

The Study on the Production of Tilapia Patty

Nur Aina Lyana binti Mohamad Ali^{1*}, Erliana binti Mohamad², Noor Ain binti And Hamid²

¹Department of Agrotechnology and Bio-Industry, Politeknik Jeli Kelantan, Jalan Raya Timur Barat, 17600 Jeli, Kelantan

²Kolej Komuniti Bandar Baharu, No. 1, Jalan Syariah, 34590 Bandar Baharu, Kedah

*Corresponding author E-mail: aina@pjk.edu.my

Abstract

This study focuses on the production of meat patty slices product from tilapia fish. The problem regarding the meat supply in the market relates to its cleanliness and safety as well as halal status and the limited number of processed products based on tilapia fish. This project aims to produce fish patty developed from the popular freshwater species, tilapia. The research methodology consists of three phases: the development and production phase of the fish patty product, the respondent's acceptance study phase, and the laboratory analysis phase. In the first phase, the production of the product involves the process of preparing fish fillet from tilapia fish, then blended, steamed, shaped and stored in an airtight container at a temperature of - 20 degrees Celsius. In the second phase, the set of questionnaires were distributed randomly to 100 respondents among the staff and students of the Politeknik Jeli Kelantan to determine the level of acceptance for the fish patty produced. Tilapia fish patty was successfully produced, the product acceptance test carried out on 100 respondents showed that a min score of 4.3, 4.2 and 4.3 were obtained for taste, smell and marketability. The protein, carbohydrate, energy and fat content were 16.8 g, 2.2 g and 102 kcal and 2.9 g respectively. Aside from being fried, this tilapia fish patty can be consumed with burgers, sandwiches, soups, and other foods. This product is expected to offer good market potential as well as supporting TVET learning, which teaches students and communities how to turn surplus fish into commercially valuable foods.

Key Words: *Tilapia; aquaculture; TVET; patty; food*

1.0 Introduction

The global demand for sustainable and nutritious protein sources has led to increased interest in aquaculture products, particularly tilapia, one of the most farmed and consumed fish species worldwide. Tilapia is valued for its mild taste, high protein content, low fat levels, and affordability, making it an excellent candidate for value-added processed foods. Fish patties represent a convenient and versatile product that can cater to modern consumers seeking healthy, ready-to-cook meal options. This study explores the production of tilapia patties, focusing on optimizing formulation, processing techniques, sensory quality, and nutritional value to develop a product that meets consumer expectations while maximizing the utilization of farmed tilapia.

Tilapia is a highly nutritious and widely available fish, yet its utilization remains largely limited to fresh or frozen fillets, with minimal value-added processing. Despite the growing demand for convenient, healthy, and sustainable protein sources, there is a lack of diversified tilapia-based products in the market, particularly ready-to-cook options like fish patties. Current fish patty products often rely on high-fat additives, artificial binders, or excessive fillers, which compromise nutritional quality and sensory appeal. Additionally, inconsistent texture, poor binding, and rapid spoilage are common challenges in fish patty production, leading to consumer dissatisfaction and reduced market potential.

Despite their economic importance, consumer acceptance of tilapia remains limited due to persistent concerns regarding palatability, specifically, the presence of muddy and earthy off-flavors and unpleasant odors in the flesh. These undesirable sensory attributes are commonly linked to geosmin and 2-methylisoborneol (MIB), compounds produced by certain algae and bacteria in aquaculture ponds (Tan et al., 2021). Such off-flavors significantly affect consumer perception, reducing purchase intent and long-term consumption patterns. As Malaysia promotes increased tilapia production to meet protein demands, the mismatch between production and this consumer preference becomes a pressing challenge. Furthermore, limited

awareness and inconsistent mitigation strategies among farmers to cater the problems had exacerbated the issue. Addressing the causes of poor palatability and improving the sensory quality of tilapia are essential to enhance consumer confidence, market competitiveness, and the sustainability of the freshwater fish sector in Malaysia. Processed products like fish patties can reduce this stigma and make tilapia more acceptable among consumers.

Fish patties also can be an innovative way to enhance the marketability of tilapia, particularly in regions where processed seafood products are gaining popularity. Unlike whole fish or fillets, patties offer extended shelf life, ease of preparation, and the potential for flavor customization. However, producing high-quality tilapia patties require careful consideration of factors such as ingredient selection, cooking methods, and preservation techniques.

In Malaysia's market, fish meat is a vital source of protein and a staple in the daily diet of many consumers, especially within the Muslim majority population. However, growing concerns have emerged regarding the cleanliness, nutritional quality, and halal integrity of fish available in the market. Although fish is inherently halal, lapses in hygienic handling, processing, and storage can compromise its cleanliness and raise questions about its compliance with halal standards (Mohd Azmi et al., 2020). Additionally, intensive aquaculture practices and the use of additives have led to doubts about the nutritional value and safety of fish products (Zulkifli & Norazmir, 2019). Therefore, the production of this tilapia patty with limited ingredients and additives can eliminate the qualms among consumers.

The study investigates the effects of formulation used including the ratio of fish meat to other ingredients, including the incorporation of herbs and spices, on the texture, taste, and overall acceptability of the patties. Additionally, this study examines the impact of cooking methods on product quality and nutritional retention.

Another critical aspect of this study is assessing the nutritional profile of tilapia patties, particularly their energy, carbohydrate, protein and fat content, to ensure they serve as a healthy alternative to traditional meat-based patties. Consumer acceptability tests were also conducted to evaluate sensory attributes such as appearance, flavor, texture, and aroma, ensuring the final product aligns with market preferences. Furthermore, the study explores packaging and storage conditions to enhance shelf life without compromising quality.

This study holds substantial importance for the food industry, aquaculture sector, health-conscious consumers, and the broader economy by addressing key challenges in tilapia utilization and processed seafood production. Developing tilapia patties introduces a convenient, value-added product that can expand market opportunities, reduce post-harvest losses, and increase profitability for fish farmers and processors. Besides, it can encourage efficient resource use, enhances the economic viability of tilapia farming, benefiting small-scale producers and commercial fisheries alike. Tilapia is a lean, high-protein, and low-fat fish rich in essential nutrients. This study ensures that the patty formulation retains these nutritional benefits while offering a healthier alternative to traditional meat patties, which are often higher in saturated fats.

With the growing demand for ready-to-cook and easy-to-prepare foods, tilapia patties cater to busy consumers seeking nutritious, quick meal solutions. Therefore, this study evaluates sensory acceptability, ensuring the product meets taste and texture preferences of the community, hence increasing its market potential.

Processing tilapia into patties allows the use of underutilized cuts and trimmings, reducing waste in fish processing plants. This contributes to a more sustainable food system by maximizing resource efficiency. By optimizing the production process, this study can

contribute to the diversification of tilapia-based products, supporting food security, reducing post-harvest losses, and promoting sustainable aquaculture practices. The findings will benefit food processors, fisheries, and health-conscious consumers, offering a nutritious, convenient, and economically viable seafood product. Ultimately, this study seeks to expand the utilization of tilapia in the food industry while meeting the growing demand for functional and value-added seafood products.

This research aims to develop a high-quality, nutritious, and market-ready tilapia patty that can meet consumer demands, reduce post-harvest losses, and promote the sustainable use of tilapia in processed seafood products. The findings hopefully will provide valuable insights for food technologists, aquaculture industries, and small-scale processors seeking to innovate in the seafood product market.

2.0 Materials and Methods

The method in this study involves three main parts, firstly the tilapia patty production phase, followed by the questionnaire distribution phase to obtain feedback on the respondents' acceptance of the texture and taste of the product, and the laboratory analysis test phase to determine the nutrient content in the product produced.

2.1 Product development

The production of Tilapia patty begins with sampling fresh tilapia and ends with the packaging and storage as shown in Figure 1.

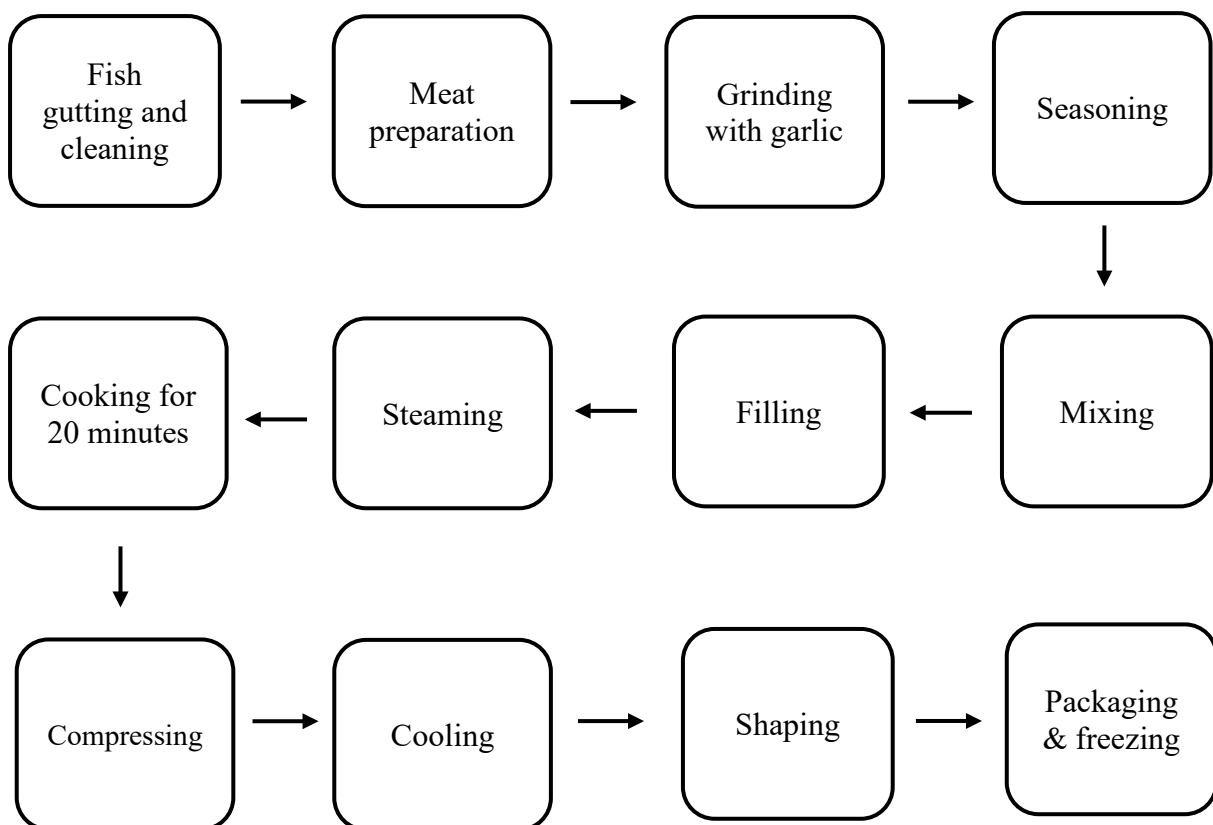


Figure 1: Flowchart of the tilapia patty preparation

The tilapia fish were collected freshly from the pond. The fish were first gutted to remove all the internal organs. It is then carefully cleaned under running water to eliminate excessive blood, scales and other impurities. The gutted fish were then soaked in lime water and ice cube for 30 minutes to remove any muddy smells and kept the flesh as fresh as possible. After that, the cleaned fish meats were separated from the bones and skin. Undesirable matters such as fin were trimmed off to improve texture and quality.

The prepared fish meat was ground along with the peeled garlic cloves until a smooth, uniform mixture was produced. The use of garlic could enhance the aroma of fish meat. After that, the seasonings were added to the ground fish mixture. The salt, sugar and seasoning powder as well as black pepper powder were added in the mixture until the desired taste was obtained. The mixture was thoroughly mixed to ensure even distribution of seasoning in the fish paste. The seasoned mixture was transferred to a mixer and blended until a consistent, homogenous mixture was achieved. The sticky paste then was filled into the aluminium foil and spread evenly to about 1 cm thickness into the cake tin. Even thickness is important to ensure even cooking. Uneven, cooked may lead to quick food spoilage.

The shaped patties are arranged on trays and steamed at the appropriate temperature (70 °C) until fully cooked for about 20 minutes. Through steaming, moisture and nutrient preservation can be achieved. After the steaming process was done, the steamed patties were taken out from the steamer. The patties were lightly compressed to improve the density of the patties structure, so that it would not easily crack during handling, packaging or storing.

The compressed patties were allowed to cool to room temperature in a well-ventilated area for about 30 minutes before kept in refrigerator for 1 hour. This process allowed slow cooling which helps prevent the sudden temperature changes that could affect texture or structure as well as to avoid cracking or collapsing structure due to thermal shock. This slow cooling method follows the regulatory guidelines (e.g., FDA, USDA) that often specify that foods must be cooled from 60°C to 21°C (140°F to 70°F) within 2 hours, and from 21°C to 5°C (70°F to 41°F) within the next 4 hours to remain safe. After the cooling period, the fish patties were cut into desirable size (square). Finally, the fish patties were packed in the airtight container and stored in – 4 °C until consumption.

2.2 Consumer's acceptance study

The questionnaire consists of two parts, with 15 questions being developed overall. Part A consists of five demographic questions for the respondents and part B consists of ten questions regarding the fish patty products (physical, sensory, acceptance) in 5-point Likert scale form. The questionnaire was then distributed to 100 of respondents among students, staff, contract workers and cafe workers. The respondents were presented with the sample frozen fish patty, together with samples (tester) of fish patty products to be tasted. The data was analyzed using descriptive mean analysis which is mean score average.

2.3 Nutritional composition

Nutrient analysis test was conducted to determine the nutritional composition of food products. In this study, the analysis was performed on tilapia fish parties to assess their value as a healthy alternative protein source. 200 gram of tilapia patty were packed in container and placed in the Styrofoam box together with the ice pack to maintain the temperature below 4 degree Celcius. After that, the box was transported to the laboratory for nutrient analysis. The nutrient contents such as energy, carbohydrate, protein, fat, sodium and sugar were determined using standard laboratory methods by outsourcing the samples to the established analytical laboratory, Kedah BioResources Corporation Sdn. Bhd. (KBioCorp).

3.0 Results and Discussions

3.1 Tilapia patty product

The tilapia patty was successfully developed using fresh tilapia fillets combined with selected spices and seasonings, then processed through steaming and molding before being packed and stored. The final product demonstrated good shape retention, appealing color, and firm texture. The addition of garlic and pepper enhanced the aroma, helping to reduce the typical muddy odor that is often associated with freshwater species such as tilapia (Tan et al., 2021). This tilapia patty can be freshly included in any kind of food. It can be freshly cooked with vegetables, in soup, as salad, or can be lightly fried and be eaten with sandwiches, porridge, fried rice, parathas and so on.

3.2 Consumer acceptance study

A total of 100 respondents participated in the sensory evaluation using a 5 point Likert scale (1 = strongly disagree, 5 = strongly agree), following the standard practice for consumer acceptance testing (Stone et al., 2012). The evaluation covered taste, aroma, texture, and overall acceptance.

Table 1: Mean scores of questionnaires main attributes

Attribute	Mean score	Interpretation
Texture	4.0	Agree
Smell	4.2	Agree
Taste	4.3	Agree
Appearance	3.9	Neutral
Commercial potential	4.3	Agree
Overall acceptance	4.5	Agree

The sensory evaluation of the tilapia fish patty revealed generally positive responses from the participants, as shown by the mean scores for various key attributes. The highest mean score was recorded for overall acceptance ($M = 4.5$), indicating that most respondents found the product satisfactory and enjoyable. This suggests strong potential for consumer approval if the product is introduced onto the market. The acceptance score also supports the product's market readiness and aligns with consumer trends favoring healthy, ready-to-cook foods (Marimuthu et al., 2022).

Commercial potential also received a relatively high score ($M = 4.3$), reflecting the participants' perception that the product could perform well in a commercial setting. This aligns with studies highlighting the growing consumer interest in convenient, protein-rich seafood products.

Taste ($M = 4.3$) and smell ($M = 4.2$) were also positively rated, indicating that the product meets sensory expectations in terms of flavor and aroma. These attributes are critical for consumer acceptance, and their favorable ratings reinforce the suitability of the tilapia patty as a palatable food product (Rodriguez et al., 2022). The slightly lower texture score ($M = 4.0$) may relate to soft consistency due to the steaming process, which can be improved through binder optimization.

Appearance received the lowest mean score ($M = 3.9$), interpreted as neutral. This indicates that the visual appeal of the tilapia patty may not have met consumer expectations and could be a potential area for improvement. Enhancing product color, shape, or packaging presentation could help boost this score in future evaluations.

3.3 Nutritional composition

The nutritional composition of the tilapia patty per 100 gram samples were shown in Table 2.

Table 2: The nutritional composition of tilapia patty

Parameter	Result (per 100g)
Energy	102 kcal
Carbohydrate	2.2 g
Protein	16.8 g
Fat	2.9 g
Total sugar	7.2 g
Sodium	576.0 g

The energy value of 102 kcal per 100g suggests that the patty is a low-calorie food product, making it suitable for consumers seeking healthier meal options. This aligns with recommendations by the Malaysian Dietary Guidelines (MOH, 2020), which encourage the consumption of nutrient-dense, low-energy foods as part of a balanced diet.

The protein content is relatively high at 16.8 g, indicating that the tilapia patty is a good source of high-quality protein. Protein is essential for body tissue repair, immune function, and muscle maintenance. Compared to other common protein sources such as chicken nuggets or beef patties, which typically range between 12–15 g of protein per 100g, the tilapia patty demonstrates competitive nutritional value (USDA, 2023).

The fat content is low at 2.9 g per 100g, suggesting that the patty is a lean product. This is beneficial for consumers who are managing fat intake, particularly saturated fats, which are often linked to heart disease when consumed in excess. The low-fat content is consistent with the nature of tilapia as a lean white fish (Zhou et al., 2019).

In terms of carbohydrates, the product contains only 2.2 g per 100g, making it a low-carb option suitable for those on carbohydrate-controlled diets. However, total sugar content was recorded at 7.2 g, which appears relatively high compared to the carbohydrate content. The use of sugar, however, can act as preservative in processed food.

The sodium content was 576 mg per 100g, which is considered moderately high. Excessive sodium intake is associated with increased risk of hypertension and cardiovascular disease. Therefore, while the patty offers nutritional benefits, sodium levels should be considered, especially for individuals following low-sodium diets. Reformulation strategies may be considered to reduce sodium content without compromising taste and shelf life. It can be suggested that the combined food with tilapia patty may consider reducing the salt content.

3.4 Market and practical implications

Given its convenience, positive consumer acceptance and good nutritional value, the tilapia patty product demonstrates strong potential for commercialization, especially in school cafeterias, institutional catering, and frozen food markets. Furthermore, this project supports TVET-based learning by involving students in practical, real-world product development using locally available fish resources (Nor Suhanna et al., 2024) from freshwater aquaculture farms.

The findings of this study can empower small and medium enterprises (SMEs) in developing countries to enter the value-added seafood market, creating jobs and boosting local economies. This study also provides baseline data insights into optimal processing

techniques, ingredient formulations, and preservation methods for fish-based patties, contributing to advancements in food science and technology.

4.0 Conclusion

The tilapia patty product gained interest among the respondents in this study especially for the taste and market potential ($M = 4.3$). Additionally, the protein content (16.8 g per 100 g patty) enhances the patty's market value. In conclusion, this study not only enhances the commercial value of tilapia but also supports food security, sustainability, and public health by introducing a nutritious, convenient, and economically viable seafood product. The outcomes can benefit TVET practitioners, stakeholders across the supply chain, from fish farmers to consumers, while promoting innovation in the seafood industry.

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