, protein, ash, fat, and carbohydrate). The organoleptic test of dendeng was conducted on its appearance, taste, color, odor, and texture using a hedonic test with 15 regular panelists. The test used a preference score sheet with a scale of 1-5 (5 = very like, 4 = like, 3 = neutral, 2 = dislike, 1 = very dislike). The organoleptic and chemical data were the average of 3 repetitions and standard deviation. The preference data were analyzed using the Friedman test, while the chemical data were analyzed using the T-test.

RESULTS AND DISCUSSION

The results of the hedonic test and chemical composition of Butana fish dendeng processed using the slicing and grinding methods are presented in **Table 1**.

Table 1. Evaluation of Preference Level and Chemical Composition of Sliced and Ground Butana Fish Dendeng

Test Parameter	Butana Fish Dendeng Sliced Method	Ground Method
Organoleptic :		
Colour	4,40[a]	4,46[a]
Appearance	4,40[a]	4,60[a]
Flavor	4,53[a]	4,73[a]
Odor	4,53[a]	4,80[a]
Texture	4,46[a]	4,80[a]
Total	22,32[a]	23,39[a]
Chemical (%) :		
Moisture content	21,81[a]	26,44[b]
Protein content	43,62[b]	29,05[a]
Ash content	7,22[b]	4,76[a]
Fat content	1,46 %[b]	0,44%[a]
Carbohydrat content	14,95[b]	9,81[a]

Note : Different level behind the number indicate significant differences.

1. Preference Test

The preference test of dendeng is essential for determining product acceptability. In addition, it can serve as an indicator of spoilage, physical damage, or quality deterioration. The results of the preference test for Butana fish dendeng, as presented in Table 1, show that panelists assigned a score of 4 (corresponding to the "like" criterion) across the organoleptic parameters. The ground dendeng received a higher total preference score (sum of mean scores), amounting to 23.29, compared to the sliced dendeng, which scored 22.32. For the ground dendeng, the parameters of color, appearance, taste, aroma, and texture all received higher scores than those of the sliced variant. These results indicate that the ground dendeng was more preferred overall than the sliced dendeng, as reflected by the higher total average score.

a. Appearance

Appearance refers to the visible characteristics of a product, including its shape, color, and size, which are important attributes for sensory evaluation. The appearance of Butana fish dendeng is typically characterized by a fillet-like shape and a brown coloration. Based on the Friedman test, there was no significant difference in the appearance between sliced and ground Butana fish dendeng (p-value > 0.05). The brown color observed in dendeng may result from the drying process or the addition of salt. High-temperature drying and extended drying time can

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lead to non-enzymatic browning reactions, such as the Maillard reaction and oxidation, which cause a darker brown coloration. A rapid darkening of dendeng may also occur due to excessive salt usage. The Maillard reaction involves a chemical interaction between reducing sugars and amino acids. According to Nugraha et al. (2021), the type of sugar used can influence the resulting color of dendeng. For instance, tilapia dendeng prepared with refined sugar tends to appear yellowish-brown, whereas the use of palm sugar results in a darker brown color.

Some amino acids are highly susceptible to the Maillard reaction, particularly when bound to reducing sugars. Reducing sugars are simple sugars that react with amino acids under specific humidity and temperature conditions. The Maillard reaction occurs at high temperatures, resulting in the formation of dark pigments. Factors influencing the Maillard reaction, aside from the presence of reducing sugars and amino acids, include reaction time, temperature, and pH. The Maillard reaction is most effective at temperatures around 300°F (149°C), producing a characteristic brown color. Prolonged drying time can trigger the Maillard reaction (Winarno, 2008). The Maillard reaction also depends on the moisture content during the reaction. Optimal Maillard reaction products are formed at moisture levels between 20-50% when heating amino acids such as cysteine and glutathione at temperatures around 180°C (Dedin et al., 2006).

b. Taste

The taste of Butana fish dendeng is characterized by its savory or umami flavor. Panelists expressed a preference for the taste of Butana fish dendeng, attributing their liking to this savory quality. The umami flavor is primarily derived from the glutamate content naturally present in fish, as well as from the specific composition of spices used in the preparation. The dominant taste profile of dendeng is savory, which is typical for fish-based products. The salty taste originates from the salt used and the drying process, while sweetness is contributed by added sugar or selected spices. Additional factors that influence the overall taste include its dry and slightly crunchy texture, distinctive aroma, and serving method.

According to Witono et al. (2017), fish contains L-glutamic acid—an amino acid responsible for the umami taste. Maisyaroh et al. (2018) reported that the addition of sugar significantly affects the flavor of dendeng. Based on the hedonic test, the taste scores for ground and sliced Butana fish dendeng were 4.74 and 4.54, respectively, both falling under the “like” category. Furthermore, the Friedman test results indicated no significant difference in the aroma of the dendeng samples. Nugraha et al. (2021) found that the flavor of tilapia fish dendeng is influenced by the sugar concentration used during processing, with a 25% sugar concentration being preferred over 20%. Overall, the flavor characteristics of dendeng can be influenced by factors such as the type of fish used, seasoning formulation, and the methods applied during processing, including drying and frying.

c. Texture

The typical texture of dendeng is dry, crunchy, and tender. The dry texture is a result of the drying process, while the crunchy and tender characteristics may be influenced by the type of fish used (Tarwendah, 2017). An ideal dendeng texture is one that is dry and crunchy, yet remains tender and soft, which enhances its palatability. The results of the Friedman test indicated no significant difference in texture between sliced and ground Butana fish dendeng (p-value > 0.05). The texture of dendeng can be influenced by various factors, including the type and composition of spices or seasonings used. In addition, moisture content plays a crucial role in determining texture. According to Fellow (2000), the texture of food products is directly influenced by their moisture content. A reduction in moisture during the drying process, along with the softening of collagen and the denaturation of proteins, contributes to the hardening of the texture commonly observed in dendeng products.

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2. Chemical Composition of Butana Fish Dendeng

a. Moisture Content

The analysis results showed that the moisture content of ground dendeng was higher than that of sliced dendeng. The T-test results indicated a significant difference in moisture content between sliced and ground dendeng (p-value 0.000 < 0.05). This difference suggests that the moisture content of dendeng varies depending on the processing method. Ground dendeng is likely to have a higher moisture content than sliced dendeng because the ground meat has a greater ability to absorb water. Drying dendeng at the same temperature and time can result in higher moisture content in dendeng with higher initial moisture content, as the evaporation process is slower. The moisture content of dendeng can vary depending on the type of fish, drying process, and use of additives such as sugar and salt. Generally, the moisture content of dendeng can range from 10-20% of the total weight of fish. The moisture content of dendeng is influenced by the temperature and duration of drying. Higher temperatures and longer drying times can reduce the moisture content of dendeng. The water lost during drying is primarily free water. Although the moisture content of sliced dendeng was lower than that of ground dendeng, neither method met the quality standard for moisture content (maximum 12%) (BSN, 2013). The moisture content of Butana fish dendeng was higher than that of other types of fish dendeng, such as tuna (14.42%) (Syahputra et al., 2018), catfish (12.56%) (Wijayanti et al., 2020), and milkfish (16.21%) (Sari et al., 2019).

High moisture content in dendeng can increase the risk of microbial growth, reduce shelf life, and elevate the potential for product spoilage. According to Kartika and Nisa (2015), moisture content decreases when dendeng is soaked in a sugar solution, as water becomes more tightly bound, especially in solutions with high sugar concentration. Both sugar and salt act as osmotic agents that facilitate the removal of water from food materials. Moisture content significantly influences the microbial stability of fish-based dendeng, including tilapia dendeng (Nugraha et al., 2021). Proteins containing hydrophilic groups are also associated with the water-binding capacity of food products, which can change depending on the processing temperature and physical properties of the protein. The moisture content of fish dendeng products varies depending on the type of fish used. For example, tuna dendeng typically has a moisture content of 14.42% (Syahputra et al., 2018), catfish dendeng contains 12.56% moisture (Wijayanti et al., 2020), and milkfish dendeng has a moisture content of approximately 16.21% (Sari et al., 2019).

b. Protein Content

According to Erfiza et al. (2018), the protein content of dendeng is generally high and comparable to that of fresh fish meat. Typically, fish contains between 14% and 20% protein based on its total weight. Fish protein is known to be easily digestible and contains essential amino acids that are vital for human health. Protein plays an important role in supporting the structural integrity and biological functions of the body at the cellular level.The results of the T-test showed a significant difference in protein content between sliced and ground Butana fish dendeng (p-value = 0.000 < 0.05). The protein content in dendeng can vary depending on several factors, such as the type of fish used, the drying technique, and the presence of additives. High protein levels in dendeng are often associated with lower moisture content; as moisture decreases, nutrient concentration, including protein, increases. The use of spices and the drying process can further enhance protein content in fish dendeng (Maisyaroh et al., 2018).During drying, water is removed from the product, leading to a concentration effect that increases the levels of protein, fat, and carbohydrates compared to the original fresh material (Nugraha et al., 2021). The higher protein content in sliced dendeng may be attributed to its intact meat sheet structure, in contrast to ground dendeng, which consists of minced or crushed meat. When dendeng is soaked in a spice solution, more protein tends to dissolve in ground meat compared to whole slices. Protein solubility depends on factors such as the type and composition of amino acids, the solvent used, and temperature. Proteins like albumin, globulin, prolamin, and glutelin are known to be highly soluble in water.

Protein solubility is the total amount of protein in a food material that dissolves in water under specific conditions. The presence of salt can increase protein solubility, particularly in

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dilute salt solutions. According to SNI 2908:2013, the minimum protein content standard for dendeng is 18%. The protein content of Butana fish dendeng meets the quality standard for dendeng, as it is higher than the minimum limit, and also compared to the protein content of tilapia fish dendeng in the study by Ramadayanti et al. (2019), which ranged from 39.48-41.94%, especially for sliced dendeng. The high protein content of fish dendeng is beneficial for improving nutritional quality, repairing body tissues, and increasing energy and stamina.

c. Ash Content

The ash content of fish dendeng can vary depending on the type of fish, drying process, and use of additives. The table shows that the ash content of sliced dendeng is higher than that of ground dendeng. The T-test results indicate that the ash content of sliced and ground dendeng differs significantly (p-value 0.000 < 0.05). The ash content of Butana fish dendeng is higher than that of other types of fish dendeng, such as tuna fish dendeng (3.32%) (Syahputra et al., 2018), catfish dendeng (2.56%) (Wijayanti et al., 2020), and milkfish dendeng (4.21%) (Sari et al., 2019). Ash content essentially represents mineral content, which is dominated by magnesium, phosphorus, iodine, fluorine, iron, copper, zinc, and selenium. However, the ash content of both sliced and ground dendeng methods does not meet the Indonesian National Standard (SNI) for dendeng, which specifies a maximum ash content of 1%. High ash content can affect product quality and safety, increasing the risk of heavy metal contamination or chronic diseases, and reducing nutritional quality.

d. Fat Content

The fat content of fish dendeng can vary depending on the type of fish, drying process, and use of additives or spices. The fat content of sliced Butana fish dendeng is higher than that of ground dendeng. The T-test results show a significant difference in fat content between sliced and ground dendeng. The fat content of fish dendeng can range from 10-30% of the total weight of dendeng. The fat content of Butana fish dendeng is lower than that of other types of fish dendeng, such as tuna fish dendeng (15.42%) (Syahputra et al., 2018), tilapia fish dendeng (12.56%) (Wijayanti et al., 2020), and milkfish dendeng (20.21%) (Sari et al., 2019). Fish generally contain fat ranging from 2-12% of the fish's weight, with a high composition of unsaturated fatty acids such as PUFA. Fish is a source of omega-3 unsaturated fatty acids, including linoleic acid, EPA, and DHA. Omega-3 is an essential fatty acid that cannot be produced by the body and must be obtained from food. Omega-3 is crucial for body health and is abundant in fish meat. High fat content in dendeng can affect product quality and safety, increasing the risk of oxidation and rancidity, chronic diseases if consumed excessively, and reducing product shelf life. There is no quality standard for fat and carbohydrate content in dendeng. Fish generally contain a small amount of carbohydrates, ranging from 1-3%, in the form of glycogen. The high protein, fat, and carbohydrate content of dendeng can provide energy for the body.

CONCLUSION

Butana fish dendeng processed using the slicing and grinding methods has organoleptic characteristics that are preferred by panelists. The organoleptic score of ground dendeng is higher than that of sliced dendeng. The chemical composition of sliced dendeng differs from that of ground dendeng. Sliced dendeng has a lower moisture content but higher protein, ash, fat, and carbohydrate content. The protein content of dendeng meets the Indonesian National Standard (SNI) quality requirements.

REFERENCES

Badan Standardisasi Indonesia. (2013). *Dendeng sapi. SNI 01-2908*. Jakarta (ID): Badan Standarisasi Nasional.

p-ISSN 2722-8258
e-ISSN 2722-8266

Dedin, F.R., Dedi fardiaz, Anton Apriyantono, Nuri Andarwulan. (2006). Isolasi dan karakterisasi melanoidin kecap manis dan peranannya sebagai antioksidan. *Jurnal Teknologi dan Industri Pangan*, *XVII*(3).

Erfiza NM, Hasni D, Syahrina U. (2018). Evaluasi nilai gizi masakan daging khas Aceh (sie reuboh) berdasarkan variasi penambahan lemak sapi dan cuka aren. *Jurnal Teknologi dan Industri Pertanian Indonesia, 10*(1), 28-35.

Froese, Rainer and Pauly Daniel. (2016). *Spesies of Acanthurus di Fishbase*, Versi Pctober. 2016.

Husna, N. E., Asmawati., dan Suwarjana, G. (2014). Dendeng ikan leubiem (Canthidermis maculatus) dengan variasi metode pembuatan, jenis gula, dan metode pengeringan. *Jurnal Teknologi*.

Kartika, P. N., dan Nisa, F. C. (2015). Studi pembuatan osmodehidrat buah nanas (Ananas comosus L. Merr): kajian konsentrasi gula dalam larutan osmosis dan lama perendaman. *Jurnal Pangan dan Agroindustri*, *3*(4), 1345-1355.

Lorenzo, J.M., L. Purrinos, S. Temperan, R. Bermudez, S. Tallon, and D. Franco. (2011). Psysicochemical and Nutritional composition of dry-cured duck breast poult. *Sci*, 90, 931-940.

Maisyaroh, U., Kurniawati, N., Iskandar dan Pratama, R. I. (2018). Pengaruh penggunaan jenis gula dan konsentrasi yang berbeda terhadap tingkat kesukaan dendeng ikan nila. *Jurnal Perikanan dan Kelautan*, *9*(2), 138-146.

Mutia, E. (2017). Pengaruh waktu perendaman dalam bumbu terhadap tingkat kesukaan dendeng ikan nilem. *Skripsi*. Program Studi Perikanan, Fakultas Perikanan dan Ilmu Kelautan Universitas Jatinangor

Nugraha, B. F., Sumardianto, Slamet Suharto, Fronthea Swastawati, Retno Ayu Kurniasih. (2021). Quality Analysis of Tilapia Jerky (Oreochromis niloticus) with The Addition of Various Types and Concentration of Sugar. *Jurnal Ilmu dan Teknologi Perikanan*, 3(2).

Rahma, A. A., Raden S. N, Almanda Meilani, Zunesha Puspa, Sarayono, Ajriani Dainita Pajrin. (2024). Ikan sebagai Sumber Protein Dan Gizi Berkualitas Tinggi bagi Kesehatan. *Karimah Tauhid*, 3(3).

Ramadayanti, R. A., Swastawati, F., dan Suharto, S. (2019). Profil asam amino dendeng giling ikan lele dumbo (Clarias gariepinus) dengan penambahan konsentrasi asap cair yang berbeda. *Jurnal Saintek Perikanan*, *14*(2), 136-140.

Sari, N. P., et al. (2019). Analisis Kualitas Dendeng Ikan Bandeng (Chanos chanos) dengan Metode Pengeringan yang Berbeda. *Jurnal Teknologi Pangan, 10*(2), 123-130.

Suryanti, Eriyanto H. E., Muljanah, I. 2010. Pengaruh pencucian daging lumat ikan patin siam terhadap karakteristik dendeng yang dihasilkan. *Jurnal pasca panen dan Bioteknologi Kelautan dan perikanan, 5*(1).

Syahputra, A., et al. (2018). Analisis Kualitas Dendeng Ikan Tongkol (Euthynnus affinis) dengan Metode Pengeringan yang Berbeda. *Jurnal Ilmu dan Teknologi Pangan, 7*(1), 45-52.

Tarwendah., dan Ivani P. 2017. Studi kompirasi atribut sensoris dan kesadaran merek produk pangan. *Jurnal Pangan dan Agroindustri, 5*(2), 66-73.

Wijayanti, N., et al. (2020). Analisis Kualitas Dendeng Ikan Lele (Clarias batrachus) dengan Metode Pengeringan yang Berbeda. *Jurnal Teknologi Pangan, 11*(1), 15-22.

Winarno, F. G. 2008. *Kimia Pangan dan Gizi*. Jakarta: PT. Gramedia.

Witono, Y., Windrati,W. S. I., dan Taruna, A. D. Masahid dan A. B. Dardiri. (2017). Profil flavor enhancer hasil hidrolisis enzimatis ikan bernilai ekonomi rendah dalam penggunaannya sebagai ingredient pada makanan. *Jurnal Agroteknologi, 11*(1), 69-81.