



Short Communication

Preliminary Research: Utilization of Gourami Fish Bone Flour (*Osphronemus gouramy*) in Making Calcium Dumplings

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Abstract

Gourami (*Osphronemus gouramy*) is a type of freshwater fish native to Indonesia that is widely preferred, and has high economic value so that production per year increases. Increasing the amount of fish production will result in an increased amount of fish bone waste. However, the processing of gourami in general is still limited to using the meat for frying, grilling, filling, and making shredded fish, while the fish bones are not widely used. Several studies have shown that fish bones that are made into flour contain high calcium. Food processing from fish bone flour can be used as an alternative to meet daily calcium intake. Several studies have started to use fish bone flour to become processed food with calcium such as baked donuts, starch balls, and biscuits, but there are still many other foods from the different regions that need to utilize the fish bone as one of their ingredients. The purpose of this study was to analyze the understanding of the community members, and newcomers in Purbalingga regarding the use of fish bone flour, and its processed products, calcium content, also to know their favorite snacks, and types of fish. The results of the survey analysis stated that it is necessary to use Gourami fish bone flour in making calcium dumplings and its resistance to oxygen

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1. Introduction

Gourami (*O. gouramy*) is a type of freshwater fish native to Indonesia which is cultivated in ponds. Gourami is one of the important economic commodities of cultivated fish which is known, and favored by the community because the meat has a delicious taste with a distinctive taste (Hardaningsih, 2018; Nugraha et al., 2020; Budi et al., 2015; Slembrouck et al., 2019). The delicious taste of gourami meat and its high nutritional content is very beneficial for growth and energy formation (Nugroho et al., 2014). In addition to being widely preferred, gourami, the price is relatively higher than other types of fish that are commonly marketed, therefore it has a high economic value (Nugroho, 2012). Based on data from the Directorate General of Aquaculture, Ministry of Marine Affairs, and Fisheries (2019), it was noted that the production of gourami from 2015-2019 showed an average increase of 24.75% per year. Increased production of gourami will result in an increased amount of bone waste.

The processing of gourami in general is still limited to using the meat for frying, grilling, filling, and making shredded fish, while the fish bones themselves are not widely used. One of the uses of gourami bones is the extraction of collagen from bones and scales (Tri-dhar, 2016). According to Amitha et al. (2019); Asikin et al. (2019) stated that to minimize environmental pollution, and fish bone waste, it can be done by using it as fish bone flour or a source of food calcium which can provide added value. Fish bones are the part that has the highest calcium content among fish body parts, because the main constituents of fish bones are a source of important minerals: sodium, calcium (5.63g/kg), phosphorus (2.38g/kg), and carbonate (Sinaga et al., 2018; Hemung, 2013; Stanek et al., 2013). When compared to mackerel fish bones, gourami bones have a higher calcium content (Amalina, 2019). Calcium compounds from fish bones have high bioavailability, so that they have the potential to be a natural source of calcium such as food, feed or supplements (Malde et al., 2010a; Boutin-guiza et al., 2012, Yin et al., 2016; Malde et al., 2010b).

The use of fish bone waste in food is made of flour containing calcium (Wardani et al., 2013). Several studies have shown that there is a high level of calcium contained in fish bone flour. Putranto et al. (2015) tested calcium levels using the protein hydrolysis method in belida fish bone flour (*Chitala* sp), the highest calcium was 30.93% with a yield of 27.77%. Marasabessy et al. (2018) tested the calcium content using the deproteinase method, the highest calcium was found in snapper flour at 29.42%. Angraini et al. (2019) tested calcium levels with an experimental method on catfish, catfish

and sembilang bone flour, obtained calcium of 51.3%, 65.9%, and 38.4%. This means that fish bones that are made into powdered flour can be used as food and calcium supplements to meet daily calcium needs (Bin et al., 2013; Jeyasanta et al., 2013). The recommended daily calcium requirement according to the Regulation of the Minister of Health of the Republic of Indonesia No. 28 of 2019 is 1,000 mg for adults over 25 years, and 1,200 mg after the age of 50, pregnant, and lactating women should consume +200 mg of calcium per day. The calcium needs of children, and adolescents increase according to age.

Food processed from fish bone flour can be used as an alternative to meet daily calcium intake. Bachtiar et al. (2019) utilized milkfish bone flour as a source of calcium, and phosphorus in making baked donuts. Susanto et al. (2019) have used tuna bone waste flour as a source of calcium to make starch balls. Akhmadi et al. (2019) have also used milkfish bone flour in making biscuits. From the three, it was found that the higher the concentration of fish bone flour given a high calcium content. Meanwhile, the level of preference for grilled donuts, starch balls, and biscuits depends on the concentration of adding fish bone flour. This means that in addition to being an alternative for the fulfillment of calcium, processed fish bone flour also has its own characteristics related to taste, color, aroma, and texture of donuts, starch balls, and biscuits. The concentration of adding fish bone flour needs to be considered so that the calcium content, and physical characteristics of the processed food do not decrease. Based on some of the descriptions above, other food processing that can take advantage of processed regional food are needed, for this purpose the purpose of this study is to analyze the understanding of the community and newcomers in Purbalingga regarding the use of fish bone flour and its processed products, calcium content, as well as snacks and types of fish that are popular.

2. Materials and Methods

2.1 Material

This research used the main ingredient in the form of gourami bones (*O. gouramy*) from head to tail obtained from the Purbalingga fish market.

2.2 Experimental design

This research was an initial stage of experimental research related to the use of gourami (*O. gouramy*) bone flour in making calcium dumplings in Purbalingga, Central Java. This preliminary research was conducted using a survey research method through an online google form questionnaire that was distributed to community members and newcomers in Purbalingga,

Central Java. The experimental research was carried out in three stages, namely the stage of making gourami fish bone flour, the stage of making dumplings with the addition of variations in the measurement of gourami fish bone flour, as well as the stages of testing calcium levels, and hedonic tests. The experimental research used experimental methods with two treatments (steamed and fresh), four variations in the concentration of gourami fish bone flour (0%, 10%, 15%, and 20%), and the repetition of each variation was carried out three times, along with several random selected panelists.

The stages of making gourami bone flour referred to the modified method (Susanto *et al.*, 2019). Gourami bones from the head, back to tail were washed clean from the remaining meat, and boiled for 45 minutes to remove fat. Furthermore, two treatments were carried out, namely the non-steaming method (fresh sample after boiling) and the steaming method (the sample after boiling was steamed for two hours). The next process, the fresh sample was cut into the segments of the fish bones. Fresh samples and steamed samples were then dried in the sun to dry, and the dried gourami bones were mashed in a blender or grounded until smooth. Furthermore, gourami bone flour was sieved using a sieve to obtain the desired flour.

2.3 Making gourami fish bone flour dumplings

The stages of making this gourami fish bone flour dumplings namely by refining the spices, mixing all the ingredients together with each varying the concentration of gourami fish bone flour, and stirring until blended. Next, heating the steamer, and adding the dumplings to be steamed, then steaming the dumplings for 20-25 minutes.

2.4 Calcium level test and hedonic test

The parameter to be observed was the calcium level test using AAS (Atomic Absorption Spectrophotometry) in the chemistry laboratory of Yogyakarta State University with the method used (Akhmadi *et al.*, 2019) by weighing 0.1 gram of gourami fish bone flour, and putting it in a Kjeldahl flask as much as 100 ml, and added 15 ml of HCL (hydrochloric acid), the solution was then digested until it was clear, and cooled. After chilling, the results of the digestion were filtered until the volume of the filter results was 100 ml, and ready to be measured at AAS with a wavelength of 420 nm. Hedonic test (level of preference for texture, color, taste, and aroma) through an assessment form.

2.5 Data Analysis

The results of calcium levels was analyzed as the method used (Susanto *et al.*, 2019) using the Standard Error of Mean (SEM) with the help of Microsoft Excel 2013, and the results of the hedonic test was described descriptively.

3. Results and Discussion

The results obtained from an online survey using google form which were distributed to residents, and newcomers in Purbalingga, Central Java regarding the use of gourami fish bone flour (*O. gouramy*) discussed the use of fish bone flour, and its processed products, calcium content, as well as snacks, and types of fish which was popular. The distribution for seven days obtained 150 respondents who filled out the questionnaire well. The results of the questionnaire analysis can be seen in Table 1.

Table 1 contains the results of the analysis regarding the understanding of the community members, and newcomers in Purbalingga regarding the use of fish bone flour, and its processed products. It could be seen that the use or processing of fish bone flour is still limited to the addition of animal feed, and food processing was still limited to process pempek. There was still little understanding of fish bones which could be used as calcium flour, whereas when viewed from the opinion that had tried food made from fish bone- flour, it was stated that it is savories and more delicious. Bachtiar *et al.* (2019) had used milkfish bone flour as a source of calcium, and phosphorus in making baked donuts, it was found that in addition to being an alternative for calcium fulfillment, the addition of milkfish bone flour also provided its own characteristics related to taste, color, aroma, and texture of the donuts. However, it was still necessary to pay attention to the concentration of adding fish bone flour, therefore it did not affect the physical characteristics of the food.

Edam (2016) conducted fortification of the piercing fish bone flour on its physical characteristics, it was found that it had an effect on reducing the bite test of fish balls., contains the results of an analysis of the understanding of community members, and new comers in Purbalingga regarding calcium content. It appeared that almost the majority of respondents already knew what calcium was even though they did not know how much calcium the body needs every day. The recommended daily calcium requirement according to the Regulation of the Minister of Health of the Republic of Indonesia No.28 of 2019 is 1000 mg for adults over 25 years, and 1,200 mg after the age of 50 years, pregnant, and lactating women should consume +200 mg of calcium per day and calcium needs for children and adolescents increased with age. Meanwhile, the daily calcium needs of most respondents had met so they know that fish flour also contains calcium. Calcium could be obtained from dairy products, cheese, supplements or products that were fortified with calcium (Miller *et al.*, 2013). According to the International Osteoporosis Foundation (2017) that aparted from milk, and its processed products, you could also obtain calcium from other foods such as green vegetables, nuts, tofu, salmon, sardines, and food and beverage products that had been fortified with calcium.

Table 1. Analysis of the understanding of citizens and migrants in Purbalingga regarding the use of fish bone flour and processed products.

No	Aspects to observe	Result
1	Food processing from fish flour	Of the 150 respondents, it was found that 14% or 21 respondents had tried to process food from fish flour and 86% or 129 other respondents had never done it.
2	Utilization or processing of fish bones	11.3% (17 respondents) of 150 respondents used or processed fish bones and 86.7% (133 respondents) had never used it. The average utilization or processing of fish bones that was carried out was as a craft, additional livestock feed, cat food, and fish cake processing.
3	Understanding of fish bones into calcium flour	The understanding of fish bones that could be used as calcium flour was still low, namely only 34.7% of respondents already knew, while the remaining 65.3% did not know.
4	Consumption of food made of fish bone flour	Consumption of food that came from added fish bone flour was still small, of the 150 respondents, only 24 respondents (16%) had tried it. The average response to food with the addition of fish bone flour was tastier and <u>savorier</u> .

Table 2. Analysis of the understanding of citizens, and newcomers in Purbalingga regarding calcium content

No	Aspects to observe	Result
1	Understanding of mineral samples that the body needs	Based on the survey results, 98% or it could be said that most of the 150 respondents understood that calcium was a mineral that the body needs.
2	An understanding of the amount of calcium the body needs	Respondents' understanding of the amount of calcium The body's needs were still low where 76.7% of 150 respondents did not know and only 23.3% do.
3	Understanding the diet required daily calcium	Of the 150 respondents, 103 respondents stated that they consumed foods containing calcium every day such as milk, fish and supplements. The rest, namely 47 respondents, did not consume it every day.
4	Understanding of fish flour contains calcium	Some of the respondents (54.7%) of the 150 respondents had understood that fish flour contained calcium and 45.3% or 68 respondents did not know.

Table 3. Analysis of snacks and fish species favored by residents and newcomers in Purbalingga

No	Aspects to observe	Result
1	Favorite snacks and why	The most popular snacks for residents and newcomers in Purbalingga were dumplings (35.3%), meatballs (21.3%), and batagor (11.3%). Most of the respondents stated that this favorite snack was delicious, tasty, and cheap.
2	Popular types of fish and their reasons	The types of fish most favored by residents and newcomers in Purbalingga are Grouper (44%), catfish (10%), and milkfish (9.3%). Most of the respondents stated that these popular types of fish was delicious, easy to process, and nutritious.

Table 3 contains the processed food and the type of fish that is preferred. It could be seen that respondents liked and often consumed processed dumplings, meatballs, and batagor because they were cheap, delicious, and tasty. Meanwhile, dumplings were the type of food processed most favored by residents, and newcomers in Purbalingga. Meanwhile, the fish preferred by some respondents was gourami because it was delicious, easy to process, and cheap. The three results of the online questionnaire analysis were related to each other. Prior to food processing, and the preferred type of fish to be used as variables in further research, it was necessary to know the respondents' understanding regarding the use of fish bone flour and its processed products, and calcium content. This was because further research was related to the use of fish bone flour in the process of calcium-rich foods.

4. Conclusion

The results of the survey and analysis regarding the understanding the use of fish bone flour, and its processed products, calcium content, as well as snacks, and types of fish favored concluded that it is necessary to process or use gourami bone flour in making calcium dumplings in Purbalingga, and how much oxygen resistance is needed, this is to help meet the daily amount of calcium through processed foods.

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Authors' Contributions

All authors have contributed to the final draft. The contributions of each writer are as follows, DLH compiles the text and conceptualized the main idea, MES helps collect data, TA corrects the article script, and J provides input and improvement.

Conflict of Interest

We declare that we have no competing interests.

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