
Effect of The Proportion of Sorghum Flour: Wheat and Carrageenan on The Quality of Patin Fish Burger**Nurdin Dwiki Febrian¹, Jariyah¹, Winarti¹**

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ABSTRACT

Patty Burger is minced meat, shaped round, flattened, steamed first, and then fried in butter or grilled over coals. Patin fish meat was chosen because it is high protein and low fat, the use of proportions of sorghum flour and wheat flour to improve product quality so that it is not easily crushed, the addition of carrageenan as a stabilizer to improve texture. This study aimed to determine the effect of the proportion of sorghum flour and wheat with the addition of carrageenan on the quality of the patty burger of patin fish. This study used a factorial Completely Randomized Design (CRD) with two factors, factor I the proportions of sorghum flour and wheat flour (60%:40%, 70%:30%, 80%:20%) and factor II carrageenan concentration (0, 5%, 1%, 1.5%). Data obtained were analyzed using ANOVA, if there was a significant difference between treatments, a 5% DMRT further test was carried out. This study showed a significant interaction with the observation parameters of moisture content, ash content, fat content, WHC, texture, starch content, food fiber, and hedonic organoleptic tests (aroma scores, color scores, taste scores). The best results were obtained in the A2B2 treatment, proportion of sorghum and wheat flour (70%:30%) with the addition of 1.0% carrageenan with the characteristics of water content 57.74%, protein content 14.47%, fat content 5.18%, texture 0.13 mm/gr/sec, WHC 16.50%, starch 17.43% and a score of 3.87 (like) for color 3.82 (slightly like) for taste and 3.75 (slightly like) for scent.

Keywords: burger patty, carrageenan, patin fish, sorghum,

INTRODUCTION

Patty or burger meat is minced meat (usually beef, but sometimes also other meats), shaped round, flattened, steamed first and then fried in butter or grilled over coals (Cory, 2009). The use of meat as an ingredient for making burger patties are generally made of beef or chicken which has a high-fat content of 14% and 25% (Kusnadi et al., 2012).

Patin fish was used as a substitute for meat in making patty burgers because it has high protein, low fat, and contains many other nutrients. Based on the results of research by (Subagja, 2009), 100 g of patin fish contained 15 g of protein, 5.9 g of fat, 75% water, and vitamins D, E, and phosphorus.

Making the patin fish burger patty is an alternative product because in general the patty burger is made using wheat flour or bread flour, while the patin fish burger patty is made with a proportion of sorghum flour and wheat flour. Making patin fish burger patties using the proportions of sorghum and wheat flour is an alternative to reduce dependence on import and gluten content from wheat flour. The advantage of sorghum is that it has a high starch content of 80.41% so that it has high swellability. (Setyanti, 2015).

Flour sorghum can be used as a filler that serves to bind water, affects the texture of the product. Sorghum flour has the advantage of high swellability and is easily soluble in water (Sutrisna, 2012). The use of sorghum flour as a food ingredient needs a combination with wheat flour because wheat flour has gluten level which is needed in the manufacture of food products that can form high elasticity properties. Wheat flour gluten has a balanced protein content, namely glutenin and gliadin, which sorghum does not have (Setyanti, 2015).

The addition of sorghum flour also serves to increase the dietary fiber content of burger patty products because processed products with fish raw materials generally contain low dietary fiber. Sorghum flour has the advantage of superior nutritional content in terms of fiber and mineral content. Sorghum has fiber and mineral content of 2.74% and 2.24% which are greater than wheat flour. Wheat flour itself contains fiber and mineral of 1.92% and 1.83%. The dietary fiber found in sorghum flour is cellulose, hemicellulose-lignin, ni, n, and B-glucan (Suarni, 2012).

The addition of stabilizer is also needed in making patty burgers from fish raw materials which generally have a soft texture. The stabilizer used in making patin fish burger patties is carrageenan. Carrageenan is added to burger patty products because it contains glycoproteins which function as a thickener and emulsifier in the product which makes the patty product chewy (Harun et al., 2013). Carrageenan is one type of stabilizers that can absorb water to produce a compact texture.

(Huzaibah et al., 2018), stated that the proportion of sorghum and wheat flour at a concentration (70%:30%) with carrageenan concentration (1%) in making tuna fish burger patties affected the water content, fat content, the texture of the penetrometer and show preference value by comparison organoleptic properties. Therefore, this study was conducted to determine the effect of the proportions of sorghum and wheat flours with the addition of carrageenan on the physicochemical characteristics of patty burgers from patin fish.

METHODS

Materials and Tools

The ingredients used for making patty burgers included patin fish meat obtained from fish auction in Gresik District and sorghum flour obtained from Babat, Lamongan District. Chemical analysis materials are hexane, sulfuric acid, hydrogen peroxide, H_3BO_3 , sodium hydroxide, sodium thiosulfate, HCl, and aquadest. The tools used are oven, soxhlet, autoclave, incubator, refrigerator, desiccator, blender, meat crusher, analytical scale, weighing bottle, petri dish, measuring flask, measuring cup, erlenmeyer micropipette, pipette, spatula, aluminum foil, paper filter, and a 20 mesh sieve.

The experimental design of the product

This method was developed using a completely randomized design (CRD) with a two-factor factorial pattern, involving the proportion of sorghum and wheat flours at concentrations of 60%:40%; 70%:30%; 80%:20%, and the addition of carrageenan at concentrations of 0.5%; 1%, 1.5% so that 9 treatment combinations were obtained, each of which was repeated twice. The data were analysed by analysis of variance (ANOVA), if there was significant difference between the treatments, the Duncan test (DMRT) was continued at the 5% level. The organoleptic test was analysed using a scoring test at the 5% level. The results obtained were then analysed to determine the effectiveness index to get the best product. Determination of the optimal formula was based on chemical and sensory performance using an effectiveness index (DeGarmo et al., 2003).

Processing of patin fish meat

Fresh patin fish was soaked in water and then washed thoroughly. The patin fish was weeded to remove the head, tail, and offal. Then the patin fish meat was filleted to separate the skin and bone. Fish meat will be reduced in size before grinding. After grinding, the patin fish meat was weighed as much as 200 g.

Making Patin Fish Burger Patty

The patin fish meat was washed with running water, drained and cut into small pieces, and weighed 200 g. Grind patin fish meat with a blender. Sauté 10% garlic, 60% onions which have been finely chopped and then grounded with meat mixture and 1% salt and 1% pepper were added. Mixed the stir-fry spices into a container that already contained patin fish meat and additional 40% of the beaten eggs. Added the proportions of sorghum flour:wheat and carrageenan with the treatment of proportion of sorghum flour:wheat 60%:40%, 70%:30, 80%:20% (w/w), and carrageenan concentration 0.5%, 1%, 1, 5% (w/w). Then steamed for 20 minutes at 80°C. Dough was printed with a diameter of 6 cm and a thickness of 1.5 cm. Burger patty was baked at 50°C for 1 minute.

Analysis of Patin Fish Burger

Patty Burger Patin fish was analysed for water content ([AOAC], 2005), ash content ([AOAC], 2005), protein content using the kjeldhal (Rosaini et al., 2015), fat content using the Soxhlet method (Asmariyani et al., 2017), WHC (Yusuf & Rohmah, 2020), penetrometer texture (Lala et al., 2017), starch content (Retnaningtyas & Putri, 2014), food fiber (M. F. Putri, 2017). Patin burger patties were analysed for sensory properties using scoring method (Yuliati & Mardiah, 2016).

Analysis of moisture content using the AOAC method ([AOAC], 2005) was as follow : the sample was weighed 1-2 g and placed in a bowl that has been dried. Then, the sample and the bowl were dried in an oven at 105°C until a constant weight was obtained. Moisture content was the difference between the weight of the starting material and the weight of the final material after drying.

Analysis of ash content using the AOAC method ([AOAC], 2005) was as follows: the sample was weighed 1-2 g and placed in a container that has been dried. The sample and bowl were then burned in a furnace at 400°C to become ashes. Ash content was the difference between the weight of the starting material and the weight of the final material after turning it into ash.

Analysis of protein content in the semi-Kjeldahl method was carried out by weighing 0.5 g of the sample and put into a catalyst flask (Kjeldahl tablets) 1 tablet was put into the flask and 10 ml of H₂SO₄. Samples were destructed. with low to high temperatures (450°C) and carried out in a fume hood for 2-3 hours (the solution was clear). The destructed samples were cooled and the walls of the flask were washed with sufficient water, then boiled for another 30 minutes. The sample was put into a distillation unit and 50 ml of 30% NaOH and 80 ml of distilled water were added, then heated for 15 minutes. The NH₃ formed was accommodated in an Erlenmeyer containing 25 ml of 4% boric acid solution and 3 drops of BGC-MR indicator. The solution in erlenmeyer was titrated with 0.1 N HCl until the light green color changes to light purple.

$$\text{Formula : \%N} = \frac{(\text{ml HCl sample} - \text{ml HCl blank}) \times \text{N HCl}}{\text{mg sample}} \times 100\%$$

$$\text{Protein Content (\%)} = \%N \times \text{conversion factor}$$

Analysis of fat content in the Soxhlet method was carried out by weighing the material as much as 2 g, then wrapped in filter paper and put into a Soxhlet extraction tube. Cooling water flows in the condenser. The extraction tube was mounted on a Soxhlet distillation apparatus with sufficient petroleum benzene solvent for 3 hours. Petroleum benzene which already contained fat and oil extracts was transferred into a clean weighing bottle and the weight is known and then evaporated with a water bath until it was slightly concentrated, continuing to dry in an oven at

100°C until the weight was constant. Fat content is calculated by fat weight divided by sample weight multiplied by 100 %.

Texture analysis was carried out by weighing the load (load with tension rods). The material to be measured was placed directly under the needle at penetrometer. Determined the testing time, namely the time required for pressing against the material. The load was removed and the indicator scale was read after the tool stops, the test needs to be repeated on various sides of the sample.

$$\text{Formula : Penetration} = \frac{(\text{average measurement results} \times 1/10) \text{ n/m}}{\text{load weight (gr)} \times \text{testing time (s)}}$$

WHC analysis was carried out by weighing 1 g of the mashed sample, entering the sample into a centrifuge tube whose weight was known, adding 9 ml of distilled water into the centrifuge tube that already contained the sample, and shaking it with a vortex mixer, closing the centrifuge tube with aluminum foil. Incubate at 0°C for 15 minutes. The tube was centrifuged at 3000 rpm for 20 minutes. Separation of the supernatant and measurement of its volume. WHC was calculated by the formula for the volume of water absorbed (ml) divided by g of sample.

Analysis of starch content was carried out by means of 2-5 g of sample materials, added 50 ml of distilled water and stirred for 1 hour. The suspension was filtered with filter paper and washed with distilled water to 250 ml. The residue was transferred from the filter paper to the erlenmeyer by washing with 200 ml of distilled water and adding 20 ml of HCl + 25%. Then place in the refrigerator for 2.5 hours. After cooling, neutralized with 45% NaOH solution and deluted to a volume of 500 ml, then filtered. Determine the sugar content expressed as glucose from the filtrate obtained. Determination of glucose as in the determination of reducing sugars. The weight of starch was the weight of glucose multiplied by 0.9.

Analysis of total dietary fiber was carried out by adding up the levels of NDF and Concentrated Substance Levels.

Determination of the Best Treatment

Determination of the best treatment was done using the scoring method by giving a score on each average of the results of the analysis of the response and giving a ranking to each sample that has the lowest to the highest score. The sample with the highest score was the sample with the highest ranking and automatically becomes the selected product. The selected sample will be analysed for dietary fiber.

RESULTS AND DISCUSSION

Raw Material Analysis

Based on Table 1. the results of the analysis of patin fish were as follows, water content of 76.60%, ash content of 0.18%, protein content of 14.08%, and fat content of 6.02%, where as according to other researchers the water content was 79.42%, the fat content was 6.60% (Poernomo et al., 2015). The ash content of 0.22% and protein content of 17.52% (Ikasari et al., 2011). Based on the results in the analysis that has been carried out, there were several differences in the results of the analysis with the literature, including differences in the results in the analysis of water content, fat content, and protein content. The difference in these results may be due to differences in species, harvest age, and the environment where patin fish live and their food.

Table 1. Results of Analysis of patin fish and Sorghum Flour Raw Materials

Parameter	Patin Fish (%)	Sorghum Flour (%)
Water content (%)	76.60 ± 0.32	11.02±0.07
Ash content (%)	0.18±0.08	1.17±0.10
Protein content (%)	14.08 ± 0.09	8.53±0.09
Fat Content (%)	6.02±0.24	2.25±0.10
Dietary Fiber (%)	-	2.82±0.09
Starch Content (%)	-	81.27±0.10

The results of the analysis of sorghum flour showed that the water content was 11.02%, the ash content was 1.17%, the fat content was 2.25%, the protein content was 8.53%, the fiber content was 2.822% and the starch content was 81.27%. According to (Kinanthi et al., 2014) stated that the water content of sorghum flour was 9.97%, the ash content according to (Aprilia et al., 2019) was 0.99, according to (Suarni, 2012) the protein content is 6.05%, the fat content was 2.02%, fiber content is 2.74% and starch content of 80.42%. Based on the results of the analysis that has been carried out, there were several differences in the results of the analysis with the literature.

Chemical properties of Patty Burger Patin

Based on Table 2, the moisture content of the burger patty ranged from 55.73% to 58.93%. Based on the analysis of variance, it can be seen that there was a significant interaction ($p \geq 0.05$). The higher the proportion of sorghum flour or the lower the wheat flour and the higher the concentration of carrageenan, the water content of the burger patty will increase.

The high starch content in sorghum and wheat flours of 80.42% and 78.74% has a high water holding capacity as well. Starch is a hydrophilic compound. The ability to absorb large amounts of water in starch is because starch molecules have a large number of total hydroxyl groups. The more concentration of sorghum flour used, the higher the amylopectin fraction so that in the process of heating the material, the starch will swell and eventually break and the water absorption capacity will be higher (Putra et al., 2016).

Table 2. The average moisture, ash, and fat contents of patin fish burger at different proportion of sorghum and wheat flours

Coagulant Concentration		Moisture Content (%)	Ash Content (%)	Fat Content (%)
TS: TT (%)	KK (%)			
60:40	0.5	55.73±0.06 ^a	1.33±0.04 ^a	5.03±0.10 ^a
	1	56.75±0.05 ^b	1.44±0.04 ^b	5.17±0.02 ^b
	1.5	57.11±0.06 ^c	1.50±0.02 ^b	5.20±0.02 ^b
70:30	0.5	57.37±0.08 ^c	1.55±0.02 ^b	5.16±0.05 ^b
	1	57.73±0.14 ^c	1.60±0.02 ^b	5.18±0.04 ^b
	1.5	57.44±0.04 ^c	1.61±0.01 ^b	5.37±0.06 ^c
80:20	0.5	58.24±0.13 ^d	1.71±0.01 ^c	5.52±0.05 ^d
	1	58.53±0.24 ^d	1.85±0.02 ^d	5.70±0.03 ^e
	1.5	58.93±0.12 ^e	1.93±0.04 ^e	5.95±0.01 ^f

Note: 1) TS: TT = Sorghum flour: Wheat flour, 2) KK = Carrageenan concentration, 3) different notations show a significant difference ($p \leq 0.05$).

The water content of the patin fish burger patty increased with the addition of carrageenan. This happens because of the high insoluble dietary fiber owned by carrageenan so that it can bind water and trap in the matrix after the formation of the carrageenan gel. Therefore, the amount carrageenan was used, the less the amount of water bound during the cooking process (Trisnawati & Nisa, 2014).

The ash content of the patin fish burger patty (Table 2) ranged from 1.33% to 1.93%. Based on the analysis of variance, it can be seen that there was a significant interaction ($p \geq 0.05$). This is because sorghum flour and carrageenan contain minerals, so the higher the addition of sorghum flour and carrageenan, the higher the ash content. According to (Astawan & Leomiro, 2009), sorghum flour has an ash content of 3.25%, while wheat flour has an ash content of 1.94% (Hafiludin, 2012). The increase in the ash content of the burger patty added with sorghum flour was due to the high mineral content of sorghum flour (Wibowo, 2016), stated that the mineral content in sorghum includes phosphorus 64mg/100g, calcium 45mg/100g, and iron 1.4mg/100g.

The fat content of the patin fish burger patty in Table 2. ranges from 5.03% to 5.95%. Based on the analysis of variance, it can be seen that there was a significant interaction ($p \geq 0.05$). The higher addition of sorghum flour or the lower the addition of wheat flour and the higher the concentration of carrageenan, the fat content of the burger patty will increase starch granules that swell and enter the surrounding fluid. Amylose can absorb lipids, during the gelatinization process swelling occurs which eventually forms a cavity or pore. These pores allow lipids to enter to replace the evaporated air. Amylose has the ability to bind lipids in starch, thereby increasing the fat content of the product. This was supported by (Polnaya et al., 2012) that fat binds non-polar components through hydrophobic bonds. There is a complex form of bond between amylose starch and fat, namely between the hydrocarbon chains of fat and amylose starch

The greater the concentration of carrageenan used, the fat content in the burger patty will increase. This is because carrageenan can bind into compounds that have polar and non-polar groups in the materials that the fat content in the burger patty will increase. This was the statement of (N. S. Putri, 2018), which states that carrageenan can stroncanolar and non-polar compounds in materials including fat.

The protein content of the patin fish burger patty (Table 3) ranged from 14.15% to 14.77%. Based on the analysis of variance, it can be seen that there was no significant interaction ($p \geq 0.05$). The addition of sorghum flour to the patty can reduce protein levels because sorghum starch was water-binding so that the water content of the patty is higher so that more protein is dissolved and lowers the protein content of this according to the statement of (Hetharia et al., 2013) that decrease in protein content occurs because the solubility increases so that the protein soluble in water the higher which can reduce protein levels. (Restu, 2012) also stated that protein content was influenced by the amount of flour or starch added, the higher the addition, the smaller the protein content. According to (Kharisma et al., 2016) that carrageenan did not affect the protein content of patin fish patty because the protein content in carrageenan was 2.80%

Table 3. The average content of patin fish burger patty protein content

Sorghum flour: Wheat flour	Protein Content (%)
60:40	14.81±0.05 ^c
70:30	14.75±0.03 ^b
80:20	14.69±0.02 ^a
Carrageenan (%)	Protein Content (%)
0.5	14.58±0.05 ^a
1.0	14.46±0.07 ^a
1.5	14.37±0.03 ^a

Note: The average value followed by different letters means that it is significantly different ($p \leq 0.05$)

Table 4. The average texture, WHC, and starch content of patin fish burger

Variable Change	Penetrometer			
TS: TT (%)	KK (%)	Texture (mm/gr/sec)	WHC (%)	Starch Content (%)
60:40	0.5	0.16±0.01 ^c	19.27±0.03 ^c	18.22±0.03 ^f
	1	0.19±0.09 ^d	26.41±0.02 ^d	14.63±0.03 ^c
	1.5	0.19±0.06 ^f	28.06±0.03 ^e	11.07±0.05 ^a
70:30	0.5	0.15±0.08 ^b	16.33±0.03 ^b	20.99±0.06 ^h
	1	0.13±0.09 ^c	16.50±0.06 ^b	17.43±0.10 ^e
	1.5	0.17±0.02 ^e	17.76±0.07 ^b	13.82±0.09 ^b
80:20	0.5	0.07±0.05 ^a	12.30±0.08 ^a	23.10±0.04 ⁱ
	1	0.09±0.04 ^b	12.41±0.05 ^a	19.97±0.15 ^g
	1.5	0.09±0.05 ^c	13.85±0.03 ^a	16.49±0.04 ^d

Note: 1) TS: TT = Sorghum flour: Wheat flour, 2) KK = Carrageenan concentration, 3) different notations show a significant difference ($p \leq 0.05$)

The penetrometer texture of the patin fish burger patty in Table 4 can be seen to range from 0.07 mm/gr/sec to 0.19 mm/gr/sec. Based on the analysis of variance, it can be seen that there is a significant interaction ($p \geq 0.05$). The lower the proportion of sorghum or the higher the flour, the better the texture of the burger patty, and the higher the concentration of carrageenan, the better the texture of the burger patty.

High amylopectin in wheat flour can form a chewy product or the texture becomes more dense and compact, but carrageenan increases the juiciness and makes the patty less dry because carrageenan is easily soluble in water.

This was by (Ruiz-Capillas et al., 2012), that amylopectin and water content will affect the texture of the product. The texture was also influenced by the composition of the material, the conditions of homogenization, and the processing process.

Sorghum flour or wheat flour has a function as a filler because the amylopectin content was higher than the amylose. According to (Mentari, 2016), starch that contains higher amylopectin will form a sticky product or a denser and compact texture. Both sorghum flour and wheat flour has a role to improve the texture of the burger so that the texture formed will be denser and draw water from the dough. In addition, it has the function to increase the water holding capacity so that the texture formed will be better along with the increase in the concentration of given sorghum flour.

Table 4 shows that the WHC patty of patin fish burgers ranged from 12.30% to 28.06%. Based on the analysis of variance, it can be seen that there was a significant interaction ($p \geq 0.05$). The

relationship between the treatment of proportions of sorghum flour and wheat flour with the addition of carrageenan to the WHC patty fish burger can occur because along with the increasing use of the concentration level of sorghum flour, the proportion of protein in the burger patty was getting lower so that with decreasing protein content it will reduce water holding capacity. Protein serves as a binder in the emulsion process and as a binder or water retainer. This was by (Trisnawati & Nisa, 2014) the more flour was added to the dough, the less protein content will be so that the water holding capacity decreases.

The addition of carrageenan concentration can affect the increase in water holding capacity because it acts as a binding agent. This happens because carrageenan contains higher insoluble dietary fiber so that it can bind water and trap in the matrix after the formation of carrageenan gel (Trisnawati & Nisa, 2014).

Based on Table 4, the starch content of patin fish burgers ranged from 11.07% to 23.1%. Based on the analysis of variance, it can be seen that there was a significant interaction ($p \geq 0.05$). The higher the addition of sorghum flour and the lower the addition of flour, the higher the starch content of the burger patty. This happens because sorghum and wheat flour are sources of starch with high starch content, while carrageenan is not a source of starch because the dominant components of carrageenan are minerals and water.

Based on the results of the analysis, the sorghum flour used has a starch content of 80.41%, and the wheat flour used has a starch content of 78.71%. Starch is a carbohydrate that plays a major role in determining the dough properties of foodstuffs. The main components in the formation of starch are amylose and amylopectin. (Gaonkar et al., 2010) stated that the sorghum flour dough has characteristics as filled gels in which the sorghum flour granules spread with a matrix that is interconnected between proteins. Proteins can interact with water or react with other components that have the same characteristics (ionic bonds or H bonds) and as polar residues that can bind water and interact as other non-polar residues (via hydrophobic reactions).

Sensory characteristics of patin fish burger patty

Table 5 shows that the value given by the panelists to the level of preference for the color of the burger patty ranged from 2.9 to 3.55. The treatment of proportions of sorghum flour and wheat flour (70:30) and the addition of carrageenan concentration (1.5%) of 3.55 resulted in the burger patty color with the highest level of preference.

The results of the color test show that the higher the addition of sorghum flour can affect the color of the resulting burger patty. The added sorghum flour in the dough affects the appearance of the patty from a low-fat content so that the product does not dry out. If the product has low-fat content, it can produce an unattractive product. This is by the opinion of (Lengkey & Balia, 2014) which state that if the fat content of the product is low, it will reduce the display value of the product. In addition, the cooking process can also change the color of the product.

This is caused by the loss of some pigment due to the release of cell fluid during cooking or processing, the color intensity decreases. The color of the patty burger product can also be influenced by the color quality of the raw material, in this case, patin fish meat.

In Table 5, it is known that the value given to the panelists on the level of preference for the taste of the burger patty ranges from 3.5 to 4.425. The treatment of proportions of sorghum flour and wheat flour (70:30) and the addition of carrageenan concentration (1.0%) of 4.425 resulted in the patty burger taste with the highest level of preference.

Table 5. The average hedonic score of texture, aroma, score, and taste of patin fish burger patty.

Variable Change		Hedonic score of		
TS: TT (%)	KK (%)	Color	Flavor	Aroma
60:40	0.5	3.25	3.50	3.30
	1	3.20	3.55	3.05
	1.5	2.90	3.60	4.00
70:30	0.5	3.15	4.15	2.95
	1	3.30	4.25	4.10
	1.5	3.55	3.95	2.75
80:20	0.5	3.10	3.75	3.75
	1	3.35	3.75	3.05
	1.5	2.90	3.90	3.50

Note: 1) TS: TT = Sorghum Flour: Wheat Flour, 2) KK: Carrageenan Concentration, 3) The higher the total aroma ranking, the more preferred the panelists are

Wheat flour has a neutral taste so it doesn't affect the taste, but the addition of sorghum flour will give the product a savory taste. The increasing concentration of sorghum flour and carrageenan were added, panelists tend to dislike it because it adds a bitter taste to the patty. According to (Ismail et al., 2016), generally, three kinds of flavors determine consumer acceptance, namely savory, salty, and the taste of the main ingredients used. Factors that influence the taste are chemical compounds, temperature, consistency, and interaction of food with other flavor components as well as the type and duration of cooking. Taste attributes were largely determined by the formulation used and most are not influenced by the processing of a food product (Wuryastuty, 2012).

In Table 5, it is known that the value given by the panelists on the level of preference for the aroma of the burger patty ranged from 2.75 to 4.1. The treatment of proportions of sorghum flour and wheat flour (70:30) and the addition of carrageenan concentration (1.0%) of 4.1 resulted in the aroma of a burger patty with the highest level of preference.

Based on the results of the study showed that the addition of the amount of sorghum flour and wheat flour with the appropriate proportions can affect the preference for the aroma of the patty. In addition, raw materials also affect the aroma, it was known that the meat of patin fish has a distinctive aroma. According to (Asrawaty, 2018), the aroma of a burger patty was influenced by the type of meat used, and the ingredients added during cooking and the higher amount of flour will affect the aroma of the burger patty. Using too much flour will mask the aroma of the burger patty.

Determination of the Best Treatment

Determination of the best treatment can be seen in (Table 6) done by the scoring method. The data needed for decision analysis are aspects of quantity and aspects of quality. The quantity aspects include water content, protein content, fat content, texture, while the quality aspects of the organoleptic test include color, taste, and aroma. Determination was done by assigning a score to each average of the results of the analysis of the response and assigning a ranking to each sample that has the lowest to the highest score. The sample with the highest score was the sample with the highest ranking and automatically becomes the selected product. The selected sample will be analyzed for dietary fiber.

Table 6. Determination of the best formula using the effective index method.

No	T	Respon														JS		Rank
		Color	Flavor	Sc ent	Moisture (%)		Protein (%)		Fat (%)		Texture (mm/gr/dt)		WHC (%)		Pati (%)			
		S	S	S	R	S	R	S	R	S	R	S	R	S	R	S		
1	A1B1	3,3	3,3	3,6	55,7	5	14,8	1	5,0	5	0,16	3	19,2	4	18,2	3	32,3	4
2	A1B2	2,9	2,8	3,2	56,7	4	14,7	3	5,2	5	0,19	2	26,4	2	14,6	4	29,0	9
3	A1B3	3,6	3,5	3,6	57,1	4	14,6	2	5,2	5	0,19	2	28,1	1	11,1	5	29,8	8
4	A2B1	3,7	3,4	3,6	57,4	3	14,5	3	5,1	5	0,15	3	16,3	4	20,9	2	30,8	7
5	A2B2	3,8	3,8	3,7	57,7	3	14,4	3	5,1	5	0,13	4	16,5	4	17,4	3	33,4	1
6	A2B3	3,6	3,5	3,6	57,4	3	14,4	4	5,3	4	0,17	2	17,7	4	13,8	5	32,9	2
7	A3B1	4,0	3,8	3,9	58,2	2	14,3	5	5,5	3	0,07	5	12,3	5	23,1	1	32,7	3
8	A3B2	3,8	3,2	3,7	58,5	2	14,2	5	5,7	2	0,09	5	12,4	5	19,9	2	31,8	5
9	A3B3	3,6	3,5	3,6	58,8	1	14,1	5	5,9	1	0,09	5	13,8	5	16,5	4	31,7	6

Based on the results of the analysis carried out in Table 6, the burger patty with the proportion treatment of sorghum flour and wheat flour (70:30) with the addition of carrageenan concentration (1.0%) was a product that can be accepted by consumers with a chemical composition of 57.74% water content, protein content 14.47%, fat content 5.18%, Texture 0.13 mm/g/sec, WHC 16.50%, starch content 17.43% Color 3.87, Taste 3.82, Aroma 3.75 This alternative was next will be continued with an analysis in the form of dietary fiber in the burger patty.

Food Fiber analysis

Based on Table 7, the burger patty treated with the proportions of sorghum flour and wheat flour (70:30) with a carrageenan concentration of 1.0% contained $2.21 \pm 0.1\%$ dietary fiber.

Dietary fiber content was influenced by sorghum flour as a raw material added to the patin fish burger patty product in the best treatment, which is 80%. (Pangan & Penyuluhan, 2012), stated that sorghum flour is a type of gluten-free cereal that contains high protein, dietary fiber, and iron. Sorghum flour can be used as a mixture of other cereals or as a substitute because sorghum flour has a nutritional content that is not inferior to other cereals. 100 g of sorghum flour contains 11.3 g of protein, 2.3% dietary fiber, and 4.4 mg of iron, higher than wheat flour, rice flour, and corn flour. The crude fiber contained in the patin fish burger patty can be used as an index of dietary fiber content. Because basically, the fiber content of food is higher than crude fiber. During the heating process, the crude fiber does not change because the crude fiber can only be degraded by strong acids and strong bases. The main content of crude fiber is cellulose.

Table 7. Results of Food Fiber Analysis of burger patty on proportions of sorghum flour and wheat flour with carrageenan concentration

Treatment		
Sorghum Flour: Wheat Flour	carrageenan	Food Fiber (%)
70: 30	1.0%	2.21 ± 0.1

CONCLUSION

Based on the results of the decision analysis, the best treatment for patty burgers that can be accepted by consumers was the proportion of sorghum flour and wheat flour (70:30) with the addition of 1.0% carrageenan concentration with a chemical composition of 57.73% water content, 17.03% protein content, 5.18% fat content, 0.13 mm/g/sec texture, WHC 16,50%, starch 17,43% Color 3.87, Taste 3.82, Aroma 3.75 This alternative will then be continued with an analysis of dietary fiber in the burger patty with a yield of 2.21%.

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