

RESEARCH STUDY

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Alkaloid, Protein, Dietary Fiber Content, and Acceptability of Lacto Cookies Substituted with Banana Blossom (*Musa Paradisiaca* Linn.) and Fish Flour (*Rasbora Argyrotaenia*)

Kadar Alkaloid, Makanan dan Daya Terima Lacto Cookies dengan Substitusi Tepung Jantung Pisang (*Musa Paradisiaca* Linn.) dan Tepung Ikan Seluang (*Rasbora argyrotaenia*)

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[10.20473/amnt.v7i2.2023.217-223](https://doi.org/10.20473/amnt.v7i2.2023.217-223)**Available online at:**<https://e-journal.unair.ac.id/AMNT>**Keywords:**Banana heart (*Musa Paradisiaca* Linn.),
Seluang fish (*Rasbora Argyrotaenia*),
Alkaloids, Cookies**ABSTRACT**

Introduction: The smooth creation of bosom milk (ASI) given to infants can emphatically affect the wholesome status of children. Breast milk production can be smooth if the hormones oxytocin and prolactin increase. Banana heart (*Musa paradisiaca*) contains Laktagogum, which can stimulate hormones, Oxytocin, and Prolactin, such as alkaloids, polyphenols, steroids, and flavonoids. In seluang fish (*Rasbora Argyrotaenia*), there are nine essential amino acids (histidine, arginine, threonine, valine, methionine, isoleucine, and leucine).

Objectives: This study analyzed the acceptability of five cookie formulations and alkaloids, protein, and fiber content.

Methods: This study used a completely randomized AA design (CRD) D with N5 treatments. The research subjects were 25 people for the acceptability test. Alkaloids were carried out using the UV-is spectrophotometric method, proteins using the Kjeldahl method, and fiber using the enzymatic gravimetric method.

Results: Regarding color, taste, and aroma, formula 2 (40% banana heart, 10% seluang fish) was significantly more acceptable with a mean $p < 0.001$ (3.06 ± 0.97). Formula 2 (40% banana heart, 10% seluang fish) in 100 grams contains 110.03 g/100 g alkaloids, 25.79% protein, and 21.06% crude fiber.

Conclusions: The most preferred formula is formula 2, with alkaloid content of 110.03 g/100 g, protein of 25.79%, and crude fiber 21.0.

INTRODUCTION

The breastfeeding period is a significant period for a mother and her baby. The smooth production of breast milk (ASI), which is given to babies, can require around a positive impact on the baby's nutritional status. To meet the need for breast milk for babies, breastfeeding mothers need more nutritional intake than pregnant women. In breastfeeding mothers, in the first month of breastfeeding, 640 calories/day can produce an average amount of breast milk¹. The total energy requirement during breastfeeding will increase to 2,400 kcal daily to produce breast milk and for the mother's activities. Breastfeeding mothers are given green vegetables to increase milk production, but many do not like vegetables. Therefore, other light foods or snacks must be consumed and can facilitate breastfeeding for nursing mothers².

Galactogogum is a home remedy, food, or supplement used to increase breast milk production.

Most of the galactagogues exhibited in Indonesia are in tablet form. Several galactagogue items are exhibited as food and drink. At the same time, galactagogue products packaged as food or drinks with healthy substances expected to meet energy and fluid needs will be more helpful and pragmatic in their use to assist breastfeeding mothers, especially mothers active outside the home³.

Indonesia is rich in biodiversity, including the banana flower (*Musa paradisiaca*). Some banana flowers that can be consumed include Kepok, Klutuk, and Stone bananas. Banana flower contains galactagogue, which has the potential to stimulate the hormones oxytocin and prolactin. The hormones oxytocin and prolactin are obtained from various food ingredients containing alkaloids, polyphenols, steroids, flavonoids, and other most effective ingredients in increasing and facilitating breast milk production⁴.

One source of animal protein for the people of West Kalimantan is the Seluang fish because they are easy to get and cheap. There are nine essential amino acids in Seluang fish: histidine, threonine, arginine, valine, methionine, isoleucine, leucine, phenylalanine, and lysine. While there are eight types of nonessential amino acids: aspartic acid, glutamic acid, serine, glycine, alanine, proline, tyrosine, and cysteine. Seluang fish (*Rasbora argyrotaenia*) contains 17 essential and nonessential amino acids. Amino acids can be used to determine the quality of the protein contained in a product. In nursing mothers, a high content of amino acids and protein is needed to facilitate the production of breast milk⁵.

This research developed cookies by substituting banana flower flour (*Musa paradisiaca* Linn.) and Seluang fish flour (*Rasbora Argyrotaenia*). Cookies are bakery products that various groups of people love because they taste delicious, are small in size, and are practical to carry anywhere. Cookies are pastries that are crunchy and usually small in size. The shape and taste of the cake vary depending on the additional ingredients used. Cookies are soft dough biscuit with a high sugar and fat content and a low water content (<5%), relatively crunchy when broken, and has a solid textured cross-section. Cookies are dry food products classified as snacks that are not easily damaged and have a relatively long shelf life⁶.

The problem with breastfeeding mothers is not maximizing milk production, so the baby's nutritional needs are also not optimal. Therefore, eating foods that can stimulate breast milk production is necessary. Mother's Milk (ASI) is needed by children, especially towards the beginning of life. Mother's Milk (ASI) is good food for children because it contains many supplements and can provide immunity regularly. An additional intake of 600 calories is needed each day to provide breast milk. Breastfeeding mothers should eat more than expected and eat nutritious food sources. Breastfeeding mothers need 550 calories daily and 17 grams of protein daily with high levels of vitamin A, thiamin, and riboflavin. Therefore, it is essential to have an appropriate diet with the same standards as a pregnant woman's diet but in more significant quantities and with better nutrition. If breast milk production is not good, then the recommended food for mothers is Katuk leaves (Moringa leaves) and food containing high alkaloids. Alkaloids are active ingredients

that contain prolactin which works like prolactin-releasing hormone (PRH)⁷.

This study aimed to determine the acceptability and levels of alkaloids, protein, and fiber in lacto cookies by substituting banana flower flour (*Musa paradisiaca* Linn.) and Seluang fish flour (*Rasbora Argyrotaenia*) and, for further research, it could be given to breastfeeding mothers.

METHODS

This study used a pure experimental design in the laboratory in vitro using a completely randomized design (CRD) with five treatments. Each treatment was repeated twice, and for each repetition, organoleptic and nutritional value measurements were carried out in duplicate. The proportions were made with the interpretation of 100 grams/serving and the target content of alkaloids, protein, and crude fiber in 5 formulas coded F0, F1, F2, F3, and F4. The interpretation of 100 grams/serving is used, namely that each formula consists of various compositions, as shown in Table 1. The interpretation of 100 grams/serving refers to the regulation of the Indonesian Food and Drug Supervisory Agency number 22 of 2019, which states that the formula must be listed per 100 grams.

After formula processing was obtained, acceptability tests were carried out on five formulas with a hedonic test to determine the level of preference for each formula. The scale used for the hedonic test is five: 1 = Really do not like it, 2 = Do not like it, 3 = Somewhat like it, 4 = Like it, and 5 = Really like it. In this study, the panelists were semi-trained consisting of 25 DIV students of the Nutrition Department of the Pontianak Health Polytechnic. The panelists used by DIV students at the Nutrition Department of the Pontianak Health Polytechnic were because those who had to take the hedonic test were trained or moderately trained people. Panelists who carried out the hedonic test previously filled out informed consent as proof of their willingness to be respondents in the hedonic test. The data obtained were analyzed using the non-parametric Friedman Test. Furthermore, the best product was analyzed for alkaloid value using UV spectrophotometry, crude fiber, enzymatic gravimetric, and protein using Kjeldahl. In this study, what will be tested is the most preferred formula.

Table 1. Composition of cookies with substitution of Kepok banana heart flour (*Musa paradisiaca*) and Seluang flour (*Rasbora arayrotaenia*).

Formulas	Wheat Flour (g)	Margarine (g)	Eggs (g)	Sugar (g)	Skimmed Milk (g)	Salt (g)	Baking Powder (g)	Banana Heart Flour (g)	Seluang fish flour (g)
F0	100	75	60	20	50	5	2.5	0	0
F1	50	75	60	20	50	5	2.5	50	0
F2	50	75	60	20	50	5	2.5	40	10
F3	50	75	60	20	50	5	2.5	0	50
F4	50	75	60	20	50	5	2.5	50	10

Tools and Materials

The tools used to manufacture banana flower flour and Seluang fish flour were cabinet dryers, blenders, and 80 mesh sieves. Equipment for chemical analysis included porcelain dishes, aluminum cups, furnaces, flasks, Kjeldahl, fat flasks, soxhlets, distillation sets,

agitating baths, measuring cups, shelter tubes, pipettes, corougbuchners, desiccators, and pH meters. The ingredients used were a banana flower, Seluang fish flour, wheat flour, sugar, eggs, salt, butter, and skim Milk. The chemicals used for alkaloid analysis were 10% ammonia, ammonium hydroxide, 95% ethanol, ether, methyl red

indicator, chloroform, 0.2 N H₂SO₄ solution, H₂SO₄ standard solution, and NaOH standard solution.

Process of Making the Cookies

First, the substitution of banana and Seluang fish flour was determined in Cookies (Figure 1). Banana flowers and Seluang fish are dried with a drying time of 5 hours. The stages of making flour can be seen in Figure 2. Furthermore, the resulting banana flower flour determines the cookie percentage formula. This determination is based on the consideration that the dough produced is soft and can be molded, and the taste was acceptable to the panelists. They were making

cookies with a mixture of banana flower flour and Seluang fish, hedonic tests, and nutritional analysis of the resulting cookie products and determining the best formula. Making cookies includes preparing ingredients, mixing, making dough, and baking. Making cookies is to mix sugar and eggs and then shake until smooth. Next, add melted margarine, salt, baking powder, tempeh flour, and oyster mushroom flour. Then add skim Milk and water, take the dough, flatten it, roll it out to a thickness of 3 mm/0.5 cm, and then mold it. Finally, put it in the oven and bake at 140°C for 25 minutes.

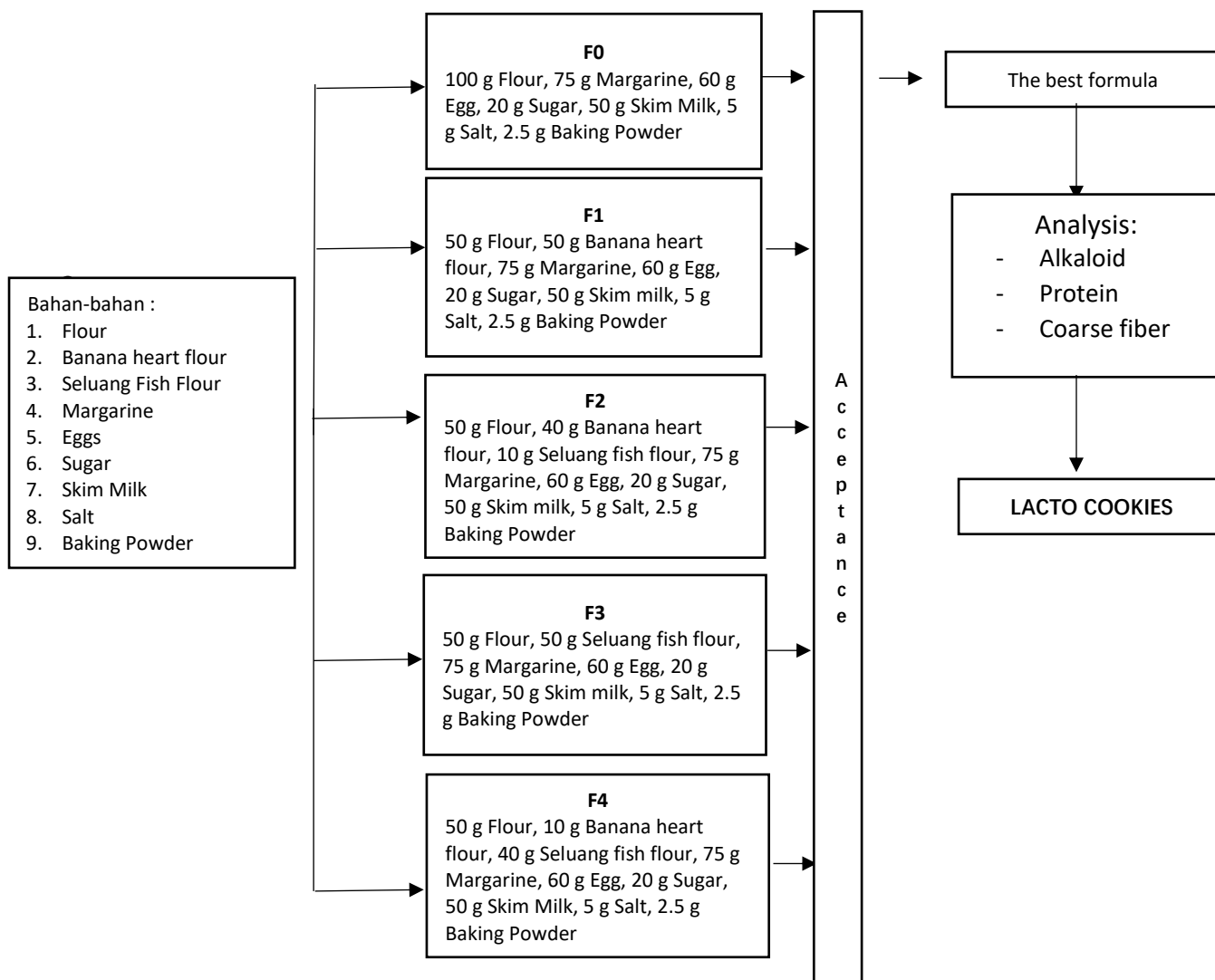


Figure 2. Design of Lacto Cookies with substitution of banana heart flour (*Musa Paradisiaca* Linn.) and seluang fish flour

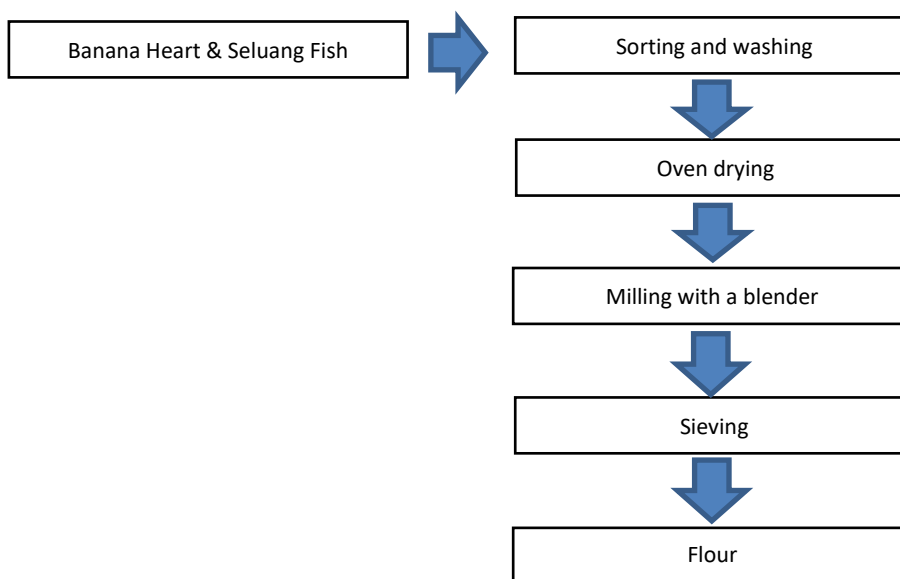


Figure 1. Design of lacto cookies with substitution of heart flour banana (*Musa paradisiaca* Linn.) and Seluang fish flour

RESULTS AND DISCUSSION

One of the leading health indicators is the high infant mortality rate (IMR). One way to prevent it is by giving exclusive breastfeeding. However, not all mothers are willing or able to give exclusive breastfeeding. Therefore, it is necessary to eat foods that can stimulate breast milk production to be more optimal. There are nine building blocks of amino acids in Seluang fish: histidine, threonine, arginine, valine, methionine, isoleucine, leucine, phenylalanine, and lysine. In contrast, eight kinds of amino acids are unnecessary: specific aspartic acid, glutamic acid, serine, glycine, alanine, proline, and cysteine. So in Seluang fish (*Rasbora Argyrotaenia*), there are 17 kinds of amino acids, both essential amino acids

and excess amino acids. Amino acids can be used to determine the nature of the protein contained in a type. In nursing mothers, the high content of amino acids and protein can facilitate milk production⁸. The Banana flower is a plant that contains galactagogue, which can activate oxytocin and prolactin chemicals such as alkaloids, polyphenols, steroids, flavonoids, and various substances, so banana flowers can be the best choice in developing and working with breast milk production. The effect of cookies with the substitution of Kepok banana heart flour (*Musa paradisiaca*) and Seluang flour (*Rasbora arayrotaenia*) on organoleptic acceptability scores (color, taste, aroma, and texture) shown in Table 2 and Figure 3.

Table 2. Effect of cookies with Kepok banana heart flour (*Musa paradisiaca*) and Seluang flour (*Rasbora arayrotaenia*) substitutions on organoleptic acceptability scores (color, taste, aroma, and texture)

Group	Color	Flavor	Aroma	Texture	Overall Acceptability
Control Treatment (F0)	2.08±0.76	2.28±0.89	2.16±0.85	2.64±0.95	2.29±0.86
Treatment 1 (F1)	2.80±1.08	3.40±0.82	2.84±0.85	2.88±0.83	2.98±0.89
Treatment 2 (F2)	2.88±0.73	3.36±1.19	3.36±0.95	2.64±0.99	3.06±0.97
Treatment 3 (F3)	2.72±0.94	2.32±0.90	2.36±0.86	2.32±0.69	2.43±0.86
Treatment 4 (F4)	2.84±0.80	2.88±0.88	2.84±0.89	2.60±0.82	2.79±0.85
p-values	0.004*	<0.001*	<0.001*	0.078	

Color

The initial sensory seen by a panelist is color. Determination of the quality of food ingredients generally depends on the color it has, a color that is consistent with the color that should give the impression of a separate assessment by the panelists. Figure 3 shows that the average acceptance value for color in the five treatment groups is higher in treatment group 2 (P2), which is 2.88, while the lowest is in the control treatment group (P0). The Friedman test can determine the difference in the effect of the five treatments. Based on Table 1, it can be seen that the p-value for color is 0.004, which means that

lacto cookies with the substitution of Kepok banana flower flour (*Musa paradisiacal*) and Seluang fish flour (*rasbora Argyrotaenia*) have a significant effect on the level of preference for color aspects. In p2, banana flower flour is not used at all, so the color is not too brown. This study is in line with research showing that banana flower flour has a slightly brownish color because banana flower quickly undergoes an enzymatic caramelization response involving phenolase enzymes and oxygen so that banana flower changes color quickly. The higher the addition of banana flower flour, the banana flower cookies became brown, so the ten panelists disliked it even more¹⁰.



Warna: color, Rasa: taste, Aroma: aroma, Tekstur: texture, Skala hedonik: Hedonic Scale

F0 (100 g flour, 75 g margarine, 60 g egg, 20 g sugar, 50 g skim milk, 5 g salt, 2.5 g baking powder), F1 (50 g flour, 50 g banana flower flour, 75 g Margarine, 60 g Egg, 20 g sugar, 50 g skim milk, 5 g salt, 2.5 g baking powder), F3 (50 g wheat flour, 40 g banana flower flour, 10 g Seluang fish flour, 75 g Margarine, 60 g Egg, 20 g sugar, 50 g skim milk, 5 g salt, 2.5 g baking powder), F4 (50 g wheat flour, 10 g banana flower flour, 40 g Seluang fish flour, 75 g Margarine, 60 g Egg, 20 g sugar, 50 g skim milk, 5 g salt, 2.5 g baking powder)

Figure 3. Acceptance of lacto cookies with substitutions banana heart flour (*Musa paradisiaca*) and Seluang fish flour (*Rasbora Argyrotaenia*)

Aroma

Aroma is an odor caused by chemical stimulation that the olfactory nerves in the nasal cavity smell. The aroma in cheese is produced by the action of lactic acid bacteria, which play a role in causing aroma and sourness. The results of the aroma can be seen in Figure 3. It is known that the average value of acceptance of aroma in the five treatment groups is higher in the Formula 2 group. Based on Table 1, the p-value for color is <0.001, which means it significantly affects the level of preference aspect of the aroma. This was possible because the cookies in the second treatment group (P2) had a more dominant composition of Seluang fish flour than banana flower flour (40:10).

Flavor

Taste is the degree of preference for lacto cookies which is observed by the sense of taste and was grouped into five categories: Strongly dislike, Dislike, Somewhat like, Like, and Really like. Data from the lacto cookies taste organoleptic test calculation between the five treatments can be seen in Figure 3. The results of organoleptic test observations on the lacto cookies taste show that the panelists really liked the taste of the P1 treatment. The Friedman test can determine the difference in the effect of the five treatments. Table 1 shows that the p-value for taste is <0.001, which means that Lacto Cookies with Substitution of Kepok banana heart flour (*Musa Paradisiaca*) and Seluang fish flour (*Rasbora Argyrotaenia*) has a significant influence on the level of preference for the taste aspect.

Texture

Data from the calculation of the organoleptic test for the texture of the lacto cookie between the five treatments can be seen in Figure 3. The results of the organoleptic test observations on the taste of lacto cookies showed that the panelists really liked the texture of the P1 treatment. Table 1 shows that the p-value for taste is 0.078, meaning it does not significantly affect texture ($p=0.078$).

Alkaloid Value

According to the organoleptic results, the P2 group was a lacto cookie tested for alkaloid content in this study. Alkaloids are heterocyclic compounds that have a nitrogenous structure in their chemical structure. These compounds are contained in seeds, fruit, stems, roots, leaves, and other organs. Generally, primary alkaloids in organic solvents are relatively non-polar and poorly soluble in water¹². Almost all alkaloids have a particular organic impact, some are toxic, and some are needed as a medicine¹³. In the tested lacto cookies, the alkaloid produced was of the trigonelline type. Trigonelline is a group of alkaloids with the recipe C7H7NO2 (1-Methylpyridium-3carboxylate). Trigonelline is a chemical typically traced in plant products, has a place with alkaloid clusters, and is a subordinate of B6.

Trigonelline alkaloids have a mechanism of inhibiting dopamine so that there is an increase in the hormone prolactin to increase the synthesis of milk production¹⁴. There are many kinds, and their structures also vary. Nevertheless, examining these structures

shows that alkaloids can be classified into several groups. This finding is because these alkaloids are formed from amino acids such as lysine, ornithine, phenylalanine, tyrosine, tryptophan, and the framework of these amino acids remains original primarily in the alkaloids they derive¹⁵. In several studies, alkaloids became one of the constituents of the hormones oxytocin and prolactin, which are effective in increasing and facilitating milk production¹⁶. The increase in the hormone oxytocin is influenced by polyphenols which will make Milk flow more profusely. The role of oxytocin in the mammary glands is to encourage the contraction of myoepithelial cells from the alveoli to be pushed toward the milk ducts so that the alveoli become empty and stimulate the synthesis of milk¹⁷. Likewise, in steroid function, increased milk production is influenced by the presence of polyphenols and steroids, which affect the prolactin reflex to stimulate the alveoli, which work actively in the formation of breast milk. Most of the alkaloid compounds are sourced from plants. Alkaloids can be found in various parts of plants, such as roots, stems, leaves, and seeds. Alkaloids in plants function as toxins that protect them from insects and herbivores, growth regulating factors, and storage compounds that supply nitrogen and other elements needed by plants¹⁸.

Value of Protein and Crude Fiber

Flour Fish is a food source of animal protein. The need for animal protein sources is essential because it has a relatively high protein content composed of complex essential amino acids that can affect the growth of body tissue cells¹⁹. Meanwhile, banana flower flour has a high fiber and low sugar content. , therefore banana flower flour is perfect for digestion. The sample's high protein and fiber content is expected to increase nutritional intake, especially for nursing mothers, which is practically consumed to help overcome nutritional problems.

This study used a variety of environmental foods that are easy to obtain as essential ingredients for making lacto so that the manufacturing costs are very affordable. The sample's high protein and fiber content is expected to increase nutritional intake, especially for nursing mothers, which is practically consumed to help overcome nutritional problems.

CONCLUSIONS

Acceptability in terms of color, aroma, and taste is a significant difference, while there is no significant difference in texture. The formulation with a composition of 50 grams of wheat flour, 40 grams of banana flower flour, 10 grams of Seluang fish flour, 75 g of margarine, 60 g of eggs, 20 g of sugar, 50 g of skimmed Milk, 5 g of salt, 2.5 g of baking powder is a formulation that most liked. The alkaloid content value of the formulation was 110.03µg/100 g, the protein content was 25% and 79%, and the crude fiber content was 21.06%. Further research is needed regarding the effect of good alkaloid content on breast milk production. In addition, further research to increase the acceptability of lacto cookies needs to be carried out so that they become alternative nutritional support that can be recommended.

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Conflict of Interest and Funding Disclosure

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