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Acceptability and Test the Levels of Protein in a Biscuit With the Substitution of Milkfish Flour (Chanos Chanos Forskal)

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***Abstract*—Biscuits are a form of a very common and community-favoured dry snack. Other nutrients, such as protein, may increase the nutritional content of biscuits that are dominated by carbohydrate sources. Fish is a type of protein that's rich. The aim of the study was to determine the protein content and acceptability of milkfish (Chanos chanos) flour replacement biscuits. This method of study is experimental with improving the process and one control twice in a randomized design. Milkfish flour replacements are 0 %, 5 %, 10 % and 15 %. By the Kjeldahl process, protein content and acceptance were obtained and checked on 30 panellists. One Way ANOVA and Kruskal Wallis, accompanied by DMRT, were used to evaluate the statistical test of protein content and acceptance. The ANOVA test reveals the 0.000-value of the halo protein biscuits. The results of the Kruskal Wallis test showed the colour, aroma, taste, texture, and overall value of the halo biscuits at 0.000. Best protein content with a 15% substitution rate. The most common biscuit for the panellists is the 5% substitution of milkfish flour. The replacement of milkfish flour is affected by protein content and the acceptability of biscuits.**

Keywords—biscuit, fish flour, protein content, receptivity

I. INTRODUCTION

Aceh has high biodiversity, such as native fruit plants [1-4], herbs and spices [5], and tuberous plants [6] many of which have been used by local communities as medicinal plants [1,7,8], ancient rituals [9], garden plant and animal feed [10], and construction materials [11]. The Acehnese people also use plants for their livelihoods and make efforts to conserve plant biodiversity [12,13]. In addition, Aceh also has a high level of fishing and marine wealth, making it one of the Minneapolitan regions, especially in the East Aceh District. According to the map of aquaculture development centres, Aceh Province is one of the 15 provinces that produce aquaculture production on the basis of key commodities such as shrimp, snapper, and milkfish for the period 2011-2015 [14]. Fish is known to have a high protein content [15]. One type of fish that is very common in Indonesia and popular for consumption is Bandeng or milkfish.

Nutritional problems in toddlers are the result of unbalance in food intake, both macro and micronutrients [16], such as iron and iodine, which are still common. Biscuits are a form of very common and community-favoured dry snacks, it is estimated that 13.4 percent of the population of Indonesia eat biscuits more than once a day [17]. Biscuits have a high nutritional value of carbohydrates but relatively low content of protein. The nutritional value of biscuits per 100 grams is 458 kcal of energy, 6.9 grams of protein, 14.4 grams of fat, and 75.1 grams of carbohydrate [18]. The nutritional content of biscuits, which are dominated by carbohydrate sources, can increase the content of certain other nutrients, including proteins. The protein content of biscuits can be improved by substituting proteins for food sources, including milkfish.

The findings of the nutritional content study of milkfish have a high source of protein [19]. The protein content in milkfish was the highest at 24.18% [19], while mackerel fish was 19.38%, catfish 17.7%, and tilapia 12.46% [20]. Milkfish flour substitution biscuits may be a choice for providing additional food sources of protein for toddlers. The aim of this study was to examine the effect of substitution for milkfish flour on the protein content and the acceptability of biscuits.

II. MATERIALS AND METHODS

This type of study is a type of experiment that aims to determine the effect of flour replacement on protein content and acceptability of biscuit. The study was performed at the Syiah Kuala University Food Laboratory in September-October 2020.

A. Materials and Tools

Fresh milkfish is the substance used in the manufacture of milkfish flour. The products used in the manufacture of biscuits are milk-fish flour, wheat flour, sugar, egg yolk, margarine, and vanilla. Materials used for protein content analysis include condensed sulphuric acid, catalyst (Na2SO4:HgO), NaOH Na

solution, 0.02 N HCl solution, 4 percent boric acid, BCG + MR, Aquades.

Tools used in this analysis were: basin, knife, steamer, microwave, cabinet dryer, grinder, 60 mesh sieve, mixer, automated scale, pan, spoon, scissors, spatula, baking sheet, mold, oven, 50 ml Kjeldahl flask, Kjeldahl distillation equipment, 100 ml Erlenmeyer, 10 ml measuring cup, dropper pipette, 50 ml biuret, electric stove, analytical scale, steam hood, stationery, and acceptability forms.

B. Making a Flour of Milkfish

The stage of making fish flour, that is, the fish, is washed and then steamed at 100ºC for 30 minutes, filed, dried at 50ºC for 16 hours and 24 hours, milled, and sifted by 60 wires.

C. Making Milkfish Biscuits

Making milkfish biscuits i.e., milkfish flour (0%, 5%, 10%, and 15%), wheat flour (100 %, 95 %, 90 % and 85 %.), refined sugar (50 grams), egg yolk (30 grams), margarine (50 grams) and vanilla (1 gram). Egg yolk, sugar, and margarine are combined with a blender until blended and soft, then add vanilla, then add flour and wheat flour to the dough and combine until creamy, moistened, and baked at 160ºC for 25 minutes.

D. Protein Level Analysis

Analysis of protein content was done by using the Kjeldahl method while fat was measured by using Soxhlet [21]. Water content was determined by using the oven method. Meanwhile, Atomic Absorption Spectrophotometry method was used to calculate calcium level.

E. Acceptability Test

Acceptance of biscuits was obtained by organoleptic research by 30 people who had been quite educated. Panellists gave their answers by providing a ranking on the favourite survey form on a scale of 7 to 1. Scale 7 is the very liking scale and scale 1 is very dislike. Each treatment has been given a code namely P1 (without substitution), P2 (substitution of 5%), P3 (substitution of 10%), and P4 (substitution of 15%).

F. Data Analysis

Examination of protein content using the One Way Anova test and acceptance using the Kruskal Wallis test with a substantial level of 95% using SPSS 13 and if there is an impact, continue with the Duncan Multiple Range Test (DMRT). Presentation of data in the form of charts, tables, and narratives.

III. Results and Discussion

A. Crude Protein

The results of the statistical analyses carried out indicate that there is a substantial variation in the protein content of milkfish biscuits. The average protein content at 0% substitution was the lowest protein content, i.e., 11,59 grams per 100 grams, and the highest protein content was contained in biscuits with 15% milkfish flour substitution, i.e., 17,31 grams per 100 grams (Figure 1). This study suggests that the higher the substitution of milkfish powder, the higher the protein content of the biscuits.

Based on the One-Way ANOVA statistical test this shows that there is a significant effect on the substitution of milkfish flour on protein content. The results can be seen that there is a significant difference between each treatment (Figure 1). In the process of making milkfish flour, the fish is steamed first, this is because it reduces the water content and fat content in food. The method of processing fish by steaming has a high protein content compared to boiling and has decreased protein content less than fresh food [22].

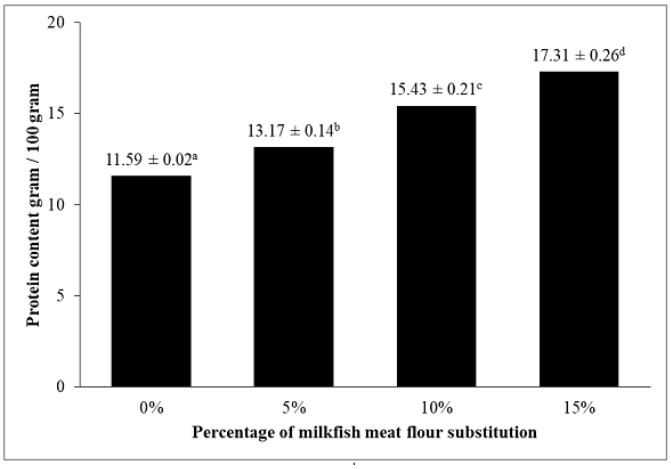

Fig. 1. Milkfish biscuit protein level test results.

Based on Figure 1, the highest protein value of milkfish biscuits is 15 % in the milkfish flour substitute. Thus, the higher the substituted milkfish flour, the higher the protein level of the milkfish biscuits. This study is in line with Domili [21] also indicates the same thing concerning the replacement of mackerel fish flour for protein content, the higher the substitution of mackerel fish flour. The minimum protein content for biscuits according to the Indonesian National Standard is 5%. The protein content of milkfish meat flour substitute biscuits was 13.17% -17.31%. This shows that the protein content of milkfish biscuits has met the Indonesian National Standard.

B. Acceptability of Biscuits

Acceptability is the measure of the preferred standard of the panellist for mackerel biscuit products and is measured based on organoleptic properties. The organoleptic properties assessed include colour, aroma, taste, texture, and overall preference. The acceptability of milkfish biscuits with milkfish flour substitutions can be found in Table 1 below.

TABLE I. THE AVERAGE SCORE OF ACCEPTANCE FROM VARIOUS TREATMENTS OF MILKFISH SUBSTITUTED BISCUITS

Percentage of Milkfish Flour Substitution	Colour	Aroma	Taste	Texture	Overall Preference
0%	5.40±0.675^{c}	5.13±0.730^{b}	5.10±0.607^{bc}	5.17±0.834^{c}	5.27±0.583^{bc}
5%	5.27±0.450^{c}	5.23±0.568^{b}	5.43±0.568^{c}	5.47±0.507^{c}	5.40±0.621^{c}
10%	4.80±0.761^{b}	4.97±0.809^{b}	4.87±0.571^{b}	4.77±0.679^{b}	5.00±0.455^{b}
15%	3.67±1.124^{a}	3.27±0.785^{a}	3.70±0.952^{a}	3.53±1.008^{a}	3.57±0.817^{a}
Score ρ	0	0	0	0	0

Note: Different notations show significant differences in the results of Duncan's test analysis

The analyses of the acceptance statistical test were not normally distributed (<0.05) so that the Kruskal Wallis test was used (Table 1). The results of the test revealed that there was an impact on the acceptability of milkfish biscuits on colour, aroma, taste, texture, and overall preference. The following is the definition of the acceptability of milkfish biscuits, which includes colour, aroma, flavour, texture, and overall preference.

Colour is one of the most critical influences in the acceptance or rejection of the product due to the first impression made by the panellists [22]. The colour of the biscuits is determined by the ingredients in the biscuits. In general, the colour of biscuits varies from light brown (yellow) to brown. The findings of the panellists' acceptance test for the most favoured colour of biscuit were 0% with an average of 5.67. While the lowest was milkfish biscuits with 15% milkfish meat flour substitute, which had an average of 3.89. Milkfish biscuits with 0 percent treatment have a light brown (yellow colour and are favoured by the panellists. Meanwhile, the colour of the biscuits, with 5%, 10%, and 15%, tended to be brownish yellow to brown. Fish flour allows the colour of the biscuits to darken due to a mallard reaction, which is a non-enzymatic browning reaction due to the reaction between the sugar reduction and the amino acid-free or protein-free amine groups [23]. This study is consistent with research by Mervia [24], African catfish flour the more fish flour substitutions, the darker the colour of the biscuit.

Aroma plays an important part in odour testing, and it will offer an assessment of whether or not the product is liked. The results of the most preferred aroma acceptance test were milkfish biscuits with a 5% replacement of milkfish meat flour with an average value of 5.61. In the meanwhile, the approval of the scent that was least enjoyed by the panellists was milkfish biscuits with a 15% replacement for milkfish fish flour with an average rating of 3.67. Centred on the Kruskal Wallis test, which reveals that there is an effect on the aroma of milkfish biscuits of the replacement of milkfish meat flour. Based on the results of the statistical test, the results revealed that the milk-fish biscuits were significantly different which had been substituted by 15%. This is because the more milk-fish meat replacements, the lower the fragrance approval because the prevailing aroma is the fishy aroma. The scent of milkfish biscuits is caused by the substitution of milkfish meat flour. This is consistent with the Neli [22] research on the substitution of mackerel, the higher the concentration of fish flour applied to the biscuit recipe, the lower the average value of biscuit aroma acceptance.

The result of the most favoured taste approval test was milkfish biscuits with a 5% substitution of milkfish meat flour with an average value of 5.59. Based on the Kruskal Wallis test, which indicates that the replacement of milk-fish meat flour affects the flavour of milk-fish biscuits. The findings revealed that the flavour of the 0% substituted milkfish biscuits did not differ significantly from that of the 5% substituted and 10% substituted milkfish meat flour but was noticeably different from that of the 15% substitution. The 5% substituted milkfish biscuits are different from the 10% substitutions and the 10% substituted milkfish biscuits are different from the 15% substitutions. This is because the further replacement of milkfish meat flour allows the flavour of milkfish biscuits to have a more distinctive taste of fish such that it is less enjoyed by the panellists. This is consistent with the research by Neli et al. [22] on the formulation of snakehead fish flour-related biscuits, namely, the higher the replacement of snakehead fish, the lower the approval by panellists of the texture of snakehead fish biscuits.

The overall evaluation is used to assess the reaction of the panellist to the characteristics of organoleptic consistency such as colour, aroma, taste, texture, and overall food products. The results of the overall preference acceptance test for milkfish biscuits with 5% replacement of milkfish meat flour with an average value of 5.52 were the most favoured (Table 1). Based on the findings of the study, the overall choice for milkfish biscuits that were not substituted for milkfish meat flour was not substantially different from those substituted for 5% and 10% milkfish meat flour but differed from that of milkfish biscuits that were substituted for 15% milkfish meat flour.

The development of biscuit products containing milkfish meals as an alternative to offering supplementary protein sources for toddlers may be a viable option. Babies and toddlers need source protein for cell growth and brain function, as well as protection against infection [23].

IV. CONCLUSION

The highest protein content of milkfish biscuits with milkfish meat flour substitution is 15% milkfish meat flour substitution, 17.31 grams / 100 grams and the lowest is 5% milkfish meat flour substitution, 13.17 grams / 100 grams. The acceptability of milkfish biscuits with milkfish meat flour substitution on colour, aroma, taste, texture, and overall preference, the most preferred is a biscuit with 5% milkfish meat flour substitution and the less preferred biscuit is 15% milkfish meat flour substitution. There is an effect of

substitution of milkfish meat flour on the protein content of milkfish biscuits, namely the higher the substitution of milkfish meat flour, the higher the protein content of milkfish biscuits. There is an effect of the substitution of milkfish meat flour on the acceptability of milkfish biscuits.

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