EFFECT OF VACUUM FRYING ON THE PROXYMATE QUALITY OF CRISPY CATFISH (*Clarias gariepinus*)

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Abstract

Conventional frying of foods usually is carried out under atmospheric conditions at temperatures near 190°C. The problem that arises most often is excessive darkening or scorching of the product, even before the product is completely cooked. Vacuum frying is a process that is carried out under pressures well below atmospheric level (below 6.65 kPa). Vacuum-fried products are expected to have higher retention of nutritional quality (phytochemicals), color is enhanced (less oxidation), and oil degradation is reduced compared to atmospheric frying. This research aimed to investigate the effect of vacuum frying processing on the quality of crispy catfish produced by the Youth Organization Group of Kandangsemangkon, Paciran Lamongan. We divide the samples into two groups, i.e., 1. Crispy catfish processed using conventional frying and 2. Crispy catfish processed using vacuum frying. The proximate composition and organoleptic characteristics of the product were observed and analyzed descriptively. The results showed that vacuum fried crispy catfish had lower water and fat content than the conventional fried one. Vacuum frying reduced the water and fat in the crispy catfish so that it might have a longer shelf life. It was suggested that vacuum frying processing increased the quality of the crispy catfish, and the technology was recommended to be used in small industries to increase their profit.

Keywords: vacuum, frying, crispy catfish, Kandangsemangkon, Lamongan

INTRODUCTION

Processing of traditional fishery products can be characterized by the simple use of materials and equipment. Traditional fish products are a major source of animal protein in Southeast Asian countries, and the production of traditional fish products is an important means of preserving fish in these countries. Traditional fish products include products that are boiled, dried, marinated/preserved, smoked, marinated, fermented, chopped/mashed, and made into powder. Many products are unique to each country, but the technologies underlying their production are similar in all countries.

Currently, the research and training programs in our research team are focused on two main areas of postharvest fishery technology: fish processing and packaging technology and fish quality management. Under fish processing and packaging technology, the main programs focus on improving the processing and packaging technology for traditional fish products (fermented dried shrimp and fish sauce), and the development of value-added products from low-value and underutilized pelagic fish resources.

Catfish has very high business prospects. This is because it is easily cultivated in critical places, such as swamps, rivers, and rice fields. muddy ponds and lack of oxygen (Suryaningrum et al., 2012). This fish has white meat, delicious taste, and high protein content, which is about 17%. Unfortunately, diversification of processed catfish products is still not widely conducted. This problem was triggered by the lack of introduction of technology and equipment

that supports catfish diversification efforts. One of the processed fish products that can be applied for catfish product diversification is crispy catfish.

Introduction of modern equipment indispensable for processing diversification efforts. The introduction of this equipment will result in a change in the quality of the product. In this study, the proximate quality of crispy catfish which were produced using two different methods, traditional/conventional and vacuum frying technology, were compared.

MATERIALS AND METHODS

Research Location

The product preparation process was carried out in Kandangsemangkon Village, Paciran Lamongan, East Java. The proximate analysis was conducted at laboratory of Fishery Products Technology Science, Faculty of Fisheries and Marine Science, Brawijaya University, Malang, East Java.

Preparation of catfish meat

Catfish (*C. gariepenus)* can be from the Youth Organization Group of Kandangsemangkon, Paciran Lamongan. Fish were harvested from their own. aquaculture ponds. Fish was cleaned with running water.

The process of making Catfish crispy

The process of making crispy catfish begins with eviscerating and cleaning of the catfish. The meat was cutted into the size of about 1 cm x 3 cm. The meat was then soaked in a seasoning consisting of Garlic 10 cloves, coriander 1 tea spoon, turmeric 3 cm, salt 1 tea spoon, five lime leaves, lemon 2 tea spoon. Soaking was done for 30 minutes.

The marinated fish meat was then stirred with the seasoning dough as in Table 1.

Table 1. Formulation of Crispy Catfish Dough Ingredients

No	Materials	Total (Gram)
1.	Catfish meat	650
2.	Flour	1000
3.	Cornstarch	90
4.	Rice flour	60
5.	Salt	30
6.	Powdered broth	6
7.	Baking soda	7

Conventional frying

Conventional frying was done by frying the product in boiling oil and then fried for approximately 10 minutes, or until the product becomes yellowish, typical of the crispy product. Furthermore, oil removal was carried out using a spinner machine.

Vacuum Frying

Vacuum frying method was done with a vacuum frying machine. The crispy were fried until the bubble on the oil in vacuum frying has disappeared. The total duration for vacuum frying was about one to two hours. Furthermore, oil removal was carried out using a spinner machine.

Proximate Testing

Proximate analysis conducted on *crispy catfish products* includes determining total protein content with micro-kjeldhal, water content by thermogravimetric method, total fat content with Soxhlet extraction method, ash content by direct diffusion method, and carbohydrate content *by difference* method (AOAC, 2005).

RESULT AND DISCUSSION

The quality of krispi catfish products can be seen from the content of proximat consisting of water content, protein, fat, ash, carbohydrate and Free Fatty Acid (FFA). In general, the analysis of the results obtained proximate and FFA tests in

sample A (*vacuum frying)* is superior compared to sample B (conventional frying. Analysis of proximate and FFA crispy catfish products using two frying methods could be seen in Table 2.

Table 1. Analysis of Proximat and FFA of Catfish Products. A=vacuum frying, B= Conventional frying

Parameter	A	B	SNI (%)
water (%)	7. 03	7. 14	Max 5. 0
Protein (%)	9. 45	9. 37	Min 15. 0
Fat (%)	9. 18	9. 25	Max 30. 0
Ash (%)	0. 69	0. 73	Max 12. 0
Carbohydrat (%)	73. 65	73. 51	-
FFA (%)	0. 243	0. 291	Max 0. 30

Water content in the material can affect "*acceptability*" and some food properties such as appearance, texture, freshness, and taste of products or foodstuffs. Water content in foodstuffs needs to be considered because high water content can cause damage toproducts and the increase of decay bacteria (Praseptiangga et al., 2016).

In this study, water content was shown by products that use the conventional frying method, while in protein on, products from conventional frying method produced lower protein (9.37%) compared to the vacuum frying method (9.45 %). This difference in water content occurs due to the length of frying that differs between conventional processes and vacuum frying. The length of time the frying process affects the water content, the longer the frying time will produce products with low water content (Susanty *et al.* (2019).

This difference in water content will also ultimately affect protein levels. Low water content will produce products with high water content. The two parameters are known to have opposite relationships. This was seen also in the study of proximate levels of dried *Trichogaster pectoralis* fish and dried *Stolephorus* sp. Called "jerky"(Riansyah et al., 2013; Dariyani et al., 2019)

Heating of chrysanthemum products if not done carefully, will result in damage to the components of food amino acids . High temperatures of about 50 ° C can affect the availability of lysine, one of the amino acids found in fish proteins. The loss of available lysine and other essential mono acids can also occur at much lower temperatures, such as 0°C (Kumolu-Johnson and Ndimele, 2011). This increases the likelihood of nutrient loss in the product. Other nutrients found in fish muscles that can be affected by heat are used in traditional processing methods, including methionine and other amino acids and vitamin K.

In products with a frying pan with vacuum, frying produces a smaller fat content, which is 9.18%. Heating with conventional methods results in a lot of fat bonding in products and flour. The high level of fat in the product will increase the risk of oxidation. Oxidation will continue during the storage process of the product, which leads to the development of a bright and characteristic yellow / orange color and an unpleasant rancid smell. The product would become very unattractive to consumers and may be rejected entirely [Amesh et al., 1991]. In addition, food products that are low in oil will be able to increase self-life and healthier if consumed (Geyskens et al., 2007; Pawar and Thompkins on, 2016; Syed 2016).

Overall prosses vacuum frying produces products that are better viewed from fat content, protein, and water content. This indicates that the engineering process of the tool can affect also the value of the product. According to Cahyono and Lantip (2012), engineering is one of the innovative and planned approaches to efficient and identify unnecessary costs with functional limitations. Value engineering method is chosen because it has advantages in terms of controlling costs by using an approach by analyzing the value of its functions without eliminating the desired quality and reliability.

CONCLUSION

The different frying methods resulted in the different product character. It was concluded that the use of vacuum frying produces a better product when compared to conventional frying methods. These better characteristics are based on important proximate parameters such as proteins, moisture, and fat content.

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