



Organoleptic Properties, Nutritional Value, And Acceptability of Ikata Cookies (Fish And Peanuts) As A Nutritious Food Supplement To Prevent Stunting

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Received: 13 September 2025/Accepted: 27 February 2026/Published Online: 28 February 2026

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Abstract

Stunting is one indicator of chronic malnutrition in children. Efforts to combat stunting can be made by providing adequate, nutritious food and good parenting. Previous studies have shown that "Ikametebiwawo," based on local foods (fish, red beans, tempeh, sweet potatoes, pumpkin, carrots), can be developed as a supplementary food for stunted toddlers. This study is a basic study that emphasizes the development of the "Ikametebiwawo" product, which is based on local foods with the addition of peanuts as an alternative supplementary food for stunted toddlers. The objectives of this study were to develop "Ikametebiwawo" with the addition of peanuts through organoleptic testing, nutritional value, safety, essential amino acids, shelf life, and product acceptance. This product was subsequently named IKATA Cookies. The study used a completely randomized design. The results showed that adding 50% peanuts to the total weight of the ingredients produced Cookies IKATA, which semi-trained panelists preferred the most. The preference scores were 4 (like) for color, 4 (like) for aroma, 4 (like) for taste, and 3.4 (between somewhat like and like) for texture. IKATA Cookies (100 grams) contain 425 kcal of energy and 16.61 grams of protein. The essential amino acids contained in IKATA Cookies are: L-Alanine, L-Arginine, L-Histidine, L-Isoleucine, L-Leucine, L-Lysine, L-Methionine, L-Tryptophan, and L-Phenylalanine. The total plate count (TPC) analysis showed zero microbial content in IKATA Cookies (0). The consumer panel acceptance test showed an 82.67% acceptance rate, with p value <0,01. After four weeks of storage, IKATA Cookies were still fit for consumption (no signs of spoilage).

Keywords: IKATA cookies; Nutritional value; Organoleptic properties

INTRODUCTION

The results of the 2022 Indonesian Nutrition Status Survey (SSGI) show that the prevalence of stunting in West Nusa Tenggara (NTB) Province is 32.70%, higher than the national (Indonesia) prevalence of 21.60%. At the district level, the highest prevalence of stunting in NTB Province was in Central Lombok District at 37.00% (Ministry of Health of the Republic of Indonesia, 2022). Stunting is a condition of low height compared to the standard height for a certain

age. Dietary patterns with inadequate protein intake are associated with stunting. Serum essential amino acids in children with stunting are significantly lower than those without (Semba et al., 2016).

The availability of amino acids is necessary for the continuity of protein synthesis. The Mechanistic target of rapamycin complex 1 (mTORC1) pathway is highly sensitive to amino acid availability. mTORC1 integrates signals from nutrients, growth factors, oxygen, and energy to regulate bone growth, skeletal

muscle, the nervous system, the digestive tract, hematopoietic cells, immune effector cells, organ size, and whole-body energy balance (Semba et al., 2016); (Uauy et al., 2016)

In addition to nutritional intake, growth is also influenced by hormonal and genetic factors (Wei & Gregory, 2009); (Batubara et al., 2015). Hormones that influence growth include growth hormones such as Interleukin Growth Factor-1 (IGF-1), which supports long bone growth by stimulating chondrocyte proliferation and maturation and plays a role in skeletal muscle growth (Yakar et al., 2018). Energy and protein deficiencies can significantly reduce IGF-1 levels (Ahmid et al., 2016); (Blum et al., 2018). Malnutrition can also increase Growth Hormone resistance, causing increased expression of the Suppressor of Cytokine Signaling 2 (SOCS-2) gene, thereby reducing IGF-1 production and secretion (Hawkes & Grimberg, 2015).

Previous research has found that the locally sourced food bar "Ikametebiwawo" (fish, red beans, tempeh, sweet potatoes, pumpkin, carrots) has the potential to be developed as a supplementary food for stunted toddlers (Darawati et al., 2021). However, "Ikametebiwawo" still has a weakness: its short shelf life. Hence, it needs to be developed into a dry food product, and its nutritional density needs to be increased by adding peanuts. Peanuts are high in fat and protein, have a savory taste, and are easily obtained. This developed product was then named "IKATA Cookies".

METHOD

This study used an experimental method conducted in a laboratory, using a completely randomized design (CRD) with one treatment factor: adding roasted peanuts, consisting of 5 treatment levels. Each level was repeated 3 times. The treatment levels were as follows:

t1: addition of 10% roasted peanuts to the total weight of the ingredients

t2: addition of 20% roasted peanuts to the total weight of the ingredients

t3: addition of 30% roasted peanuts to the total weight of the ingredients

t4: addition of 40% roasted peanuts to the total weight of the ingredients

t5: addition of 50% roasted peanuts to the total weight of the ingredients

Table 1. Composition of IKATA Cookies Ingredients

Food Ingredient Name	Treatment Level				
	t1	t2	t3	t4	t5
Catfish meat	20 g	20 g	20 g	20 g	20 g
Red bean flour	10 g	10 g	10 g	10 g	10 g
Soybean tempeh	10 g	10 g	10 g	10 g	10 g
Yellow sweet potato flour	50 g	50 g	50 g	50 g	50 g
Pumpkin flour	5 g	5 g	5 g	5 g	5 g
Carrot	3 g	3 g	3 g	3 g	3 g
Raisins	15 g	15 g	15 g	15 g	15 g
Addition of roasted peanuts	10% (32.5 g)	20% (65g)	30% (97.5 g)	40% (130g)	50% (162.5g)
Margarine	25 g	25 g	25 g	25 g	25 g
Granulated sugar	30 g	30 g	30 g	30 g	30 g
Egg white	2 eggs	2	2	2	2 pieces
Skim milk	25 g	25 g	25 g	25 g	25 g
Corn flour	40 g	40 g	40 g	40 g	40 g

The organoleptic properties (color, aroma, taste, and texture) of IKATA cookies were then tested by 25 semi-trained panelists using the hedonic scale scoring method with a 5-point scale, where 1 = strongly dislike, 2 = dislike, 3 = somewhat like, 4 = like, 5 = strongly like (Setyaningsih et al., 2010). The data from the organoleptic t-test were processed using a non-parametric statistical test (non-normally distributed data), namely the Kruskal-Wallis test. The IKATA cookies selected from the organoleptic t test results were analyzed for their nutritional content, including: moisture content (thermogravimetry), ash (dry

combustion), fat (Soxhlet), in accordance with SNI 01-2891-1992, protein (micro Kjeldahl) in accordance with AOAC 960.52-1961 (AOAC (Association of Official Analytical Chemists), 2010), and carbohydrates (by different), total microbes (total plate count at 30°C, 72 hours) (BSN, 2008), essential amino acids (LCMS). Determination of product shelf life (conventional method). The acceptance test for IKATA Cookies was conducted by a consumer panel consisting of toddlers aged 3–5 years. This research approved Ethical approval with number: DP.04.03/F.XL.26/413/2025

RESULTS AND DISCUSSION

Organoleptic Properties of IKATA Cookies

Every region in Indonesia has its own unique local food resources. Cookies made from local ingredients will have a distinctive and authentic taste. Many local foods are rich in fiber, vitamins, and minerals. This makes cookies made from local ingredients healthier and more nutritious (Fajar, 2015); (Soenardi, 2017). The local food ingredients used to make these cookies are: catfish, red bean flour, tempeh, sweet potato flour, corn flour, pumpkin flour, carrots, and peanuts. The ingredients were selected based on their nutritional value, taste, and availability. The organoleptic properties of IKATA cookies were assessed by a semi-trained panel using a hedonic scale scoring test. The average organoleptic test results are presented in Table 2.

Table 2. Average results of the organoleptic test of IKATA cookies

Organoleptic Properties	t1	t2	t3	t4	t5
Aroma	3.6	3.7	3.7	3.8	4.0
Color	3.7	3.8	3.7	3.7	4.0
Taste	3.4	3.6	3.7	3.6	3.7
Texture	3.3	3.5	3.7	3.3	3.4

Color

The selection of a food product will consider the appearance or color of the product first because a product with a good appearance tends to have good taste and high quality (Tarwendah, 2017). The hedonic value of the appearance of cookies obtained the highest value in adding 50% peanuts, with a value of 4, which is categorized as like. Statistical analysis using the Kruskal-Wallis test showed that adding different amounts of peanuts did not significantly affect the level of liking in terms of the appearance of the cookies (sig = 0.505). Roasted peanuts did not affect the appearance/color of the cookies because the color of the roasted peanuts used was brownish-white. The color of the IKATA cookies produced was brownish-yellow.

Aroma

Aroma is the most important characteristic of food ingredients because it can quickly determine whether a product is acceptable. The hedonic value of cookies with roasted peanuts was highest, with the addition of 50% roasted peanuts scoring 4.00, which is classified as "like." Statistical analysis showed no significant difference in the aroma of IKATA cookies due to adding peanuts (sig = 0.192). Aroma in food is significant because it determines consumer acceptance of food. Aroma is determined by one component, several specific components that produce a distinctive aroma, and the ratio of various ingredients (Damayanti, 2000). The aroma of the cookies produced is fragrant and savory.

Taste

Taste is a sensation that arises from the combination of exceptional taste receptor cells located in the mouth, especially on the taste buds (tongue), and is broken down into sweet, sour, salty, bitter, and savory or umami sensations. The highest hedonic value of cookies was obtained from the treatment with 50% addition of roasted peanuts. Statistical analysis results showed no significant effect (sig = 0.505). The taste of

the cookies comes from the combination of ingredients used. The taste of IKATA cookies is sweet and savory.

Texture

The texture of cookies includes hardness and ease of breaking. Texture is assessed by touching the surface of the product, usually using the fingertips, so that the texture of a material can be felt (Trisyani & Syahlan, 2022); (Devi et al., 2019). The highest hedonic value for cookie texture was found in the treatment with 30% addition of roasted peanuts. Statistical analysis showed a sig value of 0.304. This indicates that adding roasted peanuts has no significant effect on cookie texture.

The best cookie treatment level was determined based on the results of assessments of the cookies' color, aroma, taste, and texture. Based on the assessment results and statistical analysis, treatment level t5 (50% addition of roasted peanuts) was selected as the most preferred IKATA cookie.

Nutritional Value (Moisture Content, Ash, Fat, Protein, Crude Fiber, Carbohydrates, and Energy) of IKATA Cookies.

Table 3 presents the energy content, moisture content, ash, fat, protein, carbohydrates, and crude fiber of IKATA Cookies treatment level t5 (50% addition of roasted peanuts to the total weight of ingredients).

Table 3. Nutritional content in 100 grams of IKATA Cookies

Nutrient	Value
Moisture Content	12.35
Ash Content	0.07
Fat Content	15.84%
Protein Content	16.61
Crude fiber content	1.31
Carbohydrate content	53.82%
Energy	425 kcal

Based on the nutritional data obtained, IKATA Cookies fully meet the requirements for complementary foods for toddlers, containing 425 kcal and 16.67 grams of protein per 100 grams. Complementary foods require 300–400 kcal of energy per 100 grams of food and 3–4 grams of protein per 100 kcal.

Compared to SNI No. 01-2973-1992, cookies (dry biscuits), most nutritional content requirements have been met, except for the water content, which still exceeds the standard (BSN, 2008). SNI requires that the maximum water content of cookies be 5%. The water content that exceeds the SNI is due to the use of several ingredients that have a reasonably high water content in the manufacture of cookies, namely, catfish and steamed carrots. Referring to research by (Wati et al., 2020) on cookies made from ganyong flour, the measured moisture content was in the range of 4-6%, while another study by Sari et al. (2021) on functional cookies showed a moisture content of around 5-8%. The higher moisture content in your product indicates that there are unique factors in the formulation or raw materials that need further examination, such as adding ingredients that can absorb and bind more water.

A fat content of 15.84% and a protein content of 16.61% indicate that IKATA Cookies are a good source of macronutrients. Research by (Fitriani et al., 2022) on biscuits with added snakehead fish flour showed an increased protein content of up to 15%. The high protein content of IKATA Cookies comes from the raw materials used, namely fish, tempeh, red beans, and peanuts.

Amino Acid Content of IKATA Cookies

Protein is a significant nutrient essential during the toddler's growth period. It is composed of various types of amino acids. Table 4 presents the amino acid content of IKATA Cookies.

Table 4. Amino Acid Content of IKATA Cookies

Type of Amino Acid	Value	Unit
L-Alanine	7113.37	mg/kg
L-Arginine	12712.33	mg/kg
L-Aspartic Acid	13863.50	mg/kg
L-Glycine	11059.85	mg/kg
L-Glutamic Acid	23448.98	mg/kg
L-Histidine	3184.00	mg/kg
L-Isoleucine	2495.52	mg/kg
L-Cysteine	2121.68	mg/kg
L-Leucine	9098.01	mg/kg
L-Lysine	3469.37	mg/kg
L-Methionine	132.88	mg/kg
L-Tryptophan	1254.56	mg/kg
L-Valine	3286.72	mg/kg
L-Phenylalanine	8674.27	mg/kg
L-Proline	7066.82	mg/kg
L-Serine	9761.54	mg/kg
L-Threonine	9619.27	mg/kg
L-Tyrosine	6684.39	mg/kg

IKATA cookies contain 10 types of essential amino acids (EAAs), namely L-Alanine, L-Arginine, L-Histidine, L-Isoleucine, L-Cysteine, L-Leucine, L-Lysine, L-Methionine, L-Tryptophan, and L-Phenylalanine, which are essential for infant growth and development. One of the causes of stunting in toddlers is a lack of protein intake, especially essential amino acids, which must be obtained from food. A risk factor for stunting in toddlers is a lack of dietary diversity. The intake of EAAs in stunted toddlers, especially isoleucine, is lower than in non-stunted toddlers (Nurbaiti et al., 2023).

These essential amino acids play a significant role as follows (Mahan & Escott, 2016):

- L-Leucine (9098.01 mg/kg): One of the most dominant BCAAs (Branched-Chain Amino Acids). Leucine is essential for muscle protein synthesis, tissue repair, and blood sugar regulation.
- L-Lysine (3469.37 mg/kg): Important for growth, collagen production, and calcium absorption.

- L-Isoleucine (2495.52 mg/kg): Along with leucine and valine, it is important for muscle energy metabolism.
- L-Methionine (132.88 mg/kg): An essential sulfur-containing amino acid, important for metabolism and detoxification.
- L-Phenylalanine (8674.27 mg/kg): A precursor for tyrosine and important neurotransmitters such as dopamine.
- L-Threonine (9619.27 mg/kg): Essential for collagen and elastin formation.
- L-Tryptophan (1254.56 mg/kg): A precursor for serotonin and melatonin, important for mood and sleep.
- L-Valine (3286.72 mg/kg): Another BCAA important for muscle tissue repair and growth.
- L-Histidine (3184.00 mg/kg): Important for producing red and white blood cells and myelin.

Results of Total Microbial Count, Acceptability, and Shelf Life Tests for IKATA Cookies

Total microbes in IKATA cookies

The total microbial count (Total Plate Count) on IKATA Cookies showed a value of 0 (zero), or no microbial contamination was found. In addition to containing nutrients the body needs, food products must also be free from contamination and microbial growth to be consumed. The total microbial content in IKATA Cookies was analyzed using the total plate count (TPC) method, and it showed zero (0) or no microbial growth. Therefore, IKATA Cookies meet the safety requirements for consumption, per SNI No. 01-2973-1992 (BSN, 2008).

Acceptability and shelf life of IKATA Cookies

Table 5. Acceptance test results for IKATA Cookies by consumer panelists (children aged 3-5 years)

Category	n	%
Good acceptance (product consumption $\geq$ 80%)	62	82.67
Poor acceptance (product consumption < 80%)	13	17.33

Total	75	100.00
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Consumer acceptance is one indicator used to measure the success of food product development. In food production, a product is said to have good acceptance if consumers can consume more than 80% of the portion served. The additional food requirements (snacks) for toddlers are 10% of their daily requirements, around 150-200 kcal, and 4-5 grams of protein. So, one serving of IKATA Cookies weighing 40 grams contains 170 kcal and 6 grams of protein. The results of the acceptance test by toddlers show that most toddlers have good acceptance of IKATA Cookies (Indonesian Ministry of Health, 2019). Based on observations of the color, aroma, and texture of IKATA Cookies, it was found that up to the fourth week of storage, the product was still in normal condition and suitable for consumption, and showed no signs of damage.

CONCLUSION

IKATA cookies with 50% roasted peanuts added to the total weight of ingredients have the most desirable organoleptic properties (color, aroma, taste, and texture). IKATA cookies (per 100 grams) contain 425 kcal of energy and 16.61 grams of protein. The essential amino acids contained in IKATA Cookies are: L-Alanine, L-Arginine, L-Histidine, L-Isoleucine, L-Leucine, L-Lysine, L-Methionine, L-Tryptophan, and L-Phenylalanine. The total plate count (TPC) analysis results show that the total microbial content in IKATA Cookies is zero (0). Consumer panel acceptance testing showed an 82.67% acceptance rate. After four weeks of storage, IKATA Cookies were still fit for consumption (no signs of deterioration). IKATA Cookies have the potential to be given to toddlers as a measure to prevent stunting.

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