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Diversification of Mackerel Tuna(*Euthynnusaffinis)*Productsas Processed Fishcake, Nugget, Cracker, Meatball, andMeat Floss Products at the TPI Tempursari Beach Tourism Site, Lumajang

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Abstract:-Among many kinds of catches, the mackerel tuna is the most frequently caught fish in Indonesian waters. Oftentimes, the mackerel tuna is only consumed directly, without being processed into other products. This research attempts to develop the mackerel tuna into 5 processed fish products, which are fishcakes, fish nuggets, fish meatballs, fish meat floss, andfish crackers. The final result of this research is to show the proximatecontent of mackerel tuna that has been processed into productswith added value.

Keywords: *diversification, Euthynnusaffinis, products, fishery*

I. INTRODUCTION

Najih, Swastati, andAgustini (2014) stated that mackerel tunais a fish generally consumed by Indonesian people. Every year, the production volume of this fish has increased, andproduction reached 5,714,271 tonsin 2011. Towadi (in Najih, Swastati, andAgustini, 2014) presented data that mackerel tuna contains 117 kilocalories of energy, 24% ofprotein, a low fat content of 1%, as well asvarious kinds of minerals. The edible portion of the fish in general reaches up to 45 – 50%.

In the book titled *Taxonomy andKey Identification of Fish*, Saanin (1984) classified the mackerel tuna as belonging:

Phylum →Chordata
Subphylum→Vertebrata
Class →Perciformes
Subclass→Teleostei
Order →Actinopterygi
Suborder→Scombridei
Family→Scombridae
Genus→Euthynnus
Species→Euthynnus sp.

In relation to the proximate compositionof mackerel tuna, the red meat and white meat possess different proximatecontent. Hafiludin (2011) stated that the highest proximatecontent of mackerel tuna flesh is its protein content which ranges from 54.196% (red meat) to 68.355% (white meat), fat content which ranges from 1.8% (white meat) to 5.6% (red meat), ash content which ranges from 2.493% (white meat) to 3.290% (red meat), and watercontent which ranges from 7.934% (red meat) to 12.164% (white meat).

With the above consideration, this research will attempt to create a diversificationof mackerel tuna fish products. This research attempts to create five kinds of products, which are fish nuggets, fishcakes, meat floss, meatballs, andcrackers.

1. Fishcakes ("Kaki Naga")

Nugroho, Swastati, andAnggo (2013) stated that for fishcakes, texturebecomes one of the primary parametersfor determining quality. Consumerscertainly expect fishcakes to have a dense, chewy texturewith an emulsionthat remains stable. As such, an important point in the making of fishcakes is the binding ingredients. Usually, the binders that are often used in making fishcakes are tapioca starch, cornstarch, wheat flour, rice flour, and sago (Nugroho, Swastati, and Anggo, 2014).

2. Fish Nuggets

Fish nuggetsrepresent one form of processed fish meat, where the fish is finely ground and mixed with binders. The nuggetsare then seasoned and steamed before being formed into certain shapes. Wellyalina, Azima, andAisman (2013) stated that these nuggetsare coated with a batter made of water, starch, andseasonings,coated with breadcrumbs, and then fried or frozen before frying.

According to Sahubawa*et al.* (2006), fish nuggetsare a product of amixture of deboned fish meat from various kinds of fish that are ground or mashed. Starches and seasonings are added in order to enrich the flavor of the fish nugget products. The ingredients for making fish nuggetsare composed of fish meat, tapioca starch, garlic, salt, cooking oil, and butter. The goal of making nuggetsis to take advantage of abundant fishery resources.

II. FISH MEAT FLOSS

Meat floss has been establishedas one of the PRODUCTSof the food industrywith a standardof quality that has been set by the Departmentof Industry. This is meant so that consumers andproducersare guaranteed to have good quality meat floss products. Mamuajaand Aida (2014) explained that the factors that affect the quality standardof meat floss are, among others, water content which affects the storage and preservation of meat floss, ash content which can decrease the degree of acceptability by the consumer, protein contentwhich acts as a guide to how much meat or fish was used to make the floss, as well as fat content which is related to the ingredients used andwhether or not cooking oil was used in the process of cooking.

Meanwhile, Dewi, Ibrahim, andYuaniva (2011) stated that fish meat floss is a processed fish product made from fish meat andtraditionally processedwith boiling, seasoning, and frying. In the process of making meat floss, the frying methodusually employed is deep frying,which is a method of frying where the ingredients are completely submerged in frying oil.

III. FISH CRACKERS

Fish crackers are dry food products made from a mixture of starch with fish meat as well as seasonings or other added ingredients. According to Hustiany, (2005) crackers are a popular snackfor Indonesian people, in particular Javanese and Sundanese peoplethat usually consume crackers with rice. According to Wijandi*et al.*(inHustiany, 2005),crackers are grouped into two kinds, which are rough crackers andsmooth crackers.

Laiya, Harmain, and Yusuf (2014) stated that the quality of fish crackers can be judged through several parameters. These include organoleptic, physiochemical, and microbiological properties. Quoting from Zulfiani (1992), Laiya, Harmain, and Yusuf (2014) continue to explain that crackers become puffy during the frying process.

IV. FISH BALLS

Meatballs are apopular type of foodfor Indonesian people. Meatballs are usually made of meat mixed with starch and other seasonings. Next, the processof making meatballs is to form the mixture of ingredients into rounds and boiling them until they float, a sign that the meatballs are fully cooked (Nefriti, Sari, andSumarto, 2010).Generally, meatballs can be stored for up to 12 – 24 hours at room temperature. However, meatballs can be made to last longer, for up to two weeks, when stored at a temperature of (-1) – 5 °C. According to Wiraswanti (2008), meatballs contain a high content of protein andwater, with (aw > 0.9), and a neutral pH (6.0-6.5). This makes meatballs vulnerable to spoilage. If the meatballs taste sour,have a very soft and mushy texture, easily break down and become slimy, and have a rotten smell, then the meatballs are spoiled and no longer fit for consumption (Wiraswanti, 2008).

V. RESEARCH METHODS

This research uses the experimental method. The research was conducted in a laboratoryto practically find out the most appropriateway of processing fishery products for the conditionsat the TPI Tempursari Beach Tourism Site. Laboratoryresearch also aimed to find out the nutritionalcontent of the fishery products to be produced through this effort of the diversificationof fishery products.

The experimental design used in thisresearch is a simple Complete Random Design with 3 treatments and 5 repetitions. The free variablesin this research cover the starch concentration, meat concentration, tofu remains concentration, and salted fish meatconcentration. The bound variablesin this research cover the parametersof proximate testing, the organoleptic property, amino acid profile testing, andtexture testing. The results were tested with BNT ANOVA (analysis of variance), and then tested further with deGarmotesting to find the best treatment.

The tools used for the processof making the productsare among others digital scales, bowls, knives,blenders, food processors, pans, pots, andstoves. The tools used for the proximateanalysisaretest tubes, measuring glasses, digital scales, a goldfish, a hotplate, porcelain crucibles, a desiccator, an oven, and muffle. The tool used for the amino acid profile testis HPLC, among others.

The primary material used for this research is mackerel tuna (*Euthynnusaffinis*) obtained from the catches of fishermen in the area of Tempursari Beach, Lumajang Regency. Additional ingredients used in the process of making theproductsare among others tofu remains, salted fish meat, wheat flour, sugar, salt, vegetable oil, shallots, garlic, cornstarch, tapioca starch, coconut milk, eggs, turmeric, candlenuts, red chilies, brown sugar, bay leaves, lemongrass, galangal, ginger, kaffir lime leaves, and tomatoes.

VI. RESEARCH RESULTS

For the proximate content, the following is the proximate analysisfor mackerel tuna products based on the tests of the Food Safety and Quality Control Laboratory, Faculty ofAgriculture Technology, University ofBrawijaya.

Table 1. Proximate AnalysisTablefor the Mackerel Tuna Nugget Product

Treatment	Proximate (%)					Texture (N)
Mackerel tuna fillet: tofu remains	Protein	Fat	Water	Ash	Carbohydrate	
15 : 2	12.94	1.83	61.16	1.71	22.36	22.80
12 : 5	11.17	2.30	63.21	1.81	21.51	14.20
9 : 8	9.65	1.35	65.45	1.22	22.33	10.70

Table 2. Proximate AnalysisTablefor the Mackerel Tuna Fishcake Product

Treatment	Proximate (%)					Texture (N)
Ground meat : tofu skin	Protein	Fat	Water	Ash	Carbohydrate	
1 : 7	12.47	1.81	55.22	1.72	28.78	28.40
5 : 3	11.85	3.46	50.50	1.26	32.93	27.60
3 : 5	13.52	3.29	55.44	1.65	26.10	23.00

Table 3. Proximate AnalysisTablefor the Mackerel Tuna Meat Floss Product

Treatment	Proximate (%)				
Fish meat : salted fish	Protein	Fat	Water	Ash	Carbohydrate
1 : 1	15.83	10.63	63.68	5.03	4.73
3 : 2	19.73	7.62	53.83	3.51	15.31
7 : 3	12.66	8.25	46.12	5.79	27.18

Table 4. Proximate AnalysisTablefor the Mackerel Tuna Fish Ball Product

Treatment	Proximate (%)					Texture (N)
Fish meat : tapioca starch	Protein	Fat	Water	Ash	Carbohydrate	
1 : 4	8.18	0.20	78.39	1.12	12.11	21.30
1 : 3	8.15	0.76	54.41	1.03	35.65	20.70
1 : 2	8.55	0.72	56.10	0.79	33.84	25.30

Table 5. Proximate AnalysisTablefor the Mackerel Tuna Cracker Product

Treatment	Proximate (%)					Texture (N)
Fish meat : tapioca starch	Protein	Fat	Water	Ash	Carbohydrate	
3 : 65	1.39	11.25	3.06	83.76	0.54	3.00
6 : 65	3.51	11.46	3.02	81.58	0.43	4.70
9 : 65	4.91	17.03	3.55	74.01	0.50	33.10

Table 6. Proximate AnalysisTablefor Ingredients

Sample	Proximate (%)				
	Protein	Fat	Water	Ash	Carbohydrate
Fresh Mackerel Tuna	16.44	73.85	1.50	7.67	0.54
Salted Mackerel Tuna	23.13	69.48	1.93	4.95	0.51
Tofu Remains	9.82	79.58	0.30	2.56	7.74

VII. CONCLUSION

Mackerel tuna can be processedinto a variety of fishery products. In general, based on the tests of the Food Safety and Quality Control Laboratory, University of Brawijaya,Malang, the research products contained the following proximatecontent:

Code	Protein (%)	Fat (%)	Water (%)	Ash (%)	Carbohydrate (%)
Fish Meatballs (B1P1)	8.18	0.20	78.39	1.12	12.11
Fish Meatballs(B2P2)	8.15	0.76	54.41	1.03	35.65
Fish Meatballs(B3P3)	8.55	0.72	56.10	0.79	33.84
Fish Meat Floss (A1P1)	15.83	10.63	63.68	5.03	4.73
Fish Meat Floss (A2P2)	19.73	7.62	53.83	3.51	15.31
Fish Meat Floss(A3P3)	12.66	8.25	46.12	5.79	27.18
Fishcake (K1P1)	12.47	1.81	55.22	1.72	28.78
Fishcake (K2P2)	11.85	3.46	50.50	1.26	32.93
Fishcake(K3P3)	13.52	3.29	55.44	1.65	26.10
Fish Nugget (N1P1)	12.94	1.83	61.16	1.71	22.36
Fish Nugget (N2P2)	11.17	2.30	63.21	1.81	21.51
Fish Nugget (N3P3)	9.65	1.35	65.45	1.22	22.33
Fish Cracker (K1P1)	1.39	11.25	3.06	83.76	0.54
Fish Cracker(K2P2)	3.51	11.46	3.02	81.58	0.43
Fish Cracker(K3P3)	4.91	17.03	3.55	74.01	0.50

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