CHAPTER IV
RESULT AND DISCUSSION

4.1. Product Result

The proximate analysis of the catfish nuggets revealed no significant difference in moisture content between the control (45.2%) and mocaf flour-based samples (44.8%). The mocaf flour-based catfish nuggets exhibited slightly lower protein content (15.6%) compared to the control (16.2%). However, there was no significant difference in fat content between the two samples. The ash content in mocaf flour-based catfish nuggets (1.2%) was marginally higher than that in the control sample (1.1%). The sensory evaluation indicated that the mocaf flour-based catfish nuggets were comparable to the control in terms of appearance, taste, and overall acceptability. However, the texture of the mocaf flour-based nuggets was slightly different, with a slightly softer and less crispy texture compared to the control. Despite this difference, the overall acceptability of the mocaf flour-based catfish nuggets was promising, as the majority of the panelists expressed positive feedback and willingness to consume them regularly.

The utilization of mocaf flour as a basic ingredient for gluten-free catfish nuggets showed promising results in terms of proximate analysis and sensory evaluation. The moisture content was well within the acceptable range for catfish nuggets, indicating the adequacy of the frying process. Although there was a slight decrease in protein content in the mocaf flour-based sample, it still provided a reasonable protein profile for a gluten-free product. The fat content was not significantly affected, suggesting that mocaf flour can be used as a suitable replacement for wheat flour without compromising the nutritional profile. In terms of sensory attributes, the mocaf flour-based catfish nuggets were well-received by the panelists, with positive feedback on appearance, taste, and overall acceptability. However, the texture was slightly different,

which may be attributed to the absence of gluten in mocaf flour. Further optimization of the formulation and cooking process could potentially improve the texture of the mocaf flour-based catfish nuggets, making them more comparable to the control.

4.2. Nutrition Fact

4.2.1. Nutrition Table

The nutritional value of Mocaf flour is as follows:

Table 4.1 Nutrition value of Mocaf flour per 100 g

Calorie (kcal)	350
Moisture (g)	11.9
Protein (g)	1.2
Fat (g)	0.6
Carbohydrate (g)	85.0
Fiber (g)	6.0
Ash (g)	1.3

Source : Tabel Komposisi Pangan Indonesia, 2017.

In the manufacture of mocaf the fermentation process involves the addition of microbes directly on cassava slices for at least 12 hours. Several studies on the types of microbes that used are summarized in Table 2. One of the microbes usedis lactic acid bacteria (LAB) which produces lactic acid in the mocaf fermentation process. Lactobacillus plantarum is a species of lactic acid bacteria(LAB). L. plantarum has the ability amylolytic which can produce amylase enzymes so that it can be used to modify amylose component in mocaf. Use of selected isolates of L.plantarum UA3 in fermentation Grated cassava produces 0.92% lactic acid in 60 hours of fermentation, with the number of cells 9.54 logCFU/mL (Noor et al., 2018).

Table 4.2 Nutrition value of Catfish per 100 g

Calorie (kcal)	90
Moisture	78.5
Protein	18.7
Fat	1.1
Calcium	15
Phospor	260
Iron	2
Sodium	150
Thiamin	0.10
Riboflavin	0.05
Nhiasin	2.0

Source : Djatmiko Hertami, 2016.

Catfish contains high protein and substances good for strengthening bones(calcium). toddler food. Apart from that, catfish too Contains other important minerals as well for body health (Djatmiko Hertami, 2016).

4.2.2. Nutrition Calculation

Table 4.3 Nutritional Value of Ingredients used in The Recipe for Gluten-free Catfish Nugget.

Ingredients	Calories (kcal)	Carbohydrate(g)	Protein(g)	Fat(g)	Sugar(g)	Fiber(g)	Sodium(g)
Catfish Meat (400 g)	360			4.4			600
Gluten-free Cornflakes (200 g)	773.3		74.8	2.7			3.8
Mocaf flour (225 g)	787.5	166.7	14.7	1.35	18	8.7	18
Baking Powder (2.3 g)	1	191.25	2.7			13.5	0.24
Paprika Powder (2.3 g)	6	0.6					0.2
Garlic Powder (2.3 g)	10	1				1	0.2
Peeled Garlic (3 cloves/ 9 g)	13	2.3	0.5	0.1	0.1	0.3	0.1
Green Onion (1 stalk/ 15 g)	5	3	0.6		0.1	0.2	0.2
Egg (2 pcs)	148	1.1	0.3	10.3	0.3	0.4	0.1
Water (70 ml)		1.4	12.7		0.3		
Salt (5 g)				947			0.2
Oil (1000 ml)	8370						
TOTAL	**10.473,8**	**367,35**	**106,3**	**965,85**	**18,8**	**24,1**	**623,04**

4.2.3. Nutrition Label

Nutrition Facts

5 servings per container

Serving size	**10 (10g)**
Amount Per Serving	
Calories	**350**
	% Daily Value*
Total Fat 9g	**12%**
Saturated Fat 0g	**0%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 380mg	**17%**
Total Carbohydrate 200g	**73%**
Dietary Fiber 17g	**61%**
Total Sugars 6g	
Includes 0g Added Sugars	**0%**
Protein 13g	**26%**
Vitamin D 0mcg	0%
Calcium 0mg	0%
Iron 1.62mg	8%
Potassium 0mg	0%

*The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

Figure 4.1 Nutrition Fact of Gluten-free Catfish Nugget

4.3. Food Safety and Packaging

4.3.1. Processing and Storage Temperature

Nugget is a frozen processed meat product. this product Has a long shelf life, can be stored in the freezer reach 2 weeks. The meat used before must be ground, so that makes it easier to form at the next stage. One of the main ingredients that can be used is fish, which will give theproduct a texture desirable, because it contains myofibril protein (Soemarno, 2009).

Fish nuggets are not much different from other nuggets, the difference lies in the raw material for making nuggets. The type of fish used will be affect the quality of the nuggets produced. One of a kind fish that can be use is catfish as raw material for nuggets. One way that can be done to prevent the occurrence damage to catfish nugget products such as the appearance of slime and changes in texture,

namelywith packaging. According to Hariyadi (2008), in the practice of the food industry In modern times, packaging is an important factor in minimizing or controlling the process of decreasing the quality of a food product. Packaging has a very important role in protecting packaged products. Therefore, the selection of the right packaging materials and the proper packaging process is very important to determine the expiration date of a food product packed.

Currently the most widely used packaging material for packaging food is plastic, because the price is relatively cheap and has properties light and flexible so as to facilitate the packaging process. Plastic packaging has many types and can be adjusted according to type packaged product. Each type of plastic also has a function as well its own advantages and disadvantages. According to Nurminah (2002), nature is the most important packaging materials used include gas and water vapor permeability, shape and surface.

According to Rosalina Silvia (2015), age-definable food products stored using the Arrhenius model ASLT method including food products which are easily damaged by chemical reactions, such as fat oxidation, Mailard reaction, protein denaturation and so on. In general,the rate of a chemical reaction will increase rapidly at higher temperatures which means a decrease in product quality happen fast. Temperature is a factor that influences changes in quality food. The higher the storage temperature, the reaction rate of various compounds chemistry will be faster. For dry and semi-wet food types, temperature Storage trials are recommended to test food expiration is 0ºC (control),room temperature 30ºC, 35ºC, 40ºC or 45ºC (if needed), while for thermally processed food is 5ºC (control), temperature room 30ºC, 35ºC, or 40ºC. For this type of frozen food, you can use temperature - 40ºC (control), -15ºC, -10ºC, or -5ºC (Syarif and Halid, 2008).

4.3.2. Self Life

Nuggets are processed food products that are processed using technology restructuring, namely utilizing small size pieces of meat later reattaching to a larger size with the help of a binder. Binders that can be used are wheat flour, tapioca flour, and flour cornstarch (Asrawaty and If'all., 2018). The basic ingredients for making nuggets can come from chicken, fish and beef. The useof fish or shrimp meat can be a choice of other meat ingredients that tend to have a higher fat content low, namely in 100 grams of shrimp contains 1.15 grams of fat and protein is 19.4 gram with a total energy of 89.0 kcal (Ngginaket al., 2013). The stages of the nugget-making process begin with grinding the fish meat the main ingredients, mixed with spices, then mixed with binding ingredients, steamed, cut, entered the process (battering), namely coating with wheat flour adhesive then covered with bread flour (breading). After that the product is half cooked, then stored in freezing temperature for extend the shelflife and maintain the quality of the nuggets (Wulandari et al., 2016).

4.3.3. Product Packaging

Vacuum packing is commonly used in several types of frozen food products such as fish balls, scallops, nuggets, and other types of products other foodpreparations that require packaging protection for extend shelf life with freezing temperatures (Harris & Fadli, 2014). The principle of the method the vacuum is byremoving all the air in the package, so that in oxygen-free packaging with a large vacuum pressure of 0.66 Kpa and Sealing Length = 400 x 10 mm (Özpolat et al., 2014). Advantages of use Vacuum packaging can reduce the appearance of damagein the form of physical, chemical and biological. Product shelf life and product quality will be significantly increased overall, because food does not interact with

oxygen (Astawan et al., 2015). The disadvantages of the vacuum method are the type and level the thickness of the plastic used, because it will affect the length of storage or the shelf life of the product as well as the level of pressure and heat usedduring the process vacuum (Wahyudie et al., 2016).

The packaging used to package food products has a basic material varies, one of which is polyamide type plastic such as nylon. Nylon is a plastic type Polyamide (PA) with mechanical, thermal and application properties similar to type(PET). According to (Kirwan, Plant, & Strawbridge, 2011), the usual type of PA plastic can be combined with PE (Polyethylene), PET (Polyethylene Terephthalate), EVA (Ethylene Vinyl Acetate Copolymers) and EVOH (Ethylene Vinyl Alcohol).PA movie bidirectionally oriented has high heat resistance. Excess plastic This type of polyamide, which has a good odor barrier ability, is resistant to oil and grease, and has a high permeability to water vapor. Polyamide can also be laminated or co-extruded with polyethylene for packaging vacuum packed or gas-flushed bacon and cheese (MAP or modified atmosphere packaging). The thickness level is the same as other types of plastic such as PE and PP resistance to damage by moisture or chemical ingress. Plastic which tends to be clearer is also one of the other factors that becomes an advantage of nylon plastic. These advantages relate to product transparency, so consumers can see the product directly in terms of aesthetics (Astawan et al., 2015).

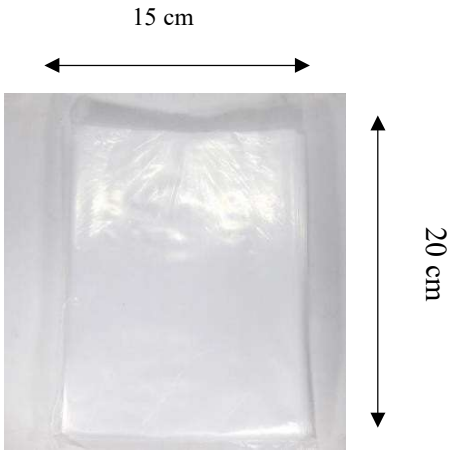

Figure 4.2 Polythylene Plastic Bag

Figure 4.3 Logo

4.4. Financial Aspect

4.4.1. Product Cost (Variable Cost, Overhead Cost, Fixed Cost)

Product cost is calculated based on the total of all cost per month. The costs consist of labour cost, raw material cost, packagingcost, and utility cost. The labour cost is considered based on monthlyworking days, which are 25 days per month. As for raw material, thequantity of raw materials is counted as 6 recipes per day or 150 recipes per month, which are 24 portions per day or 600 portions permonth.

1. Start-Up Capital

Table 4.4 Start-Up Capital

Tools and Equipment	Quantity	Price (/unit)	Sub Total
Digital Scale	1	Rp 55,000	Rp 55,000
Molder	2	Rp 45,000	Rp 90,000
Big Pot	1	Rp 65,000	Rp 65,000
Steam Tray	1	Rp 37,000	Rp 37,000
Chopper / Food Processor	1	Rp 309,000	Rp 309,000
Knife	1	Rp 119,000	Rp 119,000
Plate	1	Rp 9,000	Rp 9,000
Brush	1	Rp 12,000	Rp 12,000
Small Tray	1	Rp 11,000	Rp 11,000
Pan	1	Rp 173,000	Rp 173,000
Bowl	1	Rp 8,000	Rp 8,000
Cutting Board	1	Rp 51,000	Rp 51,000
Spatula	1	Rp 20,000	Rp 20,000
Tongs	1	Rp 18,500	Rp 18,500
Strainger	1	Rp 21,000	Rp 21,000
Measuring Cup	1	Rp 86,000	Rp 86,000
Serving Plastic Bag	20	Rp 7,600	Rp 152,000
TOTAL			**Rp 1,236,500**

2. Packaging Cost

Table 4.5 Packaging Cost

Packaging	Quantity	Price (/unit)	Sub Total
Serving Plastic Bag	20 pcs	Rp 7,600	Rp 152,000
Plastic Bag	20 pcs	Rp 2,300	Rp 46,000
TOTAL (/day)			**Rp 198,000**
TOTAL (/month)			**Rp 4,950,000**

3. Utility Cost

Table 4.6 Utility Cost

Facility	Quantity	Price (/unit)	Sub Total
Water	875 L	Rp 2,800 (/m3)	Rp 2,800
Electricity	17 kWh	Rp 1,500 (/kWh)	Rp 25,500
TOTAL (/day)			**Rp 28,300**
TOTAL (/month)			**Rp 707,500**

4. Raw Material Cost

Table 4.7 Raw Material Cost

Raw Materials	Quantity	Price (/unit)	Sub Total
Catfish (fillet)	400 g	Rp 104,000 (/kg)	Rp 41,600
Gluten-free Cornflakes	200 g	Rp 77,000 (/250g)	Rp 61,600
Mocaf flour	225 g	Rp 17,500 (/500g)	Rp 7,875
Baking Powder	2,3 g	Rp 5,500 (/45g)	Rp 275
Paprika Powder	2,3 g	Rp 14,900 (/100g)	Rp 447
Garlic Powder	2,3 g	Rp 4,500 (/100g)	Rp 147
Garlic	9 g	Rp 7,000 (/100g)	Rp 630
Green Onion	15 g	Rp 3,400 (/100g)	Rp 510
Egg	2 pcs	Rp 2,500 (/pcs)	Rp 5,000
Water	70 ml	Rp 20,000 (/220ml)	Rp 6,400
Salt	5 g	Rp 3,000 (/250g)	Rp 60
Oil	1 L	Rp 30,000 (/1L)	Rp 30,000
Gas	1 kg	Rp 188,000 (/3kg)	Rp 63,000
	TOTAL (/day)		**Rp 217,544**
	TOTAL (/month)		**Rp 5,438,600**

5. Total Cost

Variable Cost = Packaging Cost, Utility Cost, & Raw Material Cost

Total Cost (/month) = Packaging + Utility + Raw Material

= Rp 4,950,000 + Rp 707,500 +Rp 5,438,600

= **Rp 11,096,100**

4.4.2. Selling Price

Product Price $= \frac{Total\ Cost\ (/mon\quad)}{Total\ Product\ Units\ (/month)}$

$= \frac{\text{Rp } 11{,}096{,}100}{600\ portions}$

$= \mathbf{18{,}493}\ /\ \boldsymbol{portion}$

Product Selling Price = Product Price + (Product Price x Profit)

= Rp 18,493 + (Rp 18,493 x 60%)

= Rp 18,493 + Rp 11,095

= Rp 29,588 ≈ Rp 30,000