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MODIFICATION OF KOYA NATE (TUNA AND TEMPE) TO IMPROVE NUTRITIONAL VALUE AND ORGANOLEPTIC QUALITY

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Abstract

Background: Indonesia is still faced with the problem of malnutrition, one of which is stunting in children. It is reported that in 2021 the prevalence of stunting in East Java has decreased to 23.5% from 26.86% in 2019. One of the causes of stunting is poor parenting practices. The facts show that 2 out of 3 children aged 6-24 months do not get MP-ASI. The purpose of this study was to analyze the effect of modified koya nate (tuna and tempeh) to increase the nutritional value and organoleptic quality as a complement to MP-ASI to meet protein needs in toddlers. **Materials and Methods:** The research object for stage 1 is koya which is made from processed tuna and tempeh. The design of this study uses the Research and Development (R&D) method, to find formulas and find out processing techniques that are suitable for the development of processed menus and public acceptance. The research steps consist of the following stages: 1) Define, which is looking for a recipe for making koya from processed tuna and tempeh; 2) Design is the stage of designing a recipe for product development with the percentage ratio of ingredients for tuna; tempe is FR 1 100%; 0, FR2 80%; 20%, FR3 70%; 30%, FR 4 60%; 40%; 3) Develop is the stage of conducting laboratory tests; 4) Dissemination is the researcher providing product samples to be tasted. The panelists used were mothers of toddlers as many as 30 people. **Results:** Kandungan protein pada koya Nate antara 21, 83 gr % sampai 26, 72 gr %. Kandungan lemak pada koya Nate antara 15, 4 gr% sampai 28, 11 gr%. Kadar air pada koya Nate dari 4, 60 % sampai 8, 21 %. Kenaikan tertinggi, yaitu hampir sebesar 50 % terdapat pada koya Nate komposisi ikan 100 % serta komposisi ikan 80 % dan tempe 20%. karakteristik rasa, tertinggi penilaian tingkat “sangat suka” adalah pada Nate dengan komposisi 80% : 20%. Hasil statistik uji T2 sampel bebas didapakan perbedaan nilai proximat antara bahan atau adonan Nate dengan koya Nate yang sudah dalam bentuk bubuk, masing-masing pada p = 0,001, 0,005, 0,000 dan 0,002. Hasil statistik uji ANOVA menunjukkan ada perbedaan yang significant kandungan protein pada 4 formula koya Nate (p = 0,000). Demikian pula dengan kandungan lemak, uji statistik menunjukkan perbedaan yang significant koya Nate dengan 4 formula (p = 0,003). Kandungan kadar air dan kadar abu antar formula juga berbeda secara significant, masing-masing dengan p = 0,000 untuk kadar air dan p = 0,002 untuk kadar abu. Hasil analisis Penentuan Koya Nate terbaik diperoleh jumlah skor tertinggi adalah pada Formula 80 %: 20 %. Pendugaan umur simpan pada koya Nate terbaik yaitu formula 80 %: 20 %. **Conclusion:** Koya Nate, which is a processed menu made from tuna and tempeh, is quite easy to make. It has been proven to increase the protein value per 100 grams compared to when it is still in dough form, or like ordinary dishes that are not made in powder form. The Koya Nate formula with added tempeh has a

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higher fat content than that without added tempeh. The shelf life of Koya Nate can be up to 2 months. The form is in the form of powder (koya) and contains protein from fish and tempeh, as well as the use of coconut milk in its manufacture can provide good nutritional value and support as an additional PMT ingredient for preventing stunting toddlers

Keywords: Stunting, Koya Tuna fish and tempeh, Koya NATE, Breast milk complementary foods, Nutritional value, and organoleptic quality

INTRODUCTION

Indonesia is a maritime country, and its marine production continues to increase from year to year. One of the marine products in Indonesia that continues to increase is tuna. Indonesia will produce 358,626.16 tons of tuna in 2021. This number has increased by 19.22% compared to the previous year which was 300,803.5 tons (Widi, 2021). Production continues to increase and is able to encourage the level of public consumption. In addition to its delicious taste, tuna also has a high nutritional content. Tuna is a source of animal protein which contains omega-3 and protein which is quite high at 20% needed by the body. The nutritional composition of tuna is a type of fish that contains low fat (less than 5%) and very high protein (more than 20%).

The protein content in tuna is almost twice as high as the protein in eggs, which is known as the main source of protein. Protein levels per 100 grams of tuna and eggs are 22 g and 13 g, respectively. Tuna fish is also rich in various important minerals that are essential for the body. The iodine content in tuna reaches 28 times the iodine content in freshwater fish. Iodine plays an important role in preventing mumps and increasing children's intelligence. In addition, tuna is also rich in selenium. Consumption of 100 grams of tuna is enough to meet 52.9 percent of the body's need for selenium. Selenium has an important role in the body, namely activating the antioxidant enzyme glutathione peroxidase. This enzyme can protect the body from free radical attacks that cause various types of cancer. Judging from the ratio of potassium and sodium, tuna is good for heart sufferers. This food is classified as healthy food for the heart and blood vessels if it contains a minimum ratio of potassium and sodium of 5 to 1. The ratio of potassium to sodium reaches 6.4:1 in bluefin tuna; 11:1 on skipjack tuna; and 12:1 in yellowfin tuna. Potassium is known to be useful for controlling blood pressure, treating high blood pressure, and cleaning carbon dioxide in the blood. Potassium is also useful for triggering the work of muscles and nerve nodes: High potassium will facilitate the delivery of oxygen to the brain and help expedite the body's fluid balance. The vitamin content in tuna, especially the bluefin species, is very high, reaching 2.183 IU.

Consumption of 100 grams of bluefin tuna is enough to meet 43.6 percent of the body's need for vitamin A every day. Vitamin A is very good for the maintenance of epithelial cells, increasing body immunity, growth, vision, and reproduction. Tuna fish is also a good source of vitamin B6 and folic acid. The World's Health Rating from The George Mateljan Foundation classifies the vitamin B6 content of tuna in the very good category because it has a high nutrient density, which is 6.7 (very good category limit is 3.4-6.7). Vitamin B6 along with folic acid can lower homocysteine levels. Homocysteine is an intermediate

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product component produced during the methylation process. Homosteine is very dangerous for arteries and has the potential to cause heart disease. Although tuna contains cholesterol, it is quite low compared to other animal-based foods. Cholesterol levels in tuna 38-45 mg per 100 grams of meat. The high nutritional content makes tuna very effective in curing various diseases, one of which is stroke. A study that was conducted for 15 years showed that consumption of tuna 2-4 times per week, can reduce the risk of stroke by 27% compared to those who only consume it once a month. Consumption of 5 times or more in each week can reduce stroke by 52 percent. Tuna fish ingredients will be combined with tempeh.

Tempeh is a traditional food made from fermented soybeans or some other ingredients. Fermentation uses several types of Rhizopus mold, such as Rhizopus oligosporus, Rhizopus oryzae, Rhizopus stolonifer and several other types of Rhizopus mold. Where in the fermentation process there will be hydrolysis of complex compounds into simple compounds, so they are good for digestion. Tempe is a food that is rich in dietary fiber, calcium, B vitamins and iron. Tempe apart from being an alternative to meet protein needs, also has medicinal value such as antibiotics to cure infections, antioxidants to capture free radicals. According to Haryoko (2009) in (Dewi & Aziz, 2011), tempeh is generally white in color, due to the growth of mold mycelia which glues the soybean seeds together to form a denser texture. Tempe has a distinctive aroma due to the degradation of the soybean components themselves (Fallis, 2013). In terms of nutritional composition, the levels of protein, fat and carbohydrates between tempeh and soybeans remained relatively unchanged. However, due to the presence of digestive enzymes produced by the tempe mold, the proteins, fats and carbohydrates in tempe are more easily digested than those found in soybeans. Tempe is known as a functional food that contains nutrients and non-nutritional substances in the form of bioactive components that play an important role for health. The popularity of tempeh is increasing as it is known that the composition of vitamin B complex is quite high in tempeh. Tempeh even contains vitamin B12, a vitamin that is generally not found in plant products. Tempe also contains bioactive components, some of the bioactive components in tempe include isoflavones, dietary fiber, ergosterol, the antioxidant enzyme superoxide dismutase (SOD), and some. The combination of tuna and tempeh will be a high source of protein because it comes from animal and vegetable protein. The two main ingredients will be combined to make Koya. The high protein content in tuna and tempeh can be used as a protein source such as Koya.

Koya is an authentic Indonesian food in powder form. Koya is usually added as a seasoning topping. Other seasonings that are commonly used are shredded meat, both fish and meat shredded, and coconut flakes which are used as a flavor enhancer. Koya is preferred because of its distinctive smell and delicious taste, which increases appetite. Currently, people pay more attention to practical foods with high nutrition for a healthy lifestyle (Ngozi et al., 2017). Fish koya is a practical seasoning powder that is highly nutritious. Koya is a powder that is used as a complementary food topping (Handayani and Marwanti, 2011). In general, koya powder is made from crushed shrimp crackers with

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garlic. Koya can increase the savory taste of food, therefore it is necessary to do research on making koya made from fish and tempeh which contain protein nutrients from the koya. The process of making fish koya refers to previous research carried out to modify the processing. Usually the raw materials used for koya are tilapia, catfish, mackerel or tuna. The process of making koya is smoothing all the ingredients, mixing the ingredients, and doing the grinding.

Koya serves as a complement to food, there are many types of koya that can be produced or consumed. These products can be said to be koya derivative products whose appearance and function are similar to koya, namely food additives. Koya products circulating in the community are characterized by their savory taste and strong garlic aroma. Therefore, the minimum nutritional content of koya is not far from the nutritional content of garlic and other ingredients of koya products. Complementary food called koya has been widely circulated in the community. Koya is usually found in instant noodle products. The addition of koya to instant noodles is adopted from Indonesian dishes such as soto. Koya itself is usually made from mashed shrimp crackers. The form is a kind of savory powder that can be sprinkled over food (Apriyanto, 2012). Koya is a savory powder sprinkling or topping as a complement to food. In the Koya study that was carried out by Regina (2012), the basic ingredients used were various kinds of fish and soy flour. Proximate test results showed that fish koya had a moisture content of 13.10–21.21%, an ash content of 5.54–5.99%, a protein content of 27.13–29.83%, a fat content of 15.55–21.76 %, and carbohydrate content 30.28–31.92%.

RESEARCH METHODOLOGY

This research is the first step in research, namely product development in the form of koya snack formulations from processed tuna and tempeh as a complement to complementary foods for breast milk (MP-ASI) to meet the protein needs of toddlers. In this research, the stages were carried out according to the 4D research development model which consisted of 4 main stages, namely (1) Define, (2) Design, (3) Develop, and (4) Disseminate. . In general, the stages in 4D are as follows:

a. Defining Stages (Define)

The purpose of this stage is to establish and define the development requirements, namely to find 4 reference recipes from several sources of literature as material in establishing one reference recipe from the 4 recipes being developed.

b. Stages of design (Design)

This is the stage of designing a recipe for developing a reference product that will be substituted for koya snacks made from processed tuna and tempeh. Different percentages. The percentages used in the Tuna:Tempe ratio are 100%:0%, 80%:20%, 70%:30% and 60%:40%. From the recipes tested, 1 recipe was selected after going through the effectiveness test to be developed at a later stage.

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c. Development stage (Development)

The aim of this stage is to produce a revised formula based on input from experts and the results of field trials. This stage includes validation, laboratory tests, acceptability tests and storage capacities. Validation was carried out by 2 expert panelists (nutritionists) and nutritional analysis tests were carried out at the Saraswanti Laboratory, Surabaya.

d. Stage of deployment (Disseminate)

The disseminate stage is the final stage of stage 1 of this study with the aim of testing product acceptance through a limited scale panelist test. At this stage the researcher gave product samples to be tasted to 30 people in the community, namely mothers of children aged 6-24 months.

Table 1: Composition of Koya Tuna and Tempe per 250 grams with four Comparison Variants

No	Ingredients	F1	F2	F3	F4
1.	Tuna fish (g)/%	250 (100%)	200 (80%)	175 (70%)	150 (60%)
2.	Tempe (g)/%	0 (100%)	20 (20%)	30 (30%)	40 (40%)
3.	Coconut milk (g)	150	150	150	150
4.	Shallot (g)	20	20	20	20
5.	Garlic (g)	40	40	40	40
6.	Candlenut (g)	0,13	0,13	0,13	0,13
7.	Coriander (g)	0,01	0,01	0,01	0,01
8.	Salt (g)	0,07	0,07	0,07	0,07
9.	Ginger (g)	4,3	4,3	4,3	4,3
10.	Galangal (g)	4,7	4,7	4,7	4,7
11.	Salam leaf (lembar)	2	2	2	2
12.	Lime leaves (lembar)	4	4	4	4
13.	Lemongrass leaves (g)	3,3	3,3	3,3	3,3
14.	Brown sugar (g)	32	32	32	32

1. Analysis of moisture content in koya: cup and lid, oven, desiccator, cup clamp and analytical balance (ohauus) Analysis of ash content in fish koya: ashing cup and lid, ashing furnace (neycraft), desiccator, oven, analytical balance (ohauus) and cup tongs
2. Analysis of protein content of koya fish: kjeldahl heater, kjeldahl flask, distillation apparatus complete with Erlenmeyer (pyrex) with a cross section measuring 125 ml, 25 ml burette, analytical balance (ohauus)
3. Fat analysis: soxhlet, desiccator, analytical balance (Ohauss), filter paper. The tools used for sensory analysis are forms, small plates and trays. The tools used for ISL analysis use airtight jars, augers, and aluminum cups.
4. The tool used for making koya is the tempe used is well fermented and not rotten, while the tuna used must be new, fresh, red flesh, firm, red gills, not rotten, 150 ml of

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coconut milk. The spices consist of 20 grams of shallots, 40 grams of garlic, 0.15 grams of candlenut, 0.01 grams of coriander, 4 grams of ginger, 5 grams of galangal, 3.5 grams of lemon grass, 2 bay leaves, 4 lime leaves sheet, brown sugar 32 gr, salt 0.07 gr, cooking oil used coconut oil weighing 2 gr.

Table 2: Methods of Analysis of Koya Tuna and Tempe Research

No.	Test analysis	Method
1.	Sensory Analysis	Hedonic Test (Setyaningsih, 2010)
2.	Water content	Thermogravimetri (AOAC, 1995)
3.	Ash Content	Dry Way (AOAC, 1995)
4.	Protein Content	Kjeldahl-Mikro (AOAC, 1995)
5.	Fat level	Ekstraksi Soxhlet (AOAC, 1995)
6.	Durability estimation	ASLT ISL (Labuza, 1984)

RESULTS

Development of Koya Menu from Processed Tuna and Tempe (Nate)

Tuna, which is a product of marine wealth in Indonesia, has tried to develop its preparations into powder form, which in the East Java region is often called koya. This protein-rich tuna is actually a food ingredient that plays a role in preventing stunting, but in reality its consumption for toddlers is still very minimal. Processing factors that require special handling for toddlers, mother's knowledge and physical condition of fish which tends to give a fishy smell make fish consumption less than optimal for toddlers. For this reason, processing tuna into koya is expected to increase fish consumption for toddlers. Fish koya was tried to be mixed with tempeh in the hope that apart from reducing the fishy smell it could also provide additional vegetable protein nutrients.

The results showed that koya tuna and tempeh with a composition of fish still above 50% were relatively well received by the panelists. The acceptability of the panelists on Koya Nate with the composition of 1) 100% tuna fish, 2) 80% tuna and 20% tempeh, 3) 70% tuna and 30% tempeh and 4) 60% tuna and 40% tempeh gave high yields. Preference for like or good spreads in all compositions of Koya Nate, in terms of taste, texture, aroma and color characteristics. Making Koya Nate is relatively easy and can be done on a household scale, because the equipment and processing techniques are simple and easy to do, just like making food for the family. Apart from tuna and tempeh, Koya Nate also uses coconut milk. The use of coconut milk in addition to delicious taste of koya Nate, can also enrich the fat content of koya Nate, where this fat is very necessary for the growth and development of toddlers, especially toddlers with stunting conditions.

Nutritional Content of Koya Menu from Processed Tuna and Tempe (Nate)

The nutrients analyzed from Koya Nate are two macronutrients that are important for the growth and development of toddlers, namely protein and fat. Koya Nate is a fish food product in powder form. For this reason, the results of the analysis of Koya Nate protein

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with 4 compositions were carried out on the Nate Koya material before it was processed into Koya Nate and after it became Koya Nate in powder form

Table 3: Protein content of ingredients and products from Koya Nate

No.	Product Formulas	Protein content (gr %)			
		Ingredients		Koya Nate	
		Repeat	Average	Repeat	Average
1.	Tuna fish 100 %	I = 13,44 II = 13,79	$\bar{X}$ = 13,62	I = 26,30 II = 27,13	$\bar{X}$= 26,72
2.	Tuna fish 80 % : Tempe 20 %	I = 14,38 II = 14,82	$\bar{X}$ = 14,60	I = 23,05 II = 23,79	$\bar{X}$= 23,42
3.	Tuna fish 70 % : Tempe 30 %	I = 18,80 II = 18,09	$\bar{X}$ = 18,45	I = 24,26 II = 25,14	$\bar{X}$= 24,70
4.	Tuna fish 60 % : Tempe 40 %	I = 15,51 II =15,01	$\bar{X}$ = 15,26	I = 21,47 II = 22,18	$\bar{X}$= 21,83

From the table it can be seen that in all formulas, the protein content of Koya Nate is higher than that which is still an ingredient for making Koya Nate. The protein content in Nate patch ranges from 13.62 gr% to 18.45 gr%, while in Nate patch it ranges from 21.83 gr% to 26.72 gr%. The highest increase, which was almost 50%, was found in Koya Nate with a composition of 100% fish and 80% fish and 20% tempeh.

Fat nutrients are the biggest energy contributor nutrients, because 1 gram of fat will provide 9 calories of energy. Meanwhile, protein and carbohydrates, 1 gram provides energy of 4 calories each.

Table 4: Fat content of ingredients and products from Koya Nate

No	Product Formulas	Fat content (gr%)			
		Ingredients		Koya Nate	
		Repeat	Average	Repeat	Average
1.	Tuna fish 100 %	I = 7,45 II = 7,29	$\bar{X}$ = 7,37	I = 15,84 II = 16,06	$\bar{X}$=15,95
2.	Tuna fish 80 % : Tempe 20 %	I = 13,13 II =13,39	$\bar{X}$ = 13,26	I = 26,50 II = 26,78	$\bar{X}$=26,69
3.	Tuna fish 70 % : Tempe 30 %	I = 19,93 II = 20,06	$\bar{X}$ = 19,99	I = 26,88 II =26,49	$\bar{X}$=26,64
4.	Tuna fish 60 % : Tempe 40 %	I = 18,59 II = 18,42	$\bar{X}$ = 18,51	I = 27,38 II =28,11	$\bar{X}$=27,75

The fat content in Koya Nate is also higher than when it was still an ingredient. The highest increase, which is less than 50%, is found in the 100% fish formula and 80% fish and 20% tempeh. The fat content in Koya Nate ranges from 7.45 gr% to 20.06 gr%, while in Koya Nate it ranges from 15.4 gr% to 28.11 gr%. In addition to the nutritional content, the other ingredients that need to be tested for products in the form of processed products are moisture content and ash content. This is important because the moisture content will

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determine the shelf life. Likewise with the ash content, it is also necessary to analyze it as a standard for determining the feasibility of being accepted as a dry food product in the form of koya.

Table 5: Moisture content of ingredients and products from Koya Nate

No	Produk Formulas	Moisture (gr %)			
		Ingredients		Koya Nate	
		Repeat	Average	Repeat	Average
1.	Tuna fish 100 %	U1= 56,09	$\bar{X}$ = 55,97	I = 8,15	$\bar{X}$= 8,18
		U2 =55,85		II = 8,21	
2.	Tuna fish 80 % : Tempe 20 %	U1= 53,08	$\bar{X}$ = 52,48	I = 7,38	$\bar{X}$= 7,46
		U2 =51,87		II = 7,54	
3.	Tuna fish 70 % : Tempe 30 %	U1= 35,89	$\bar{X}$ = 36,01	I = 6,55	$\bar{X}$= 6,69
		U2 =36,13		II = 6,84	
4.	Tuna fish 60 % : Tempe 40 %	U1= 34,58	$\bar{X}$ = 34,85	I = 4,60	$\bar{X}$= 4,71
		U2 =35,11		II = 4,81	

Reduction in the percentage of water content between the Nate patch materials and the Nate patch by more than 50%. The greatest reduction in water content occurred in formula 1 products, namely Koya Nate with 100% fish ingredients. The moisture content of the Nate patch ranges from 34.58% to 56.09%, while that of the Nate patch ranges from 4.60% to 8.21%.

Table 6: Ash content of materials and products from Koya Nate

No	Product Formulas	Ash content (gr %)			
		Ingredients		Koya Nate	
		Repeat	Average	Repeat	Average
1.	Tuna fish 100 %	U1 = 1,62	$\bar{X}$ = 1,61	I = 3,59	$\bar{X}$= 3,67
		U2 = 1,60		II = 3,74	
2.	Tuna fish 80 % : Tempe 20 %	U1 = 1,90	$\bar{X}$ = 1,93	I = 3,52	$\bar{X}$= 3,59
		U2 = 1,96		II = 3,65	
3.	Tuna fish 70 % : Tempe 30 %	U1 = 1,82	$\bar{X}$ = 1,86	I = 3,25	$\bar{X}$= 3,31
		U2 = 1,89		II = 3,36	
4.	Tuna fish 60 % : Tempe 40 %	U1 = 1,90 U2 = 1,96	$\bar{X}$ = 1,93	I = 2,73 II = 2,85	$\bar{X}$= 2,79

Mother's Acceptance of Koya Tuna and Tempe (Nate)

Koya Nate is a complementary food product for toddlers, especially MP-ASI for children aged 6 – 24 months. Considering that children under five, especially children aged 6-24 months, the determination and provision of food depends on the mother or caregiver, the acceptance test was carried out on mothers of children aged 6-24 months with a total of 30 mothers. Acceptability assessment includes the characteristics of taste, texture, aroma and color.

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Table 7: Distribution of panelists based on the level of preference for Koya Nate flavor

No	Formulas	Level of Taste Preference										Total	
		1		2		3		4		5			
		n	%	n	%	n	%	n	%	n	%	n	%
1.	Tuna fish 100 %	1	3,3	5	16,7	5	16,7	12	40,0	7	23,3	30	100,0
2.	Tuna fish 80 %: tempe 20%	0	0	4	13,3	12	40,0	4	13,3	10	33,4	30	100,0
3.	Tuna fish 70 % Tempe: 30%	0	0	2	6,7	10	33,4	11	36,6	7	23,3	30	100.0
4.	Tuna fish 60 % Tempe 40%	0	0	3	10,0	6	20,0	15	50,0	6	20,0	30	100.0

Characteristics of taste, the highest level of assessment of "very like" is Nate with a composition of 80%: 20%. Among the 4 formulas, only one panelist stated that he really did not like it, namely the 100% tuna formula.

Table 8: Distribution of Panelists based on Liked Texture of Koya Nate

No	Formulas	Texture Likeness Level										Total	
		1		2		3		4		5			
		n	%	n	%	n	%	n	%	n	%	n	%
1.	Tuna fish 100 %	1	3,3	1	3,3	8	26,7	14	46,7	6	20,0	30	100,0
2.	Tuna fish 80 %: tempe 20%	0	0	1	3,2	10	33,4	10	33,4	9	30,0	30	100,0
3.	Tuna fish 70 % Tempe: 30%	0	0	1	3,3	14	46,7	9	30,0	6	20,0	30	100.0
4.	Tuna fish 60 % Tempe 40%	0	0	0	0	7	23,3	18	60,0	5	16,7	30	100.0

Texture characteristics, the highest rating on the level of "very like" is also Koya Nate with a composition of 80%: 20%. The lowest acceptability was seen in Koya Nate with the most tempeh composition formula.

Table 9: Distribution of panelists based on their level of preference for the aroma of Koya Nate

No	Formulas	Texture Likeness Level										Total	
		1		2		3		4		5			
		n	%	n	%	n	%	n	%	n	%	n	%
1.	Tuna fish 100 %	1	3,3	1	3,3	8	26,7	14	46,7	6	20,0	30	100,0
2.	Tuna fish 80 %: tempe 20%	0	0	1	3,2	10	33,4	10	33,4	9	30,0	30	100,0
3.	Tuna fish 70 % Tempe: 30%	0	0	1	3,3	14	46,7	9	30,0	6	20,0	30	100.0
4.	Tuna fish 60 % Tempe 40%	0	0	0	0	7	23,3	18	60,0	5	16,7	30	100.0

For aroma characteristics, the most preferred formula is 60% fish and 40% tempeh, namely the formula with the least fish composition and the most tempeh composition.

Table 10: Distribution of Panelists based on Favorite Color of Koya Nate

No	Formula	Tingkat Kesukaan Warna										Jumlah	
		1		2		3		4		5			
		n	%	n	%	n	%	n	%	n	%	n	%
1.	Ivan tuna 100 %	0	0	4	13,3	7	23,3	13	43,4	6	20,0	30	100,0
2.	Ikan 80 %: tempe 20%	0	0	2	6,6	8	26,7	12	40,0	8	26,7	30	100,0
3.	Ikan 70 % Tempe: 30%	0	0	1	3,3	11	36,7	12	40,0	6	20,0	30	100.0
4.	Ikan 60 % Tempe 40%	0	0	1	3,3	4	13,3	14	46,7	11	36,7	30	100.0

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online): 0493-2137
E-Publication: Online Open Access
Vol:56 Issue:02:2023
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Based on the organoleptic test of color characteristics, it was found that the most preferred formula was a formula with a composition of 60% fish and 40% tempeh, namely the formula with the highest composition of tempeh.

The Effect of Making Fish into Koya Nate on the Proximate Value (Protein, Fat, Moisture Content and Ash Content) of Koya Nate.

Table 11: Statistical Test Results for Differences in Protein Content between Nate Dough and Koya Nate Powder

No	Proximate Value	p	Difference α =0,01
1.	Proteins	0,001	There is a difference
2.	Fat	0,005	There is a difference
3.	Moist	0,000	There is a difference
4.	Ash content	0,002	There is a difference

There was a significant difference in all the proximate values (protein, fat, moisture content and ash content) between the Nate ingredients or dough and the Nate paste which was already in powder form, at p = 0.001, 005, 0.000 and 0.002, respectively.

Table 12: Statistical Test Results for Differences in Koya Nate Protein and Fat Content based on Formulas Made

Formulas	Protein gr %				Fat gr %			
	Repeat	X	p	Difference	Repeat	X	P	Difference
100 %	I = 26,30	26,72	0,000	There are differences in the protein content of Koya Nate based on the composition of the formula	I =15,84	15,95	0.003	There are differences in the fat content of Koya Nate based on the composition of the formula
	II = 27,13				II = 6,06			
80% : 20%	I = 23,05	23,42			I = 6,50	6,64		
	II = 23,79				II = 6,78			
70% : 30%	I = 24,26	24,70			I = 26,88	26,69		
	II = 25,14				II =26,49			
60% : 40%	I = 21,47	21,83			I = 27,38	27,75		
	II = 22,18				II =28,11			

There was a significant difference in protein content in the 4 Koya Nate formulas at a value of p = 0.000. Likewise with the fat content, statistical tests showed a significant difference Koya Nate with 4 formulas at p = 0.003.

Table 13: Statistical Test Results for Differences in Moisture Content and Ash Content of Koya Nate based on the Formula Made

Formulas	Moisture gr %				Ash gr %			
	Repeat	X	p	Difference	Repeat	X	P	Difference
100 %	I = 8,15	8,18	0,000	There are differences in the water content of Koya Nate based on the composition of the formula	I =15,59	3,67	0,002	There are differences in the ash content of Nate's koya based on the composition of the formula
	II = 8,21				II = 3,74			
80% : 20%	I = 7,38	7,46			I = 3,52	3,59		
	II = 7,54				II= 3,65			
70% : 30%	I = 6,15	6,63			I = 3,25	3,31		
	II = 6,84				II= 3,36			
60% : 40%	I = 4,60	4,71			I = 2,75	2,79		
	II = 4,81				II=2,81			

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The moisture content and ash content between the formulas also differed significantly, each with p = 0.000 for water content and p = 0.002 for ash content.

Table 14: Total Score of Each Koya Nate Formula

No	Indicator	Score (S)	Formula							
			F 100		F 80:20		F 70:30		F 60:40	
			R	RxS	R	RxS	R	RxS	R	RxS
1.	Protein content	8	4	32	2	16	3	24	1	8
2.	Fat content	7	1	7	3	21	2	14	4	28
3.	Moisture	3	1	3	2	6	3	9	4	12
4.	Ash content	1	1	1	2	2	3	3	4	4
5,	Taste Characteristics	6	3	18	4	24	3	18	1	6
6.	Texture Characteristics	5	3	15	4	20	3	15	1	5
7.	Aroma Characteristics	4	1	4	2	8	3	12	4	16
8.	Color Characteristics	2	1	2	3	6	1	2	4	8
Total R x S of each Formula				82		103		88		87

The highest total score is in the formula 80%: 20%, that is, with a total score = 103. Then the second best is the formula 70%: 30%. The lowest is the 100% fish Nate formula, without the tempeh mixture.

DISCUSSION

Development of Koya Menu from Processed Tuna and Tempe (Nate)

Koya Nate, which is a processed menu made from tuna and tempeh, is quite easy to make, both in terms of the processing process and the equipment used. Therefore, the Koya Nate menu is quite representative for mothers under five to carry out or develop it as an effort to improve the provision and provision of fish-based side dishes, which so far have been relatively lacking for several reasons, namely fish is a food ingredient that smells fishy and its processing requires relatively special efforts. When given to toddlers. Giving lemon juice to the fish after washing is enough to help get rid of the fishy smell. Adding tempeh as a mixed ingredient for making Koya Nate not only lowers the cost of making it a little, reduces the fishy smell, it also makes the texture more preferable and makes the product easier to refine so it resembles Koya. In the form of a fine powder, Koya Nate will be easier to give to children aged 6 – 24 months and will provide an opportunity to fulfill their protein needs.

The Effect of Making Koya Nate on the Proximate Value of Koya

Making Koya Nate, which is a food ingredient made from fish and tempeh in the form of powder like koya, is proven to increase the protein value per 100 grams compared to when it is still in dough form, or like ordinary dishes that are not made in powder form. Statistical tests showed significant differences in protein content. In dry form, Koya Nate is not kamba, or not watery, so the nutritional content is within 100 grams. Be more effective. This is in accordance with Akham's statement, (2014), namely that the high or

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low measured protein value can be influenced by the amount of water content that is lost from the material. The measured protein value will be greater if the amount of water lost is greater.

Similar to the protein content, when it has become Koya Nate, the fat content of Koya Nate also increases significantly compared to when it is still dough or has not been made in the form of Koya. The lowest increase and also the lowest fat content was found in Koya Nate Formula 100. The Koya Nate formula with added tempeh had a higher fat content than that without added tempeh. This shows that the fat from soybeans, which is an ingredient in making tempeh, is sufficient to support adding fat to Koya Nate. The fat content in tempeh in 100 grams is 8.8 – 9.0 grams (TKPI, 2017).

The change in water content and ash content between the ingredients or dough before being made into Koya and after it has become Koya Nate is very significant. The data shows that the more tempeh mixture the lower the water content, both when it was still mixed and after it was mixed. This relatively large decrease in water content is very beneficial, both in terms of texture and shelf life. The process of making Koya Nate through the frying and roasting processes plays a very important role in reducing the water content, although according to Dian Sundari, et al (2015) this process causes a shrinkage of 53% in fish and 33.9% in tempeh. In contrast, the results of the analysis showed that the ash content of Nate koya was higher than when it was still made in the form of koya. It is also known that with the addition of tempeh, the ash content is lower. This shows that animal protein has more ash content than vegetable protein, as mentioned by Dian (2015) that the ash content is the material left behind when food ingredients are ignited and burned at temperatures around 500^0 - 800^0C, and the material in animal food ingredients is higher than on plant foods.

Acceptability of Koya Nate with Different Material Compositions

For the taste characteristics of the acceptability test conducted on Koya Nate, it is known that the most ratings for really liking it are the F formula 80% and 20%, namely 80% fish and 20% tempeh. The preferred 80%:20% formula is very profitable, because this formula consists of animal and vegetable protein. In terms of protein content, it's not too far from koya Nate formula F 100%, but in terms of price, of course it's cheaper. Besides that, in terms of utilization, it could be bigger, because the acceptability of other characteristics, namely texture and color, is also preferred in the 80%: 20% formula. The presence of tempeh as an ingredient from koya as much as 20% is optimal enough to make Nate's koya the most preferred. If tempe is added more than 20%, its acceptability decreases. Tempe is a food made from soybeans which has the potential to give a distinctive aroma of peanuts. In addition, considering that tempe is a fermented product, the addition given to be mixed with other foods has optimal limits. From the data, it is found that optimization is found in an addition of 20%. Texture characteristics can be a consideration for mothers to provide food to children aged 6-24 months. The most preferred texture assessment is also the Nate formula 80%: 20%. From a physical assessment, the texture of Koya Nate from the 4 formulas isn't too different. However, when an assessment was carried out

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involving the sense of taste in the mouth, Koya Nate with the addition of tempeh tasted softer. The addition of tempe above 20% makes Nate too soft and sticks to the palate. Thus, the addition of 20% is the most appropriate.

For aroma and color characteristics, the highest rating was in the formula 60%: 40%, namely the formula with the most addition of tempeh. This situation indicates that the fishy aroma factor in fish is still being considered by the panelists, so that the more fish ingredients are substituted by tempe, the more preferred the aroma will be. Likewise with color, the most preferred is also the formula 60%: 40%. By heating, the denaturation of animal protein has a greater effect on color than vegetable protein, because animal products contain saturated fat and higher cholesterol levels than vegetable protein sources (Fadhil, 2022).

CONCLUSIONS

The process of making Koya Nate is relatively not too difficult and can be done on a household scale. The form is in the form of powder (koya) and the protein content from fish and tempeh, as well as the use of coconut milk in its manufacture can provide good nutritional value. In all formulas, in 100 grams, the protein and fat content of Koya Nate is higher than the ingredients for making Koya Nate. There was a decrease in water content of about 50% in all formulas. The ash content ranged between 2.79 in formula 4 and 3.67 in formula 1. The most preferred formula for taste and texture characteristics was formula 2, namely 80% fish: 20% tempeh. For aroma and color characteristics, the most preferred is formula 4, which is 60% fish: 40% tempeh.

There was a significant difference in all the proximate values (protein, fat, moisture content and ash content) between the Nate ingredients or dough and the Nate paste, respectively at p = 0.001, 005, 0.000 and 0.002. There were significant differences between the 4 formulas for protein and fat content, each at a value of p = 0.000 and p = 0.003. The differences between formulas were also significant for moisture content and ash content, with p = 0.000 and p = 0.002, respectively. The best formula is 80% F: 20%, which is 80% fish and 20% tempeh. The durability of Koya Nate can be up to 2 months.

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