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Acceptance of Elementary School Children on Tilapia Fish and Sardinella Fish Flour Based Biscuits

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INTRODUCTION

Due to the uncontrollable increase in the world population today, food innovation is direly needed to balance the needs of the population. The availability of required foods must satisfy the adequacy, both in quantity and quality. High-quality food material will support the achievement of qualified human resources, and ultimately will accelerate the settlement of issues arising in the community[1][2]

The availability of foodstuff around that has not been utilized fully is freshwater fish (tilapia fish/*Oreochromis mossambicus*), and saltwater fish (sardine/*Sardinella aurita*) [3][4]

Type of fishes that are quite dangerous, because fishes contain many bones[5], [6]

1. Easy to obtain and easy to find in the market, relatively cheap prices
2. High nutritional value (especially protein, calcium, zinc, and iodine) [5], [6]

The fact is, in the community, those two ingredients are not being utilized fully e ven though the nutrition, amount, and pr ice of that ingredient are very afforda ble, but the bones are very risky to be c onsumed directly, especially for sardine s [1].

a formulation of high nutritional additional meal in biscuit form by utilizing tilapia fish and sardines are needed

Biscuit has advantages, such as small size, the shelf life is relatively long, and well received by the community

OBJECTIVE

This study aimed to analyze the acceptance of Tilapia fish and Sardinella fish flour based biscuit

RESEARCH DESIGN

Material

The main ingredients in the study were wheat flo ur, cornstarch, tapioca starch, tilapia fish four, S ardinella fish flour, yolk, sugar, vanilla extract, a nd baking powder..

Research Phase

The first → a recipe standardization,
The second → biscuit formulation process by using the chosen recipe.
The third → the choosing of biscuit formulation to get the best formula,
The fourth → phase is the student's approval on the best biscuit and the comparison with biscuit control.

Data Collection

The data for recipe standardization is collected based on the standard biscuit quality after the formulation of the amount and the biscuit ingredient. Standard biscuit quality uses seven hedonic quality scale by the quality of color indicator (very dark-very light), aroma (fragrant – not fragrant), texture (very hard-very soft), and taste (very tasty-not very tasty), as well as the overall quality of the biscuits (very good-not very good) [1]

Data Analysis

Data analysis used in this research is Kruskal-Wallis by analyzing the biscuit quality value (color, aroma, texture, taste, overall, and favorite) given by trained panelist and target panelist, and elementary school student of SD Lamasi for targeted organoleptic test panelist

RESULTS

The research result includes the first phase (recipe standardization), the second phase (biscuit formulation), the third phase (choosing best formulation), and fourth phase (approval of elementary school student on best biscuit).

Table 1. Biscuit recipe standardization and Formulation

Ingredients	Phase 1	Phase 2						Phase 3					
	(g)	F0	F10	F20	F30	F40	F50	F0 (Control)	F42	F43	F44	F45	F46
Wheat flour	62	62	55	40	42	52	30	30	28	28	28	28	28
Cornstarch	8	9	7	4	6	8	10	10	10	9	9	9	9
Tapioca starch	8	8	7	4	5	7	7	7	5	6	6	6	6
Tilapia fish flour	0	0	4	8	6	0	0	0	2	2	3	2	3
Sardinella fish flour	0	0	0	0	0	0	0	0	2	2	3	3	1
Margarine	12	12	12	12	12	12	12	12	12	12	12	12	12
Yolk	14	14	17	20	25	26	29	29	29	29	29	29	29
Refined sugar	12	12	12	12	12	12	12	12	12	12	12	12	12
Total (g)	100	100	100	100	100	100	100	100	100	100	100	100	100

Table 2. Modus, Panelist's percentage, and Mean rank of biscuit approval

Attribute	F0	F10	F20	F30	F40	F50	F0	F42	F43	F44	F45	F46
Color	4(52.9)	3(47.1)	3(50.0)	3(47.1)	4(58.8)	4(41.2)	54.9^a	40.4^b	21.7^a	72.4^c	59.3^{bc}	51.7^a
Aroma	4(41.2)	4(41.2)	5(35.3)	6(35.3)	5(52.9)	5(47.1)	72^b	54.4^b	37^a	54.3^a	41.3^a	53.2^a
Texture	5(29.4)	4(41.2)	4(35.3)	5(41.2)	5(29.4)	5(35.3)	57.7^a	43.8^a	56^a	48.3^a	45.1^a	54.2^a
Taste	5(41.2)	4(41.2)	4(41.2)	3(35.3)	6(35.3)	4(35.3)	51.6^b	47.7^b	40.2^a	48.4^{ab}	63.4^b	57.7^b
Overall	5(41.2)	4(47.1)	4(47.1)	4(35.3)	5(41.2)	4(28.4)	66.1^b	41.8^a	42.0^a	67.1^b	56.1^{ab}	53.9^a
Preference	7(70.6)	6(35.3)	6(47.1)	7(41.2)	7(70.6)	7(35.3)	73.2^c	37.1^a	43.8^{ab}	58^{ab}	55.1^{ab}	51.9^a

Remark: Superscript letter on the same row does not show any difference

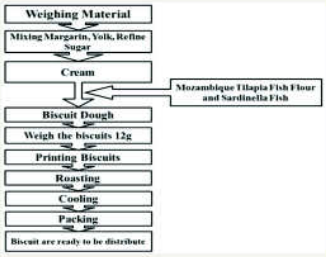

Figure 1. Biscuit Production Process

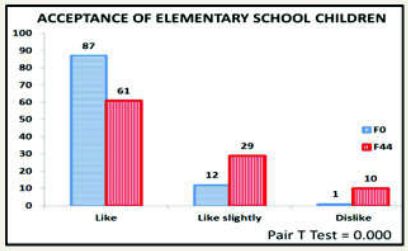

Figure 2. The Reception of Elementary School Students toward selected

CONCLUSION

The reception of elementary school students toward nutritious tilapia fish flour and sardine flour based biscuit started with recipe standardization, biscuit formulation, biscuit reception, and the level of preference by elementary school students toward biscuits. Standardized recipe (F0) generated is 47 gr of flour, 30 gr of wheat, 10 gr of corn starch, 7 gr of starch, 12 gr of margarine, 29 gr of egg yolk, and 12 gr of powdered sugar. The selected biscuit formulation (F44) is with the addition of 1 gr of tilapia fish flour, 3 gr of sardine fish flour, and other ingredients such as 28 gr of flour, 9 gr of corn starch, 6 gr of starch, 12 gr of margarine, 29 gr of egg yolk, and 12 gr of powdered sugar. The preference level of elementary school students toward the selected biscuits in the category of favorable reached the number of 61%, showing that the biscuit is well received by elementary school students

ACKNOWLEDGMENT

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Acceptance Of Elementary School Children On Tilapia Fish And Sardinella Fish Flour Based Biscuits

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Abstract-Biscuits are snacks preferred by all people, particularly elementary school children. Tilapia fish and Sardinella fish flour based biscuits is potential to improve nutritional status and academic performance of elementary school children. This study aimed to analyze the acceptance of Tilapia fish and Sardinella fish flour based biscuits. This experiment was conducted on January-April 2017 in Cullinary Laboratory of Makassar State University and elementary school in Luwu District. Data was obtained using 7-scale hedonic test on color, aroma, texture, taste, overall, and 11-scale preference test to 25 trained panelists and 100 elementary school children. Data was analyzed using kruskal-walis test. The result showed that the formula with the highest mean rank was F44, significantly (p<0.01) different from other 5 formula and 1 control. Composition of F44 are: 28 g of wheat flour, 9 g of cornstarch, 6 g of starch, 1 g of Tilapia fish flour, 3 g of Sardinella fish flour, 12 g of margarine, 29 g of yolk, and 12 g of refined sugar. The quality of F44 are: a bit dark brown color, good aroma, a bit hard texture, good taste, overall good and preferable

Keywords-component; Acceptance; Biscuits; Sardinella Fish Flour; Tilapia Fish Flour

I. INTRODUCTION

Due to the uncontrollable increase in the world population today, food innovation is direly needed to balance the needs of the population. The availability of required foods must satisfy the adequacy, both in quantity and quality. High-quality food material will support the achievement of qualified human resources, and ultimately will accelerate the settlement of issues arising in the community[1][2].

Food sources of high quality should not be obtained based on the origin (import) or the prices, but on the optimization of availability of the environment around the community. The availability of foodstuff around that has not been utilized fully is freshwater fish (tilapia fish/*Oreochromis mossambicus*), and saltwater fish (sardine/*Sardinella aurita*)[1][3][4][5][6]

The famous type of fish is freshwater fish and saltwater fish. Freshwater fish is fish that lives in a pond, lake, river. One of the examples is tilapia fish. Saltwater fish is fish that lives in the sea, such as sardine. Both types of fishes is easy to obtain and easy to find in the market, with relatively cheap prices. However, it gets stale easily. Fish is a crop that easily gets stale, hence a special handling in maintaining its quality. One way is to conduct a heat process or more well-known as cooking. There is two type of fish dishes, i.e. dry dishes and wet dishes. Dry heat dishes are dish cooked without water, such as frying and roasting. Moist heat dishes are dish cooked using water, such as boiling and steaming [3][4][6][7][8].

Tilapia fish and sardine are types of fishes that contain high nutritional value, especially protein, calcium, zinc, and iodine. However, both are the type of fishes that are quite dangerous if consumed carelessly. Because both fishes contain many bones, special processing is needed so the bones would not cause injury to those who eat it. One of the efforts of special processing is by drying, frying, or by high pressure steaming (presto). Another alternative to utilize the nutritional function from those fishes is

to make fish flour, so that the fish flour can be substituted into various food [4][6][7][8].

The fish flour is produced by all parts of fish, such as the head, meat, tail, bones, and other viscera. Since the demand of fish flour is quite high, the fish side products that are previously often being discarded become the basic ingredients for fish flour. This may influence the composition and quality of fish flour generally. High-quality fish flour can be seen by the white color, smell like fresh fish/not fishy, and smooth. High-quality fish flour will improve the fish economic value [1] [6][7][8].

Sardine is a type of fish that contain high nutritional value, especially protein, calcium, zinc, and iodine. However, both are the type of fishes that are quite dangerous if consumed carelessly. Because the fish contains many bones, special processing is needed so the bones would not cause injury to those who eat it. One of the efforts of special processing is by drying, frying, or by high pressure steaming (presto). Another alternative to utilize the nutritional function from those fishes is to make fish flour, so that the fish flour can be substituted into various food [1] [6][7][8].

The fact is, in the community, those two ingredients are not being utilized fully even though the nutrition, amount, and price of that ingredient are very affordable, but the bones are very risky to be consumed directly, especially for sardines [1] [6][7],

Based on that fact, a formulation of high nutritional additional meal in biscuit form by utilizing tilapia fish and sardines are needed. Biscuit has advantages, such as small size, the shelf life is relatively long, and well received by the community. Biscuit produced by manufacturers nowadays has not been enriched with high nutritional local crops such as tilapia fish and sardines. This study aimed to analyze the approval of Tilapia fish and Sardine fish flour based biscuits.

II. LITERATURE REVIEW

A. *Tilapia Fish*

Tilapia fish the comman name for nearly a hundred hundred species of cicihlid fish from the tilapiine cichild tribe. Tilapia are mainly freshwater fish inhabiting shallow streams, ponds, rivers and lakes and less commonly found living in brackish water. Historically, they have been of major importance in artisan fishing in Africa and the Midle East, and they are of increasing importance in aquaculture and aquaponics. Tilapia can become problematic invasive species in new warm-water habitats such as Australia, whether deliberately or accidentally introduced, but generally not in temperate climates due to their inability to survive in cold water.

Tilapia typically have laterally compressed, deep bodies. Like other cichlids, their lower pharyngeal bone are fused into a single tooth-bearing structure. A complex set of muscles allows the upper and lower pharyngeal bones to be used as a second set of jaws for processing food, allowing a division of labor between the "true jaws" (mandibles) and the “pharyngeal jaws”. This means they are efficient feeders that can capture and process a wide variety of food items. Their mouths are protrusible, usually bordered with wide and often swollen lips. The jaws have conical teeth. Typically tilapia have a long dorsal fin, and a lateral line which often breaks towards the end of the dorsal fin, and starts again two or three rows of scales below. Some Nile tilapia can grow as long as two feet[4].

B. *Sardinella Fish*

The round sardinella (*Sardinella aurita*) is a species of ray finned fish in the genus sardinella found in both sides of the Atlantic Ocean and the Mediterranean Sea *S. aurita* went through a large boom in catch population around 1990. However, its numbers have been very stable through the last several years. *S. aurita* inhabits warm waters. It is a small, pelagic species that lives in tropical and subtropical waters of the western and eastern Atlantic Ocean, the Pacific Ocean, the Mediterranean, and occasionally, the Black Sea. The gonads start to develop in April and are fully mature one month later. Plankton in spawning regions are full of eggs and larvae from the end of June into September[9]. *Sardinella aurita* has a particularly elongated body, a relatively rounded belly, and a large number of fine gill rakers (up to 160). This is one of the largest *Sardinella* species, averaging 23 to 28cm. It has eight pelvic fin rays. It

has frontoparietal stripes on the top of its head, a faint golden midlateral line, and a distinctive black spot on the hind border of the gill cover. It is often caught along with sardinella longiceps, and the two are not easily distinguished[9][10]

C. *Fish Flour*

The process of making fish meal was to clean the fish from dirt, separate the head, gill, innards, tail and fin. This cleaning stage was aimed to omit unused elements with very poor nutrient content which can reduce the quality of the material. The second stage was steaming using 85$_o$C temperature for 60 minutes. This steaming was aimed to maintain natural flavor of the food by transferring the heat by convection from hot fume to the food. The third stage was mincing the fish with aim to accelerate drying process of the fish. The fourth process was drying using 70$_o$C temperaure during 5, 6 and 7 hours. The fifth process was straining. This process was aimed to produce homogenous flour particle which was used for biscuit making. The straining used 70 mesh strainer (equivalent with wheat flour particle).

Characteristic of all produced fish flour was light brown in terms of color. This was due to basic color of fish and heating process of carbohydrate resulting in light brown color. The flavor of the fish was little bit good, while the texture was fine. This was due to grinding and straining process using 70 mesh strainer.

Yield was the important parameter to know economic value and effectiveness of the process of the product. Yield calculation was based on ratio between final weight and initial weight. More the yield of a product, higher the economic value and the effectiveness of the process

D. *Biscuit*

Biscuit is short dough which was characterized as inelastic dough. Gluten production in the dough was minimized, resulting in moistened dough. The first stage in biscuit formulation was mixing process. Mixing process was divided into two stages, namely cream formation and dry material mixing. In cream formation process, margarine was mixed in medium speed, added by sugar, and mixed with yolk in high speed. Browning cream was added by baking powder and vanili before it was mixed with in medium speed[11][12].

As the next stage, wheat flour was added to the cream and mixed until moistened. Overmixing may enable gluten matrix formation. Therefore, in order to produce high quality biscuit, the mixing was done minimumly. This two stage mixing process is recommended for biscuit formulation since it can reduce gluten formation[11][13].

III. METHOD

A. *Type of research, Studi Time and Place*

This research is an experiment description research by experimenting formulation of fish flour based on tilapia fish and sardine based on wheat flour. The design in this research is non-factorial completely randomized design. The choice is based on the previous research, which stated that the use of fish flour on nutritional biscuit is 12 gram in 100 gram of biscuit ingredient. The utilization of flour that exceeds 12 gram in 100-gram biscuit does not have good quality, especially on the fishy aroma, hence the biscuit was not well received by the panelist. The research was conducted for 4 months, from February 2017 until May 2017. The research was conducted at FT UNM Concentrated Culinary Art Laboratory to formulate the biscuit and to do organoleptic test for trained panelist, and elementary school student of SD Lamasi for targeted organoleptic test panelist.

B. *Material*

The main ingredients in the study were wheat flour, cornstarch, tapioca starch, tilapia fish four, Sardinella fish flour, yolk, sugar, vanilla extract, and baking powder. The tools were spoon, spatula, knife, washbowl, pan, frying pan, blender, mixer, biscuit print, flour strainer, kitchen scale and oven.

C. *Research Phase*

The research is carried out in a few phase. The first phase is a recipe standardization recipe, conducted by the previous researcher (Widodo). The second phase is biscuit formulation process by using the chosen recipe. The formulation is based on the comparison of tilapia fish flour, sardine fish flour, to wheat flour. The third phase is the choosing of biscuit formulation to get the best formula, and the fourth phase is the student’s approval on the best biscuit and the comparison with biscuit control.

D. *Data Collection*

Data collection on this research covers the biscuit recipe standardization, biscuit formulation based on quality and approval, and favorite biscuit chosen by the students. The data for recipe standardization is collected based on the standard biscuit quality after the formulation of the amount and the biscuit ingredient. Standard biscuit quality uses seven hedonic quality scale by the quality of color indicator (very dark-very light), aroma (fragrant – not fragrant), texture (very hard-very soft), and taste (very tasty-not very tasty), as well as the overall quality of the biscuits (very good-not very good).

E. *Data Analysis*

Data analysis used in this research is Kruskal-Wallis by analyzing the biscuit quality value (color, aroma, texture, taste, overall, and favorite) given by trained panelist and target panelist.

IV. RESULT

The research result includes the first phase (recipe standardization), the second phase (biscuit formulation), the third phase (choosing best formulation), and fourth phase (approval of elementary school student on best biscuit). The result can be described as follow:

A. *Biscuit recipe standardization*

Biscuit recipe standardization started from the utilization of existing biscuit recipe by using fish flour ingredient. The recipe was the result of research from Widodo etc. 2015. The recipe is as follows:

Tabel 1. Fish biscuit basic recipe per 100 g of ingredients

Composition	Berat (g)
Wheat flour	62
Margarin	12
Egg yolk	14
Sugar	12
Total	100

Widodo [12]

Based on the organoleptic test for standard biscuit quality, the entire panelist stated that the biscuit quality was not good, the color looked pale, it smelled bad, the texture was hard, and it did not taste well. Overall, the biscuit quality was not good. Based on the initial result, the recipe standardization is conducted by adding some ingredients that may be able to improve the biscuit quality, before then adding the main ingredients of tilapia fish flour and sardines fish flour.

The process to make the biscuits started by weighing all ingredients, and mixing of margarine, sugar, and yolk until they form a mixture of cream, and subsequently mix the cream with flour until it is smooth. Furthermore, weigh each biscuit for 12 grams, and roast them at 150°C temperature for 45 minutes. The biscuit produced will weigh around 9-10 gram. The detailed process of the biscuit production can be seen in the following figure 1

The cooked and ready biscuit will then put into a package and is ready to be distributed to the target. To obtain standard biscuit with the desired quality, the standard ingredients formulation does not change the entire production process. The formulation ingredients are as follow Table 2.

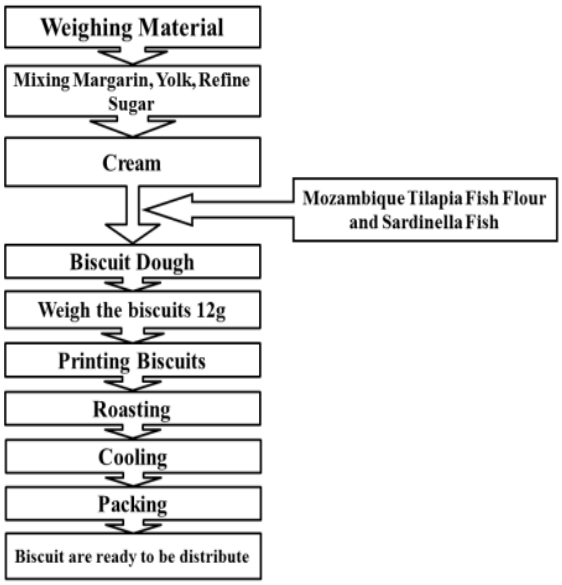

Figure 1. Biscuit Production Process

Table 2. Ingredients Standardization per 100 gram of biscuit

Composition	F00	F01	F02	F03	F04	F05
Wheat flour	62	55	48	42	35	30
Cornstarch	0	2	4	6	8	10
Tapioka starch	0	2	4	5	7	7
Margarien	12	12	12	12	12	12
Egg yolk	14	17	20	23	26	29
Sugar	12	12	12	12	12	12
Total	100	100	100	100	100	100

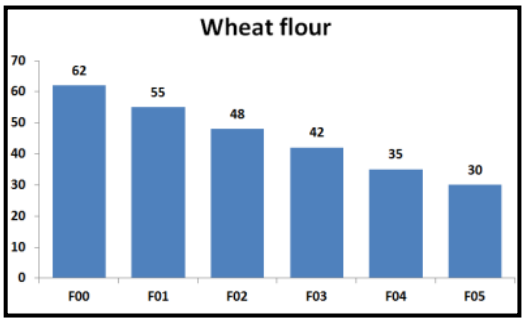

Figure 2. Usage changes wheat flour

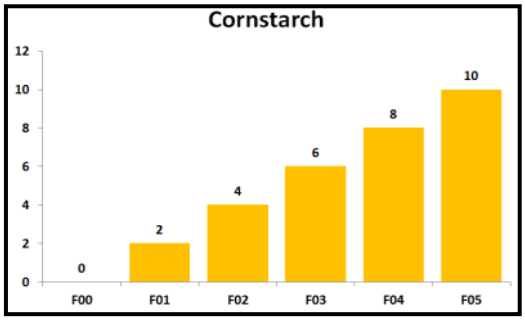

Figure 3. Usage changes cornstarch

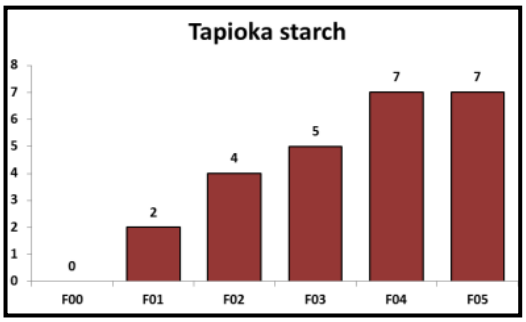

Figure 4. Usage changes tapioca starch

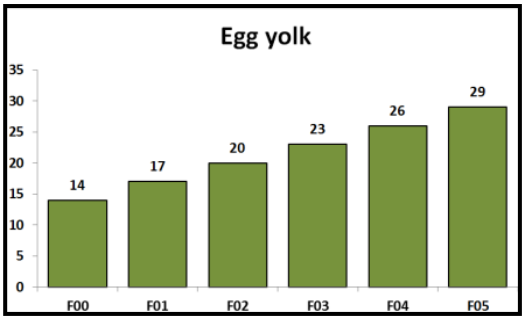

Figure 5. Usage changes egg yolk

Based on the standard recipe formulation using the additional cornstarch and tapioca starch, this recipe is able to improve the biscuit texture quality [13][11][14]. The organoleptic test is conducted on the biscuit produced to 17 trained panelists, and the result can be seen in Table 3.

Table 3. Quality approval and preferences of biscuit standardization

Indicator	F01	F02	F03	F04	F05	Value
Color	64.3^{ab}	57.1^{b}	35.7^{ab}	28.6^{a}	42.9^{a}	0.028
Aroma	50^{a}	35.7^{a}	64.3^{a}	92.9^{b}	100^{b}	0.000
Texture	100^{b}	92.9^{b}	71.4^{b}	14.3^{a}	21.4^{a}	0.000
Taste	7.1^{a}	7.1^{a}	14.3^{a}	100^{b}	92.9^{b}	0.000
Overall	7.1^{a}	14.3^{a}	28.6^{a}	92.9^{b}	100^{b}	0.000
Preference	7.1^{a}	14.3^{ab}	21.4^{ab}	85.7^{c}	100^{d}	0.000

Remark: Superscript letter on the same row does not show any difference

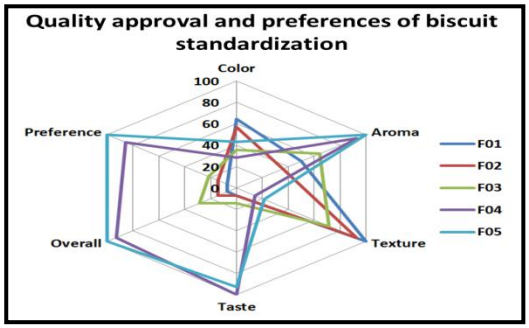

Figure 6. Quality approval and preferences of biscuit standardization

Based on the approval test, the F05 formula is better compared to numerous other formulas for biscuit quality. This standard will be used for the next formulation, and on the next phase, F05 will be renamed into F0 or the standard biscuit formula.

B. *Biscuit Formulation*

Table 4. Second phase-biscuit formulation

Composition	F0	F41	F42	F43	F44	F45
Terigu	30	29	28	26	28	28
Cornstarch	10	10	9	9	9	9
Tapioca starch	7	7	6	6	6	6
Tilapia fish flour	0	1	2	3	1	3
sardinella fish flour	0	1	2	3	3	1
Margarine	12	12	12	12	12	12
Yolk	29	29	29	29	29	29
Refine sugar	12	12	12	12	12	12
Total (100g)	100	100	100	100	100	100

The second phase is the biscuit formulation phase to get the best result by adding main ingredients in this research, i.e. tilapia fish flour and

sardine fish flour. The fish flour substitutes the previously-used flour, i.e. wheat flour, cornstarch, and tapioca starch. The production process did not change. The result of formulation is presented in Table 4.

C. *Best biscuit formula*

To obtain best biscuit approval, 18 trained panelist tested the biscuit using the organoleptic test to assess the biscuit quality produced, on its color, aroma, texture, taste, and overall. The result from the panelist's assessment is presented in the following Table 5.

Table 5. Modus and Panelist's percentage

Idikator	F0	F41	F42	F43	F44	F45
Color	4(52.9)	3(47.1)	3(58.8)	5(47.1)	4(35.3)	4(41.2)
Aroma	6(41.2)	5(41.2)	5(35.3)	6(35.3)	5(52.9)	5(47.1)
Texture	5(29.4)	4(41.2)	4(35.3)	5(41.2)	5(29.4)	5(35.3)
Taste	5(41.2)	4(41.2)	4(41.2)	3(35.3)	6(35.3)	4(35.3)
Overall	5(41.2)	4(47.1)	4(47.1)	4(35.3)	5(41.2)	4(29.4)
Preferen-ce	7(70.6)	6(35.3)	6(47.1)	7(41.2)	7(70.6)	7(35.3)

Table 5 showed that modus on the biscuit color in F41 and F42 is different due to the same assessment on the chocolatey color but with different percentage. Panelist F0, F44, and F45 assessed that the biscuit has natural chocolate color with different percentage as well. The panelist F43 gave the assessment that the color is light chocolate. Based on the Kruskal-Wallis test and Mann-Whitney U Test on Table 6, the color indicator on biscuit does not vary for every formula.

Table 6. Mean rank of biscuit acceptance rank

Indicator	F0	F41	F42	F43	F44	F45
Color	54.5^{a}	49.4^{b}	21.7^{a}	72.4^{c}	59.3^{bc}	51.7^{b}
Aroma	72^{b}	55.4^{ab}	37^{a}	50.1^{a}	41.3^{a}	53.2^{ab}
Texture	57.7^{a}	45.9^{a}	56^{a}	48.1^{a}	45.1^{a}	56.2^{a}
Taste	51.6^{ab}	47.7^{ab}	40.2^{a}	48.4^{ab}	63.4^{b}	57.7^{ab}
Overall	66.1^{b}	41.8^{a}	43.4^{a}	47.1^{ab}	56.8^{ab}	53.9^{ab}
Preference	73.3^{c}	37.1^{a}	43.8^{bc}	50^{ab}	53.3^{ab}	51.5^{a}

Remark: Superscript letter on the same row does not show any difference

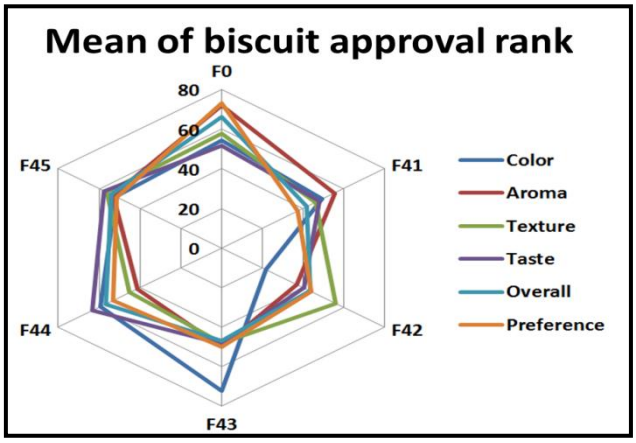

Figure 7. Mean rank of biscuit acceptance rank

D. *The acceptance of elementary school students toward selected biscuit*

Acceptance test for selected biscuits to discover the level of preference among elementary school students toward the generated biscuits was conducted to 100 students from the fourth grade in the Lamasi District, Luwu Regency, South Sulawesi. The preference assessment utilized 3 assessment scales, they are favorable, a bit favorable, and unfavorable [15]. The following Picture 2 illustrates the result:

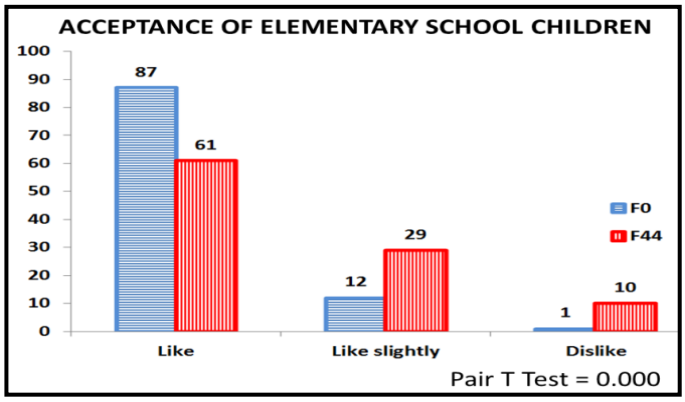

Figure 8. The Reception of Elementary School Students toward selected biscuit

V. DISCUSSION

The biscuit's chocolate color is due to the additional chocolate coloring. The addition of coloring is one of the methods to improve the produced biscuit quality. On the first organoleptic test, there was no coloring and it produced pale/light chocolate color and some feedback from

the panelists. The coloring addition is to improve the attraction for elementary school student that will be the target for biscuit distribution. The difference in color produced on each biscuit is due to the difference in the basic ingredients of the biscuit that contain sugar and protein. The heating process for sugar will result in a change in color to a caramel color, or the occurrence of caramelization. The heating process on protein will result in a decline of protein solubility and emulsion property due to the loss in its liquid nature. Hence, food processing by dry heat will make the food darkened. The more protein inside the food, the darker the food will be [13][11] [16][8][17].

Color is one of the natural looks that may influence one's appetite. There are 5 causes for coloring in food, i.e. pigment, caramelization reaction, Maillard reaction, oxidation, and additive coloring. The approval of color in foodstuff is based on natural factors, such as geography and social aspects [17] [18] .

Based on 17 trained panelists who conducted organoleptic test on the biscuit's aroma on six different formulas. Only F0 and F43 is chosen as the most fragrant biscuit, whilst the other panelists chose moderately fragrant. Based on the Kruskal-Wallis test and Mann-Whitney U Test, the aroma indicator on biscuit does not vary for every formula.

Aroma or smell that is received by the nose is a mix of five different smell, i.e. fragrant, tart, rancid, fishy, and charred. Cooking process with high heat produced strong aroma. The aroma characteristic of fishy fish flour added to the biscuit formula will influence the biscuit produced. The more fish flour utilized, the fishier the aroma will be. The fragrance produced by the biscuit is highly influenced by the temperature of baking[7] [19].

Based on 17 trained panelists who conducted organoleptic test on the biscuit's texture on six different formulas, only F41 and F42 chose the most average textured biscuit (not hard and not soft) whilst the others chose a harder biscuit. Based on the Kruskal-Wallis test and Mann-Whitney U Test, the texture indicator on biscuit does not vary for every formula

A good biscuit texture is an average one (not hard and not soft). Hard biscuit texture and soft biscuit texture will result in the decline of biscuit's approval, because there are only a few biscuits to be consumed. People dislike the soft ones because the biscuit crumbles easily. Hard texture is caused by imprecise ingredients formulation. Generally, it is due to too much sugar or flour hence the biscuit is caramelized or malted. Hard texture can be influenced by the hardening of protein in the used ingredients, as well as the overtime in the process of baking the biscuits. Soft biscuit generally is caused by too much fat in the ingredients, less flour in the composition, and less time in the baking process [12] [13][17] [20][21]

Generated biscuit taste based on organoleptic test out of 17-trained panelists on six formulas fell on F44 that had shown 35.3% in its tastiness level, F43 panelist gave out a displeased review and average review on the rest. Based on Kruskal-Wallis test and Mann-Whitney U follow-up test, taste indicator for biscuits had shown no difference amongst different formulas.

A proper taste for biscuits is sweet, savory and delicious, for biscuits generated from the mix of margarine and fat, existing protein in the main ingredients and additives. The right mix would result in a savory taste and would diminish the fishy taste found in sardines. An excessive addition of tilapia fish flour and sardine flour would result in an unfavorable biscuit taste. Besides that, processing period specifically roasting period and proper temperature would give a maximum result and prevent overcooked and unfavorable biscuit taste or bitter-tasted biscuits. On the other hand, undercooked biscuits would also result in unfavorable biscuit taste [14][18] [20][22]

Panelist's overall assessment showed that F45 and F0 had resulted in a proper quality biscuit that is ready to consume, while other formulas had showed average results. Based on Kruskal-Wallis test and Mann-Whitney U test, taste indicator for biscuits is no different for all formulas.

Overall assessment of biscuits quality based on all indicators of the biscuit, starting from its color, texture and taste, so that the overall assessment or end result of biscuit quality is the fact that the generated biscuits are proper or improper to consume. The result of hedonic quality test showed that F44 biscuit formula with the addition of 1 gram of tilapia fish flour and 3 grams of sardine fish flour

per 100 grams of dough resulted in the highest score and the most frequency given by the panelists

Favored biscuit is a hedonic indicator given by the panelist regarding the level of favorite taste on generated biscuits. Preferences assessment holds 11 assessment scale, they are: extremely unfavorable, highly unfavorable, very unfavorable, unfavorable, a bit unfavorable, average, a bit favorable, favorable, very favorable, highly favorable, and extremely favorable. Based on hedonic test result on Table 5, the highest level of preference falls into the category of a bit favorable and the highest frequency coming from the panelist chose F44 with the percentage of 70.6%, similar to the applied standard of F0. Based on Kruskal-Wallis test and Mann-Whitney U follow-up test, preference indicator on biscuits had shown no differences amongst all formulas.

The level of individual's preference influenced by various factors, among them is panelists' habit in consuming similar products so unfamiliar ingredients did not influence their assessment. The fact that there is an unfamiliar ingredient added in the biscuit had resulted in a moderate result of panelists' level of preference instead of maximum level. Another factor is the product quality that could attract the panelist to consume the product that furthermore would affect their preference on the generated biscuits. Related to the generated biscuit quality, efforts put on making them look interesting by shaping them as stars with the common biscuit color, brown. Another factor is decreasing the negative fragrant that is the fishy aroma by adding vanilla additive to improve panelists' preference toward generated biscuits. Maximum panelists' preference assessment gives out a signal that the general community/target demographic would likely to favor the biscuits as well [11] [22][23] .

Based on the result, the best and most accepted biscuit formula is formula F44. This is based on biscuit quality assessment that had scored the highest and come close to the standard formula that several indicators received similar assessment among the panelists, in the case of coloring, texture and overall assessment. But for taste indicator, F44 had scored higher than the standard formula. In the other hand, F44 scored lower on the fragrance assessment compared to the standard formula, resulted in the similar result on preference level. Based on that, formula F44 is deemed the best among other biscuit formulas. As stated by Rachel Jaenke et al., the reformulated product has to be based on the reception aligned with the original product to determine the properness of formulated product within the community [24]. Stone et al. disclosed similar statement, that formulated result should be better than the original product, or at the very least, holds the same quality and level of reception [15]

Based on Figure 2, the reception of elementary school students toward tilapia fish flour and sardine fish flour added biscuits reached 60%, lower than the reception toward control biscuits. The result shows that elementary school students received the innovated biscuit, based on the research by Widodo et al that stated the minimum 75% score to deem the biscuit is favorable [12]. The fact that some students could not receive the innovation based on the fact that the added ingredient is still unfamiliar and that fish-eating habit is still uncommon in the daily life of elementary school students. This resulted in the less favorable reception toward the biscuit. Czarnacka delivered a similar statement, saying that the discrepancy in the assessment relies on ability, experience and habit of assessor toward assessed products [25]. Joachim J. Schouteten supported the notion that kids and teenagers are heavily influenced by emotional characterization and closeness to the researchers in giving their assessment [26].

VI. CONCLUSION

The reception of elementary school students toward nutritious tilapia fish flour and sardine flour based biscuit started with recipe standardization, biscuit formulation, biscuit reception, and the level of preference by elementary school students toward biscuits. Standardized recipe (F0) generated is 47 gr of flour, 30 gr of wheat, 10 gr of corn starch, 7 gr of starch, 12 gr of margarine, 29 gr of egg yolk, and 12 gr of powdered sugar. The selected biscuit formulation (F44) is with the addition of 1 gr of tilapia fish flour, 3 gr of sardine fish flour, and other ingredients such as 28 gr of flour, 9 gr of corn starch, 6 gr of starch, 12 gr of margarine, 29 gr of

egg yolk, and 12 gr of powdered sugar. The preference level of elementary school students toward the selected biscuits in the category of favorable reached the number of 61%, showing that the biscuit is well received by elementary school students.

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Certificate

THIS CERTIFICATE AWARDED TO:

Slamet Widodo

as

Participant

"at The 5th ASIAN Academic Society International Conference (AASIC)"
Theme : Multidisciplinary Perspective of Local Wisdom: Past, Present, and Future of ASIA
on July 26-27, 2017, Khon Kaen - Thailand.

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Assoc. Prof. Dr. Kittichai Triratanasirichai
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LETTER OF ACCEPTANCE

No. 144/REG/LOA/5AASIC/VI/17

Asian Academic Society International Conference (AASIC)
"Multidisciplinary Perspectives of Local Wisdoms: Past, Present and Future of Asia"
Khon Kaen, Thailand
26-27 July 2017

4th June 2017

Dear **Slamet Widodo, Saifuddin Sirajuddin, Filia Nova, Nahriana**

On behalf of the committee of the 5th Asian Academic Society International Conference (AASIC) 2017, it is out great pleasure to inform you that your abstract has been accepted to bepresented at the conference held at Khon Kaen University, Thailand on 26-27 July 2017. The status of your abstract as follow.

Abstract Title	**: Acceptance Of Elementary School Children On Tilapia Fish And Sardinella Fish Flour Based Biscuits**
Presentation Type	: Poster presentation

The committee now needs to have confirmation from you that you will be able to present your **paper/poster** in a 15 minute allocated time no later than **June 14, 2017.** If we have not received the confirmation by this date, the committee has the right to withdraw your abstract from the conference.

The presenters and participants need to read carefully the guidelines to participate the conference which have been provided in the website. For further information, please visit our website to update the information www.5thaasic.permithakhonkaen.org.

We are looking forward to hearing from you.

With warmest regards,

Agianto, Skep.Ns, MNS, PhD (C)
Chair, Conference Organizing Committee

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