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Quality and Halal Certification of Micro and Small Enterprises Fishery Products in Sidoarjo, East Java, Indonesia

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Abstract. Fish is a potential source of protein in supporting the nutritional adequacy of Indonesian people. Fish are obtained from cultivation and catching efforts. The research results in Sidoarjo showed that the source of raw materials is dominated by the cultivation (aquaculture) of the type of fish Bandeng marketed in fresh form. On the other hand, processed fishery products in micro and small enterprises are dominated by processing fish Bandeng into smoke products, presto, and otak-otak. This business option is done for capital reasons, ease of process and technology, marketing reach (demand and supply), and ability to fulfill market absorption. The National lockdown (PSBB) and Local lockdown (PPKM) conditions during the COVID-19 pandemic require that almost all activities be carried out from home; this impacts production activities in UMKM due to shaky raw material supply chains and limited market access and a decrease in people's purchasing power. So that micro and small enterprises a very significant reduction in production. Meanwhile, the condition of product quality is still far from standard. This encourages research concepts that allow micro and small enterprises to have awareness in improving product quality and conducting halal certification.

1. Introduction

The level of fish consumption in Indonesia which was evaluated from 2014 to 2018 reached 50.69 kg/capita/year [1]. The condition of consumption levels on the island of Java was in the low range reaching 36.37 kg/capita/year compared to the national consumption level. The government hopes that there will be improvements and an increase in fish feed consumption to 62.50 kg/capita/year in 2024 [2].

To meet the national fish consumption target, the source of fishery products can be produced from catching fish of 7.6 million tons and aquaculture products of 4.5 million tons. Catching and cultivating fish is an important source of raw materials in the business of processing fishery products, because Indonesia has a marine area of about 2/3 of the total area of the Indonesian state. Potential waters on land in the form of lakes, reservoirs and swamps, are potential freshwater fishing areas. Coastal areas, bays, fresh and brackish waters are potential areas for the development of aquaculture, ponds and floating nets.



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Fish is a potential source of protein in supporting the nutritional adequacy of the community. Nutritional adequacy is one of the most important things to support performance productivity and is an input in assessing public health status. Enrichment/diversity in food diets by adding animal and vegetable food sources will make nutrition varied and contribute to nutritional status [3]. Nutritional adequacy is a pattern of management of the balance of nutrients that the body needs from various food sources, so that it can produce good health conditions to support body growth for those who are in a period of growth and maintenance of body conditions in the maintenance period which have an impact on productivity and public health status and age life expectancy.

Managing nutritional adequacy for communities and individuals is still a problem in many countries, including in Indonesia, which causes undernutrition or overnutrition. Indriasari et al [4], reported that 9.4% of adolescents aged 16-18 years had underweight nutritional status, 5.7% were obese and 1.6% were obese. In developed countries such as the United States, about 16% of adolescents aged 6-19 years are included in the obese category.

In order to prepare Indonesia's golden generation which will be achieved in 2045, efforts must be made to provide the availability of adequate nutritional intake so that it will give birth to a healthy and intelligent generation. Stunting cases are still a problem in Indonesia, although efforts have been made to reduce it, but based on its achievement it is still at 27.67 percent in 2019. This achievement figure is still considered high, considering that WHO targets the stunting rate should not be more than 20 percent. Stunting is a shortage nutrition in infants in the first 1000 days of life. If this case occurs, and lasts a long time, it will cause inhibition of brain development and child development. Due to chronic malnutrition, stunting babies grow shorter than the standard height of toddlers for their age.

Stunting will result in slow growth and short stature. However, not all short stature is caused by stunting, because it can be caused by malnutrition which results in the emergence of diseases such as kwashiorkor, marasmus, anemia, goiter, vitamin deficiency. In addition to these diseases, cases of being overweight (obesity) are also a problem in Indonesia, where adolescents aged 13-15 years in Indonesia reach a percentage of 10.8% consisting of 8.3% overweight and 2.5% obesity [5]. Someone who has been overweight (obese) since childhood tends to have a higher risk of developing metabolic diseases [6].

Protein is a compound that is needed in the composition of the nutritional adequacy of food. Protein requirements are determined by gender and age. The protein the body needs for women is "on average" about 46 grams per day, and the average man needs about 56 grams per day. The daily protein needs of the Indonesian people can be seen based on the regulation of the Minister of Health number 28, 2019. This reference is used in order to prepare a generation that is well-nourished towards the golden generation of Indonesia 2045.

As a maritime country with an area reaching 2/3 is the sea and filled with potential inland waters in the form of rivers, lakes, reservoirs, swamps, Indonesia has the ability of natural resources to provide protein sourced from fish. However, the reality shows that the level of fish consumption in Indonesia is still low, especially in areas on the island of Java, which is an island inhabited by nearly 60% of Indonesia's population. This low consumption rate is one of the reasons because the consumption of eating fish is not yet a pattern of daily consumption habits. This is a problem to be able to change the pattern of daily food consumption. The movement to eat fish is a movement pattern that aims to change consumption patterns and fish eating habits.

Fish have very different characteristics from agricultural and livestock products, because the composition of fish is dominated by high water and protein content ranging from 14%-30%, and fish habitats in the waters are a potential source for the growth of microbes. Protein content in fish fresh is 16.0% [7]. In addition, among fish species there is diversity in protein content, such as milkfish containing 20% protein, goldfish 16%, eel 14%, shrimp 20% [8]. The characteristic condition of fish as perishable food requires treatment of handling speed after being caught by applying cold temperatures so that it can withstand the rate of quality decline, damage or spoilage.

In addition to quality, the products produced must meet the provisions in halal certification, because starting October 17, 2019, mandatory halal certification has been applied for products that enter,

circulate, and are traded in the territory of Indonesia. Products that must be certified halal are goods and/or services that include food, beverages, drugs, cosmetics, chemical products, biological products, genetically engineered products, as well as goods used, used, or utilized by the community. Government policy in the mandatory phase of halal certification, has classified food and beverages as a top priority that must be certified halal starting October 17, 2019 with a coaching period of 5 years as stated in Minister of Religion Regulation (PMA) number 26, 2019. While products outside of food and For drinks, halal certification is mandatory starting October 17, 2021 with a coaching period of 7 years, 10 years and 15 years depending on the type of product and the level of complexity and the critical point of halal. Meanwhile, biological products (including vaccines) and risk class D medical devices will be regulated in a separate presidential regulation.

This study aims to look at the current condition of the quality of processed fishery products carried out by micro and small businesses, because it is suspected that micro and small businesses have limitations in controlling the quality of processed products, and awareness in complying with the rules and achieving halal certification is still very low. This study also looks at field conditions based on secondary data confirmed in the field to see the real condition of micro and small businesses that are still alive as a result of the policy to control the spread of the Covid 19 virus through the policy of Large-Scale Social Restrictions (PSBB) and the Enforcement of Restrictions on Community Activities (PPKM). Attention to halal certification is an important part, because it is in accordance with Law 33 on Halal Product Guarantee in 2014 and Law 11 on Job Creation in the field of Halal Product Assurance (2020), as well as policies implemented for micro and small businesses to be able to fulfill halal certification and halal statements (Self-Declare).

2. Materials and methods

2.1. Materials and tools

This research was conducted by conducting direct interviews with micro and small business actors in the field. The decision to take respondents was based on secondary data from the Department of Marine and Fisheries of East Java Province (2018) by confirming and communicating directly with the Provincial Marine Fisheries Service. Based on the secondary data, field checks were carried out to obtain field conditions on business continuity, by looking at the impact of the implementation of the PSBB and PPKM policies and awareness in implementing halal certification standards. Business units that are still running are reviewed and interviews are carried out to arrange a traceability of halal in the product processing process and take the product as a sample for analysis in the laboratory on quality. Samples were taken, based on the most dominant type of processing, for further testing of sample quality at the Central Laboratory of Biological Sciences (LSIH), Universitas Brawijaya, Malang.

2.2. Research methods

The research design used exploratory research design. The data collected is primary data using survey methods and direct interviews with business actors assisted by enumerators. Meanwhile, the quality analysis was carried out at the Central Laboratory of Biological Sciences, Brawijaya University, Malang, where the samples obtained were taken directly from the business actors who were the object of the interview.

3. Results and discussion

3.1. Source of raw materials, types of processed products and distribution areas.

The processed fish is dominated by milkfish obtained from pond cultivation in Sidoarjo and surrounding areas such as Gersik, Lamongan and Pasuruan. Meanwhile, other types of fish such as catfish and mujaer fish are obtained from ponds around the processing business with a limited volume. Raw materials are obtained in fresh conditions which are intended for business processing into processed fish products. Fish are mostly processed into processed products including smoked/roasted milkfish, presto milkfish and brain milkfish.

The distribution of fish processing sites for micro, small and household businesses is spread out in the sub-districts of Tanggulangin, Sedati, Sidoarjo City, Tulangan, Sukodono with the dominance of processed food production sites in the district of Sidoarjo city. This concentration of processed production activities is mostly found in the district of Sidoarjo city on three types of smoked/roasted milkfish products, presto and otak otak on the grounds of ease of access to marketing and the large number of market demands both to meet direct consumer demand, traditional markets and outlets/shops by consumers.

3.2. *Reasons for Choosing Fish Processing Technology*

The selection of these three types of processed fishery products is based on the level of ease of processing technology. The convenience of this technology is controlled because it has been mastered for a long time from generation to generation, affordable production process capital/financing, speed in the capital/marketing turnover cycle, and market certainty. Business actors realize that these three types of processed products have a relatively short shelf life when placed at room temperature, with the fastest rate of quality deterioration being the brain milkfish brain product. While smoked/roasted milkfish has a relatively longer shelf life, followed by presto milkfish products.

Regarding the level of complexity of processing technology and the need for processing time, respondents stated that the processing of brain products requires higher skills and a longer processing time because it involves the addition of additives and auxiliary materials to create the desired taste, followed by the processing of smoked milkfish, presto milkfish and roasted milkfish. Each product has a strong sense of taste with the flavors most favored by consumers, respectively, for the processed products of the brain of milkfish otak-otak, smoked milkfish, roasted milkfish and presto milkfish. All products are produced based on orders with the frequency of orders experiencing a very sharp decline during the implementation of the PSBB and PPKM policies. This is due to a decrease in the number of buyers, a decrease in people's purchasing power, a limitation on community mobility, because most of the consumption of these processed products is purchased by immigrant communities (tourists) and the movement of people between cities.

Table 1. Business area and type of processed product.

No.	Sub-District	Village	Type of Processed Product
1.	Kota Sidoarjo	Pucanganom	Bandeng Presto Otak Otak Bandeng Asap/Panggang
		Bulu Sidokare	Bandeng Asap Otak Otak
2.	Tanggulangin	Penatarsewu	Bandeng Asap/Panggang
3.	Sedati	Segorotambak	Bandeng Asap duri Lunak Bandeng Asap/Panggang Tanpa Duri
4.	Tulangan	Kepatihan	Bandeng Presto
5.	Sukodono	Kebonagung	Bandeng Presto

3.3. *Processing technology capability level*

Respondents/Business actors have adopted improved processing technology due to consumer demands and the transfer of technology provided by extension workers. Smoke processing technology is carried out by adopting oven technology, but most of them still use traditional technology by smoking directly using mangrove wood, coir and coconut grafts. The technology of compounding additional ingredients in the manufacture of milkfish brain brain is carried out to meet consumer demands and the trend is to enrich the nutritional value of the product by adding it in the form of grated coconut and carrots. Almost all respondents said that milkfish otak-otak products are made when there is an order and the order is

less frequent than smoked and presto products. Brain milkfish is a product segment that has a higher level of exclusivity and price compared to smoked/grilled fish and presto.

Respondents also stated that the milkfish otak-otak produced by respondents followed procedures, production lines and seasonings that had a high level of uniformity between one processor and another. The difference found is only a small variation due to customer demand.

3.4. Types of raw materials for processed fish products

The results of the analysis in the field show that the raw materials processed are mostly milkfish, on the grounds that milkfish is easy to obtain in large quantities because it is the result of aquaculture in milkfish ponds, so that micro and small business actors are easy to anticipate if there is a surge in demand. Meanwhile, other types of fish such as Catfish and Mujaer are available in limited quantities because they are cultivated in household size ponds.

The most processed types are in the form of smoked/roasted milkfish, presto milkfish and otak otak. The reason for choosing this product is based on two basic considerations, namely because of market demand, and the simple and fast processing process so that it places more smoked/grilled preparations compared to presto and otak otak milkfish preparations. The entire process chain uses auxiliary materials and additives that meet food grade standards. The use of smoke in smoking is also carried out using traditional smoke processing technology using smoke-producing materials such as mangrove wood, shells and coconut husks and processed in a smoking furnace directly. Processors prefer to process smoked and grilled fish because of the fast market absorption and consumer demand so that capital turnover and profits can be obtained quickly.

The condition of the PSBB and PPKM policies was felt directly by these micro and small business actors, with shrinking orders, declining consumer demand as a result of the declining purchasing power of the people, the reduced number of consumers as a result of restrictions on the movement of people's activities.

3.5. Attitudes of business actors in determining processed products

The ability of business actors to adopt technology is considered in this study. Technology adoption is obtained from the basic knowledge previously possessed and participating in training conducted by the relevant agencies. Technological improvements are made based on input from consumer desires and trends in the community that are obtained based on direct information from consumers or extension workers. Based on their own capabilities and seeing business opportunities and market access, these activities are carried out by making decisions based on their own awareness.

Micro and small businesses are indeed not a form of business that already has a stable management system, usually carried out in a family environment with limited capital and limited market access. The representation of respondents in taking business opportunities is based on their own ability to process products, simple technology, consumer/market demand, availability of capital and availability of raw materials.

Perceptions of compliance with applicable quality and standards, as well as halal certification as part of the processing process are not yet considered important considerations, because most consumers accept the product as it is with taste perception being the main consideration. Consumers also consider that fish is a halal product, so processed fish products are not a strategic thing to be demanded for halalness. This understanding must be carried out by raising awareness to producers and consumers on aspects of food quality and safety, as well as halal certification. Manufacturers and consumers do not know and realize that halal certification is a mandatory thing to do in accordance with the orders of the halal product guarantee law number 33 of 2014 article 4 [9] and work copyright law number 11 of 2020 in the field of halal product guarantees [10].

3.6. Results of processed fish quality analysis

The quality of processed fishery products is closely related to safety, health in the context of consumer protection. The processing process sometimes reduces a number of nutrients needed by the body, so that

it is not sufficient for the body's needs, and can even cause no use at all even though the appearance is organoleptically attractive and supported by a stimulating aroma to consume as occurs in the junk food group. Improper processing techniques, such as the application of temperature is a critical point for the degradation of nutrients that are susceptible to certain temperatures. The addition of auxiliary materials and other additives can cause the processed food to be harmful or not useful for fulfilling the body's nutrition.

The results of the laboratory analysis of the samples collected from the micro and small fishery business processing unit are shown in the table below:

Table 2. Proximate test results of processed milkfish samples from Sidoarjo.

Sample Code	Test Parameters (%)				
	Protein Content	Fat Content	Water Content	Ash Content	Carbohydrate (by different)
P-SDA-MTL	30.31	16.46	48.00	4.32	0.91
P-TLG-WYN	25.30	13.61	43.56	5.67	11.86
A-TGI-MWR	26.82	3.70	65.63	2.52	1.33
A-SDT-TWL	26.31	4.32	58.36	2.58	8.43
O-SDA-JLL	21.14	10.32	56.50	2.82	9.22
O-SDA-MTL	10.18	13.16	56.50	4.29	15.87

Product Description: P = Presto; A = Smoked; O = Otak Otak

Sampling Area Description : TLG = Tulangan; SDA = Sidoarjo; TGI = Tanggung Angin; SDT = Sedati.

Table 3. TPC & E-Coli test results for milkfish processed samples from Sidoarjo.

Sample Code	Test Parameter	
	Total Plate Count (TPC) (Cfu/g)	<i>Escherichia coli</i> (MPN/g)
P-SDA-MTL	5.4×10^4	1.70
P-TLG-WYN	5.9×10^3	< 0.18
A-TGI-MWR	$< 25 \times 10^1$	< 0.18
A-SDT-TWL	< 10	0.68
O-SDA-JLL	1.3×10^4	< 0.18
O-SDA-MTL	4.8×10^4	< 0.18

Sampling is based on the level of uniformity/similarity of process technology and processing methods and the dominance of the place of processing activities. Processed milkfish products (P) were taken from the districts of Sidoarjo (SDA) and Tulangan (TLG); processed smoked fish (A), samples were taken from Tanggulangin (TGI) and Sedati (SDT) sub-districts; while the samples of processed brain milkfish (O) were taken from the district of Sidoarjo city (SDA).

The results of the laboratory analysis of protein content showed that there was a difference in the processed milkfish with pressure. This is due to the different processing techniques for temperature and

processing time, thus causing differences in the protein content of the product. The protein content in processed smoked fish shows similarities. This shows that the processing techniques, especially the application of temperature and the length of the smoking process are almost the same. The application of the developed oven technology has an impact on the uniformity of the results, even though the samples are collected from different sub-districts. There is a very significant difference in the protein content in the processed milkfish brain, this is due to the different formulations for dissolving additional ingredients and different seasonings following market demand and the prices charged.

The influence of processing technology, especially temperature control and additives used as a whole, is a critical point found so that it distinguishes the quality of processed products from one processor to another. This effect can be seen in the results of the analysis of fat content, water content, ash content and carbohydrates.

The results of the analysis of the microbial content in the final product showed varied conditions. It depends on the type of product produced, the method of processing, the use of additives and packaging techniques. All processed products are still packaged using plastic in a simple way (not with vacuum packaging technology). *Escherichia coli* as one of the indicator bacteria of sanitation and hygiene conditions was found in presto (P) and hardly found in other processed products. Overall that raw materials are handled, cleaned in the right way.

From the overall results when compared with the provisions of SNI 2717:2017 [10] as the Indonesian national standard for processed smoked fish products are: maximum water content of 60%; maximum fat content is 20%. The results of sample analysis showed that the processed products of micro and small business actors from TGI (moisture content: 65.63%; fat: 3.70%), still did not meet the requirements for water content, while SDT (water content: 58.36; fat: 4.32%) have complied with SNI.

Microorganism content based on SNI with the Most Probably Number (MPN) for maximum *E. coli* contamination < 3 MPN/g, and a maximum Total Plate Count (TPC) of 5.0×10^4 colonies/g. The results of the analysis showed that processed smoked milkfish from Tanggul Angin (TGI) sub-district showed CFU results: < 25×10^1 (cfu/g); *E. coli*: < 0.18 MPN/g; while the sub-district of Sedati (SDT), showed CFU results: < 10 (cfu/g); *E. coli*: < 0.68 MPN/g. Based on the results of the analysis, it is shown that the processed smoked milkfish products in these two sub-districts have met the national standards (SNI) and show that business actors have implemented sanitation and hygiene standards well.

The results of the processed of milkfish otak otak when compared with the provisions of SNI 7757: 2013 [12] as the Indonesian national standard for processed fish brain fish (O) products are: maximum water content of 60.0%; maximum ash content of 2.0%; minimum protein content of 5.0% and maximum fat content of 16%. The results of sample analysis showed that the processed products of micro and small business actors from Sidoarjo (SDA-JLL) (moisture content: 56.50%; ash content 2.82%, protein content 21.14% fat: 10.32%), had met SNI requirements, while Sidoarjo (SDA-MTL): water content: 56.50%; ash content 4.29%; protein content 10.18%; fat: 13.16%, most of them meet the standard, only the ash content exceeds SNI.

Microorganism content based on SNI with the Most Probably Number (MPN) for maximum *E. coli* contamination < 3 MPN/g, and a maximum Total Plate Count (TPC) of 5.0×10^4 colonies/g. The results of the analysis showed that processed smoked milkfish from the district of Sidoarjo City (SDA-JLL) showed CFU results: 1.3×10^4 (cfu/g); *E. coli*: < 0.18 MPN/g; while the sub-district of Sidoarjo City (SDA-MTL), showed CFU results: $4.8 < 10^4$ (cfu/g); *E. coli*: < 0.18 MPN/g. Based on the results of the analysis, it shows that the processed product of the milkfish otak otak in the district of Sidoarjo city has met the national standard (SNI) and shows that business actors have implemented sanitation and hygiene standards well.

The processed milkfish presto is based on a field review using fresh milkfish. Furthermore, the evaluation of the results when compared with the standard, stated that the content of microorganisms based on SNI with the Most Probably Number (MPN) for maximum *E. coli* contamination < 3 APM/g, and a maximum Total Plate Count (TPC) of 5.0×10^5 colonies/g. The results of the analysis showed that the processed milkfish presto from the district of Sidoarjo City (SDA-MTL) showed CFU results: 5.4×10^4 (cfu/g); *E. coli*: 1.70 MPN/g; while the district of Tulangan (TLG-WYN), showed the results

of CFU: $5.9 < 103$ (cfu/g); E. coli: < 0.18 MPN/g . Based on the results of the analysis, it shows that the processed product of the milkfish brain in the district of Sidoarjo city has met the national standard (SNI) and shows that business actors have implemented sanitation and hygiene standards properly.

4. Conclusion

Processors have paid attention to product quality, but the methods and technology used still need to increase knowledge and skills. The role of field extension workers is very important in providing guidance to business actors. Processing technology that needs to be improved includes packaging technology after the product is produced and preservation technology. Processors' knowledge of formal rules is still limited and needs guidance to understand the rules and how to implement them, especially regarding the obligation of halal certification which is based on tracing all stages of the production process. The PSBB and PPKM policies have a very real effect on the decrease in the number of micro and small businesses processed fishery products, the number of consumers decreases and has implications for the decrease in the number of orders and business continuity.

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