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Test the Acceptability of Bread Based on Cork Fish Meal (*Channa striata*) with the Addition of Katuk Leaves (*Sauropus androgynus L.*)

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ABSTRACT

Nutritional problems that are still not resolved in toddlers include stunting and malnutrition. In Indonesia, the proportion of undernourished and malnourished toddlers nationally is 17.7%. The proportion of malnutrition and malnutrition cases in toddlers in South Sulawesi Province in 2020 was 6.43% at the district level, according to the Community-Based Nutrition Recording and Reporting Application (e-PPGBM) report. One of the direct factors that cause malnutrition is the condition of the body, such as poor nutritional intake due to not getting exclusive breastfeeding and infectious diseases. The purpose of this study was to determine the acceptability of bread based on cork fish meal (*Channa striata*) and the addition of katuk leaves (*Sauropus androgynus L.*). The p-value of the result of the panelists' acceptability assessment based on aspects of color, aroma, texture, and taste was 0.000. As conclusion, bread made from cork fish meal with the addition of katuk leaves was the most acceptable panelist of all aspects on F1 (score 750).

Keywords: albumin; iron; white bread, katuk leaves

INTRODUCTION

Nutritional problems that are still not resolved in toddlers include stunting and malnutrition. In Indonesia, the results of Riskesdas (2018)[(1)] stated that the proportion of malnutrition and malnutrition status among children under five in 2018 nationally was 17.7%. The proportion of malnutrition and malnutrition cases among children under five in South Sulawesi Province in 2020 was 6.43%. At the district level, the South Sulawesi Community Based Nutrition Recording and Reporting Application (e-PPGBM) report reported that in 2020 the incidence of malnutrition and cases of malnutrition (weight for age) were 6.43%, while in Makassar City it was 3.61%, or the same as 2711 toddlers out of 93557 toddlers in Makassar City. [(2)] One of the direct factors causing malnutrition is a body condition such as inadequate nutritional intake due to not getting exclusive breast milk and infectious diseases.

Breast milk contains approximately 90% water and also contains macronutrients, namely carbohydrates, protein, and fat, as well as micronutrients, namely minerals and vitamins. The mother's diet during breastfeeding will greatly determine the smooth flow of breast milk; the better the intake, the better the milk produced because the nutrients in breast milk are taken from the mother's body. Therefore, the nutritional intake of breastfeeding mothers must be optimal and must not be careless.[(3)]

In Indonesia, the 2020 Ministry of Health performance report shows that 66.1% of babies less than 6 months old receive exclusive breastfeeding in Indonesia. Of the 34 provinces in Indonesia, 32 have exceeded the target of 40%. There are several provinces with the highest achievements, namely West Nusa Tenggara (87.3%), Central Java, and D.I.Yogyakarta. Provinces that have not reached the target are West Papua (34%) and Maluku (37.2%).[(4)]

One of the main targets for providing additional food is breastfeeding mothers.[(5)] This is because breastfeeding mothers need more nutrients. An opportunity created from this problem is that it is hoped that a functional food for breastfeeding mothers can be developed, which can contribute to improving the nutritional status of breastfeeding mothers and can also increase the rate of secretion and the amount of breast milk

production, which is expected to launch the exclusive breastfeeding program for babies <6 months and increase poor nutritional status. One of the snack foods that is easy to find and is liked by people is white bread.

White bread is a food that is cheap, can be reached by every level of society, and is easy to find, making the high consumption of white bread among the public both used as food for breakfast and snacks. This causes the production of white bread in Indonesia to increase every year. White bread is a processed food made from wheat flour with the addition of yeast (*Saccharomyces cerevisiae*) to make the bread dough rise. White bread is a food rich in carbohydrates that was initially only consumed by Europeans and Americans as breakfast, but now white bread has become a global food, including in Indonesia.[6] This is because plain bread is more suited to the Indonesian palate, so this food can easily circulate in Indonesia.

Fish cork (*Channa striata*) is a type of freshwater fish that is quite easy to find, both in traditional and modern markets. Snakehead fish is a food ingredient that is rich in protein. Fish cork is a potential food source of antioxidants and also has good nutritional content; in 100 g of snakehead fish, there is a protein content of 25.2 g. The higher protein content compared to other types of freshwater fish makes snakehead fish widely used as research objects.[7-9]

The content of snakehead fish is very good, but in order to improve the quality of processed snakehead fish production, appropriate innovation is needed so that processed snakehead fish can be produced that are rich in nutrients, one of which is snakehead fish meal. The use of fish meal is currently not optimal. Snakehead fish meal is one of the solid and dried processed snakehead fish that is very suitable for development. Apart from its long shelf life, fish in flour form is also expected to be easier and more flexible in its use. Making snakehead fish flour involves removing most of the liquid and fat contained in snakehead fish meat. It is hoped that this innovation in making snakehead fish meal can become a form of functional additional food that is good for consumption by breastfeeding mothers.[7]

Katuk leaves (*Sauropus androgynus L*) are a leaf that is rich in nutrients and has been believed to be a good plant for facilitating breast milk. The iron content of katuk leaves has been found to be superior to that of cassava and papaya leaves. Apart from vitamins B1, C, A, protein, minerals, vitamins, and fats contained in katuk leaves, there are also papaverine alkaloids, saponins, and tannins.[10] The steroid and polyphenol content in katuk leaves is useful for increasing and facilitating breast milk production.[11] Failure to provide exclusive breastfeeding is caused by, among other things, low breast milk production; therefore, one of them is katuk leaves.

METHODS

This research was carried out from March to November 2023 at the Food Technology Laboratory and Organoleptic Laboratory, Nutrition Department, Poltekkes Kemenkes Makassar, and the working area of the Sudiang Raya Community Health Center, Makassar City. This research involved making snakehead fish flour, followed by making white bread substituted for snakehead fish flour, and then analyzing the macro- and micronutritive value of white bread based on snakehead fish flour with the addition of katuk leaves. This research used a type of laboratory research with a Completely Randomized Design (CRD) approach with 3 treatments adding snakehead fish meal (gram) and katuk leaves (gram) with different concentrations, namely 10:5%, 15:10%, and 20:15%. The research design used was a one-shot group design, which was carried out on white bread based on snakehead fish flour (*Channa striata*) with the addition of katuk leaves (*Sauropus androgynus L.*).

The determination of the concentration level used is based on previous research conducted by Adam, et al. (2020) with the concentration in making white bread based on snakehead fish flour, namely a concentration of 5% and 10%.[12,13] From this research, it can be concluded that the higher the addition of flour snakehead fish to white bread, the higher the protein content. This was further confirmed by research conducted by Setyaningsih, et al. (2010), where the concentration of katuk leaves used was 10%, 15%, or 20%, and the concentration most preferred by the panelists was white bread with the addition of katuk leaves at a concentration of 10%.[14] Next, organoleptic for white bread based on snakehead fish flour (*Channa striata*) with the addition of katuk leaves (*Sauropus androgynus L.*).

Making white bread in each formula (formula 1, formula 2, and formula 3) using digital food scales, drying pans, basins, 60 mesh sieves, ovens, mixers, grinders, spatulas, plastic cake mats, brushes, jars, tablespoons, measuring spoons, measuring cups, small plates, bread pans, and small bowls contains the following ingredients (Table 1):

Organoleptic data collection contains aspects of assessing color, aroma, texture, and taste. This assessment uses 5 hedonic scales (1=dislike very much, 2=dislike, 3=somewhat like, 4=like, 5=very like) with the criteria of untrained panelists, namely 50 pregnant women in the Sudiang Raya Community Health Center area, and understanding the attributes being valued. The data obtained from the instrument is in the form of an organoleptic assessment form that has been filled out by the panelists.

Furthermore, data processing utilizes the SPSS program, with data from organoleptic test results, namely the hedonic test (liking test), on acceptability tabulated in a table, then analyzed using the Friedman test. The data

that has been processed is analyzed, then presented in table form with graphs accompanied by explanations and narrative form.

Table 1. The ingredients of cork fish meal-based bread (*Channa striata*) with the addition of katuk leaves (*Sauropus androgynus L.*)

Ingredients	The weight of each treatment		
	F1	F2	F3
Wheat flour (g)	350	350	350
Snakehead fish meal (g)	35	52.5	70
Katuk leaves (g)	17.5	35	52.5
Egg (g)	60	60	60
Yeast (g)	5	5	5
Granulated sugar (g)	35	35	35
Milk (g)	20	20	20
Bread improver (g)	2	2	2
Water (ml)	150	150	150
Margarine (g)	30	30	30
Salt (g)	3	3	3
Vanili essense (g)	5	5	5

RESULTS

Making Fresh Bread

Making white bread went through five trials. The first trial (1) of white bread formula 1 was perfect, while formulas 2 and 3 were not perfect because the white bread dough was not cooked due to the oven time being insufficient. The white bread dough is only cooked at the edges, while the middle of the white bread is still raw. Therefore, the research team decided to increase the oven time for formulas 2 and 3. The second trial (2) of white bread for formulas 2 and 3 was not perfect because the increase in oven time was not appropriate, so the white bread was still not cooked in the middle. Initially, the white bread was baked at 160^{o}C for 40 minutes, then the time was increased by 10 minutes. The results of the white bread were still not perfect, so the researchers decided to add more oven time. The third trial (3) of formula 2 and 3 white bread was not perfect because the increase in oven time was not appropriate, so the white bread was still not cooked in the middle. Initially, the white bread was baked at 160^{o}C for 50 minutes, then the time was increased by 5 minutes. Provided that after 40 minutes, the white bread is removed and turned over so that the white bread cooks evenly. The last 15 minutes are used to continue baking the white bread that was turned over earlier. The results of the white bread were perfect, but the color of the white bread was less attractive. Therefore, the research team decided to change the method of grinding katuk leaves. Initially, the katuk leaves were roughly chopped and then ground into puree using a blender. The fourth trial (4) was carried out for formulas 1, 2, and 3 with the substitution of katuk leaves, which had been ground using a blender. This causes the color of the white bread to become more attractive. The fifth trial (5) used a temperature of 160^{o}C for 40 minutes for formula 1. A temperature of 160^{o}C for 55 minutes for formulas 2 and 3 The substitute for katuk leaves used was katuk leaves that had been ground using a blender. White bread based on snakehead fish flour (Channa striata) with the addition of katuk leaves (Sauropus androgynus L.) has a color ranging from light green to green, according to the increasing concentration of substituted katuk leaves, and has the same aroma and texture as the original white bread.

Acceptability

Table 2 is the result of the panelists' acceptability assessment of white bread based on snakehead fish flour (*Channa striata*) with the addition of katuk leaves (*Sauropus androgynus L.*) based on aspects of color, aroma, texture, and taste. Table 7 presents the mean ± SD values for each acceptability test parameter, namely color, aroma, texture, and taste. The results of the Friedman test showed $p = 0.000$ for all acceptability parameters, which means that the addition of snakehead fish flour and katuk leaves had a significant effect on the panelists' acceptability for the parameters of color, aroma, texture, and taste of white bread. This proves that all white bread formulations are acceptable to the panelists. The results of further tests with Wilcoxon for all acceptability parameters showed that the F1 formula was different from the F2 and F3 formulas, while the F2 and F3 formulas were not different. This applies to all parameters of the acceptability of white bread.

Table 2. Test results of the acceptability of flat bread based on snakehead fish meal (Channa striata) with the addition of katuk leaves (Sauropus androgynus L)

Parameter	Formulation			ρ - value
	F1	F2	F3	
Color	4.06 ± 0.767	3.76 ± 0.716	3.36 ± 0. 631	0.000
Aroma	3.46 ± 0.788	2.88 ± 0.824	2.74 ± 0.803	0.000
Texture	4.00 ± 0.670	3.20 ± 0.969	3.04 ± 0.755	0.000
Taste	3.48 ± 1.035	2.72 ± 0.858	2.50 ± 0.931	0.000

DISCUSSION

Color is a sensory attribute that can be tested using the sense of sight, namely the eyes. Color is easy to recognize, so it can influence the response and perception of panelists in accepting a food ingredient.[14] The acceptability test results showed that the F1 formula was most acceptable in terms of the color aspect of white bread based on snakehead fish flour (*Channa striata*) and the addition of katuk leaves (*Sauropus androgynus L.*). This is because as the katuk leaves grow, the color of the white bread becomes darker green compared to the color of the F1 formula white bread, which has a light green color and is more attractive than the colors of the F2 and F3 formula white bread.

In line with the results of Salsabila's research, more katuk leaf flour makes the color bright green. Likewise, research of Pawiwara, et al. (2023) showed that panelists tended to quite like the color of white bread in various concentrations of added Moringa leaf flour.[15]

Aroma is an important factor that influences the acceptability of a food product, so the aroma aspect is one of the determinants of assessing the deliciousness of food. Aroma is included in the assessment of preferences for food products because, before tasting food, a person will inhale the aroma first.[14]

The acceptability test results showed that the F1 formula was most liked by the panelists in terms of the aroma aspect of white bread based on snakehead fish flour (*Channa striata*) and the addition of katuk leaves (*Sauropus androgynus L.*) and is different from the formulas F2 and F3. This is because the distinctive aroma of katuk leaves affects the aroma of white bread. The more katuk leaves you add, the more distinctive the aroma of white bread will be, and this reduces the panelists' receptivity to the aroma of white bread. The higher the concentration of katuk leaf flour used, the lower the level of panelists' liking for the aroma of katuk leaf white bread. This is because the fragrant aroma of the butter is covered by the typical katuk leaf flour, which contains the HCN compound that causes a musty aroma.[16]

In line with Nugroho's research, et al. (2016)[17] stated that the level of panelists' acceptance of the aroma of white bread decreased with increasing levels of African catfish meat flour added to the dough. Another study stated that the ratio of wheat and taro flour from the hedonic test had a very significant effect ($p < 0.01$) on the aroma of white bread. This caused the panelists' acceptance of the aroma of white bread to decrease with the increasing use of taro flour.[18] On the contrary, according to Syarfaini, et al.,[19] the aroma of bread is determined by the ingredients used, such as margarine, eggs, yeast, and powdered milk, so that the dominant aroma that arises is the typical aroma of bread. This is in accordance with the test results, which show that tempeh in processed lawi-lawi seaweed bread does not affect the aroma quality of the bread.

Food texture describes the ability of a food product to maintain pressure. The characteristics of the basic materials used and the treatment given during the processing process will influence the texture of the product. Texture is one of the most important parameters of the quality of a product.[14] The texture of white bread is influenced by several factors, including the protein and fat content of the basic ingredients for making bread and the water content. Fat can make the texture of the bread soft and function to prevent CO_2 bubbles from escaping from the dough. The texture of white bread forms cavities, or is known as porous. The pores of fine white bread are formed because air enters the dough and is dispersed in the form of fine bubbles when the flour and water are mixed. Wheat flour contains gluten protein, which is able to form elasticity. When wheat flour is mixed with water, gluten will form a mass viscoelastin, which binds all the dough ingredients, especially starch, into a dough. The film layer formed is impermeable against gas, so that gas can be trapped and form pores. Pores are small holes formed by CO_2 gas produced by yeast in the fermentation process and the air trapped in them. The presence of pores in white bread causes the texture to become soft.

Texture is a sensation of pressure that can be observed with the mouth (when bitten, chewed, and swallowed) or touched with the fingers. The acceptability test results showed that the F1 formula was most liked by the panelists in terms of the texture of white bread based on snakehead fish flour (*Channa striata*) and the addition of katuk leaves (*Sauropus androgynus L.*) and is different from the formulas F2 and F3. This happens because the more snakehead fish flour and katuk leaves that are added to the bread dough, the less gluten's ability to capture air that enters the dough, due to an imbalance in the amount of water content and protein content of the two ingredients added to the bread dough.

Salsabila, et al.[16] produced an average organoleptic test on the level of panelists' preference for texture, showing that the texture of katuk leaf white bread that was most liked by the panelists was white bread with a 5% substitution of katuk leaf flour. According Sari, et al.,[20] which resulted in a significant effect between treatments of mustard flour concentration on the texture of mustard green bread.

From the taste aspect, it turned out that there was a significant difference in the panelists' acceptance of the taste of the three formulas, so it continued with the test Wilcoxon. The result is that the different product formulas are F1 different from F2 and F1 different from F3. The assessment of the taste aspect of a food product is known by tasting the food using the sense of taste (tongue). This assessment of the taste aspect is difficult to understand in real terms because each person has a different perception of the taste of a food product. Sensitivity to taste varies; this indicates that the older a person is, the sensitivity of the sense of taste will decrease.[14]

The results showed that the taste aspects of white bread based on snakehead fish flour (*Channa striata*) and the addition of katuk leaves (*Sauropus androgynus L.*) were most acceptable to the panelists in formula F1. Formula F1 was the most acceptable to the panelists because the comparison of cork fish flour (10%) and katuk leaves (5%) proved to give the taste of fresh bread that the panelists liked the most. In line with Pawiwara, et al.,[15] it shows that there is a significant effect ($p < 0.05$) of the addition of Moringa leaf flour in making white bread on the taste of white bread for treatment P1 (1%) of 3.40 with a rating of quite like it, and it produces bread tasteful and does not produce a bitter taste. The results of Pratama's research,[21] show that there is no real effect (p-value >0.05) of adding coconut dregs flour and soy flour to white bread on the taste parameters of white bread. The overall acceptability test results obtained the highest score in the F1 formula, with a total score of 750. This F1 formula is plain bread with the addition of 10% snakehead fish flour and 5% katuk leaves.

CONCLUSION

The white bread based on snakehead fish flour (*Channa striata*) with the addition of katuk leaves (*Sauropus androgynus L.*), which was most acceptable to the panelists from all aspects was Formula 1.

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