

# Exploring Chemical and Sensory Attributes of Katuma Pineapple Tarts as a Healthy Lactogenic Functional Food for Breastfeeding Mothers

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## Abstract

The research focused on substituting Katuma pineapple tart with mung bean flour, katuk leaf flour, and dates to investigate the chemical and nutritional characteristics. The aim was to develop a lactogenic functional food product beneficial for breastfeeding mothers. Mung bean flour and katuk leaf flour were identified as lactogenic ingredients rich in folic acid and vitamin B complex, known to enhance milk production in nursing mothers. The study, designed as a non-factorial experiment, aimed to create lactogenic functional food products for improved breast milk quality. The chemical content analysis of Katuma pineapple tart (nastar) adhered to SNI 01-2973-1992 quality criteria, revealing 425 kcal of energy, 8 g of protein, 21 g of fat, 50.5 g of carbohydrates, 1.59% ash content, and 18.57% moisture content. Sensory analysis results for color, aroma, taste, and texture indicated a positive reception by panelists. The most preferred formulation, Formula F2 (85% mung bean flour and 15% other ingredients), highlighted a higher ratio of mung bean flour. Katuma pineapple tart emerges as a promising lactogenic functional food alternative, capable of increasing breast milk concentration in nursing mothers through its lactogenic main ingredients.

**Keywords:** Pineapple tarts, chemical attributes, sensory attributes, mung bean flour, katuk flour

**Full length**

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## 1. Introduction

Breast milk is the best liquid of life that babies need. Breast milk contains various substances that are important for the growth and development of the baby and in accordance with its needs. The production and secretion of breast milk is influenced by the two hormones prolactin and oxytocin. If the baby does not suck the nipple in the half hour after delivery, the hormone will drop and it is difficult to stimulate prolactin so that breast milk will only come out on the third day or more (Aprilina, 2016). Based on the results of the 2018 Basic Health Research (Riskesdas), the coverage of exclusive breastfeeding in Indonesia has only reached 33.37%. When compared to the recommendations of the Indonesian Government through the Decree of the Minister of Health of the Republic of Indonesia No. 45- / Menkes / SK IV / 2004 concerning exclusive breastfeeding for infants in Indonesia, it is still below the target. The Indonesian government recommends an exclusive breastfeeding target of 80% [1]. While WHO recommends 50% [2]. Breastfeeding mothers are one of the groups in the life cycle that require attention. Nutritional needs during the breastfeeding period will increase by 25%, the food consumed is useful for metabolic activities, reserves in the body and in the process of producing

breast milk which will be consumed for the growth and development of the baby. Because breast milk contains proteins, carbohydrates, fats and minerals that babies need in balanced amounts [3]. One of the foods that can increase breast milk production and meet the needs of breastfeeding mothers is mung beans, katuk leaves and dates. The nutritional content of mung beans is quite high and the composition is complete. Based on the amount, protein is the second main constituent after carbohydrates, containing about 20-25% protein. Mung beans also contain active compounds, namely polyphenols and flavonoids, which function to increase the prolactin hormone. When the prolactin hormone increases, breast milk secretion will increase and the nutrients contained in mung beans will increase the nutrients in breast milk [4]. This is in line with research conducted by Wulandari & Jannah (2015) which states that there is an effect of giving mung bean juice on the smooth production of breast milk in nursing mothers [5]. Katuk leaves (*Sauropus androgynus*) contain *galactagogues* that can trigger an increase in breast milk production. Katuk leaves also contain steroids and polyphenols that can increase prolactin levels. At a temperature of 60° C with the length of drying, the total polyphenol content produced decreased. This is because the nature of polyphenol compounds is not resistant to too high heat and drying time is too long so that heat can damage the polyphenol components contained in the

material [6]. Dates are the fruit of the *Phoenix dactylifera* plant which has a seed with one copper. Dates contain protein, iron, glucose, fiber, vitamins, niacin, and folic acid. One of the mineral content of dates is *potassium*, which functions as a receptor barrier from dopamine so that it will stimulate the release of prolactin. Dates also contain protein that will increase milk production by metabolizing glucose for lactose synthesis [7]. Various strategies have been developed to increase breast milk production, namely by creating lactogenic functional food products that are easy to serve, easy to process, meet the snack needs of nursing mothers and contain *galactagogues*, one of which is nastar cake with the addition of mung bean flour and katuk leaves [8]. Based on food consumption statistics in 2020, the average consumption of pastries in a week increased from 0.373 ounces in 2016 to 0.438 ounces in 2020 or consumption in a year of 19.449 ounces in 2016 to 22.834 ounces in 2020, with an average growth from 2016-2020 of 4.250% (Ministry of Agriculture of the Republic of Indonesia, 2020). Based on previous research, lactogenic products are widely used as supplementary food for breastfeeding mothers to increase breast milk, the form of products that can be modified is very diverse such as white bread, biscuits and other snacks [9]. Utilization of local wisdom-based lactogenic biscuits made from katuk leaves to meet the snack nutrient needs of nursing mothers can consume as much as 68 g of lactogenic biscuits. Meanwhile, 100 g of katuk leaves contain 59 kcal, 5.8 g protein, 1 g fat, and 11 g carbohydrate [10]. This means that to meet the nutritional needs of breastfeeding mothers and to increase breast milk production, processed biscuits substituted with katuk leaf flour are more effective. Katuma pineapple tarts belong to the *sugar pastry* group, which is a sweet-tasting *pastry* dough made with a dry system. There are so many benefits provided by functional food ingredients such as katuk leaves, mung beans and dates as one of the lactogenic food ingredients in breastfeeding mothers. Based on this, researchers are interested in conducting research by focusing on analyzing the chemical and sensory content of katuma pineapple tart as a lactogenic functional food that is beneficial for breastfeeding mothers.

## 2. Materials and Methods

This research is an experimental research with a non-factorial Completely Randomized Design (RAL) with three formulas namely F1, F2 and F3. This research was conducted at the Food Technology and Nutrition Laboratory of the Poltekkes Kemenkes Palembang. Chemical and nutritional analysis was carried out at Saraswanti Indo Genetech Bogor Laboratory. The results of proximate analysis such as water content, fat, protein, ash and carbohydrate content of katuma pineapple tart were tested based on the AOAC 1995 method. Analysis of water content by gravimetry, protein content using the Kjeldahl method, fat content using the Weibull method, carbohydrates by difference, and total energy by calculations. The organoleptic test was tested on 30 untrained panelists in a sensory laboratory. The scale that the hedonic test uses is 1 = very dislike, 2 = dislike, 3 = somewhat like/neutral, 4 = like, 5 = very like. The main basic ingredients used in making katuma pineapple tart are mung bean flour, katuk leaf flour and dates. The katuk leaf flour and mung bean flour came from Palembang City, which were made into flour using oven

drying at 55-65 °C for 5-6 hours, and sieved using a 200-mesh sieve. Dates jam used as filling in katuma is processed with puree concentration technique with cooking temperature around 70°C until a thick jam concentration is obtained. The tools used in this research consist of basin, Teflon, whisk, silicone rolling, oven, and cabinet dryer. Statistical test of acceptability using *Kruskall Walls*, if there is a difference followed by *Wilcoxon* test.

## 3. Results and Discussions

### 3.1. Chemical and Nutritional Content of Katuma Pineapple Tart

Chemical and nutritional content of Katuma's was presented in Table 1.

#### 3.1.1. Total Energy

The energy content value is obtained based on the calculation of the conversion of protein, fat and carbohydrate content into Kcal units. The largest source of energy is fat. The conversion of 1 gram of fat is 9 calories. Carbohydrates and proteins are 1 gram equivalent to 4 cal. Based on proximate analysis, the energy content of katuma pineapple tart is 425.71 kcal. Based on the quality requirements of nastar cookies according to SNI, which is at least 400 kcal, this means that katuma pineapple tart with the addition of mung bean flour and katuk leaves filled with date jam meet the quality requirements of nastar cookies according to SNI 01-2973-1992 [11]. Breastfeeding mothers need more energy than normal or non-breastfeeding mothers [12]. The results of total energy content can be seen in Table 1.

#### 3.1.2. Protein

The protein content found in katuma pineapple tart based on proximate analysis is 8.03%. This shows that the protein content of katuma pineapple tart is in accordance with SNI 01-2973-1992 which is min 5%. Nuts are one of the good sources of vegetable protein in growth, one of the producers of vegetable protein that is affordable and useful. Nuts have a significant role in the fulfillment of protein [13]. The high protein content in mung beans is due to its complete amino acid content. So that the higher the amount of mung beans added, the higher the protein content of the resulting product. One of the many amino acids contained in mung beans includes sulfur amino acids, including methionine and cysteine [14]. High protein content is also obtained in katuk leaf flour, based on research conducted by Zakaria (2013) states that the protein value of katuk leaf flour is 28.85% so that more concentration of katuk leaf flour added will increase the protein content in the resulting product [15]. Breastfeeding mothers while running the breastfeeding program need high protein. The food preparation components of katuma pineapple tart such as mung beans and katuk leaves are proven to contain folic acid and vitamin b complex, which are good for breastfeeding mothers. 100 g of mung beans contain 159 µg of folic acid, and 0.2 mg of thiamine [16].

#### 3.1.3. Fat

Fat content in katuma pineapple tart according to proximate analysis is 21.27% and based on the quality

requirements of cakes according to SNI 01-2973-1992 fat content is at least 9.6%. The results of this proximate analysis explain that katuma has met the quality requirements of pineapple tart cookies. The high fat content in nastar cookies is due to the composition of the main ingredients of the nastar cookie formula katuma has a high fat content such as mung bean flour, katuk leaf flour and dates. In addition, the fat source of katuma can be derived from complementary ingredients such as butter and eggs. The high fat content of katuk leaf flour causes the biscuits substituted with katuk leaves and mung beans to also have a high fat content. The fat content of mung bean flour per 100 grams is around 14.3 grams, while the fat content in katuk leaf flour is 26.32% [17, 18].

### **3.1.4. Carbohydrates**

Based on the calculation of proximate analysis, the carbohydrate content of katuma pineapple tart is around 50.54%. The carbohydrate content is not too high in katuma pineapple tart because the ingredients used are not ingredients that have relatively high carbohydrate content. The decrease in carbohydrate content can also be influenced by the interaction of other nutritional components such as high protein content and high ash content. Decreased carbohydrate levels can be influenced by the interaction of other nutritional components. Carbohydrate levels in katuma pineapple tart are calculated by difference, therefore carbohydrate levels are influenced by the levels of other nutrients such as water, ash, fat and protein [19]. With the lower levels of other nutrients, the higher the carbohydrate content, and vice versa, the higher the levels of other nutrients, the lower the carbohydrate content [20]. The addition of katuk leaf flour with a high protein concentration causes the carbohydrate content of the product to decrease; this is because katuk leaf flour and mung bean flour contain high levels of minerals and protein.

### **3.1.5. Ash content**

Based on the results of the ash content analysis, the ash content of katuma pineapple tart was 1.59%. The increased ash content in cookies with the addition of katuk leaf flour is due to the high mineral content of katuk leaf flour in lactogenic snacks. Quantitatively, the value of ash content in flour comes from minerals in fresh products, the use of fertilizers, and can also come from soil and air contamination during processing [21]. High ash content can also be caused by protein concentrate; this is because the higher ash content will reflect the higher number of minerals in the product [22]. One of the main components of katuma pineapple tart is mung bean flour and katuk leaves, which are ingredients that are high in folic acid and vitamins that function to stimulate the alveoli in lactating mothers. During lactation, some activity of secretory cells in the alveoli will cause the secretion of milk components into the lumen of the alveoli. The substances contained in the test preparation can increase the activity of secretory cells, which causes the diameter of the mammary gland to become large, so that the milk will increase in volume. Therefore, foods that stimulate the alveoli or are said to be lactogenic foods are highly recommended to be consumed by mothers during the breastfeeding period [23].

### **3.1.6. Water Content**

Based on the analysis of moisture content, it was found to be 18.57% where the moisture content in katuma pineapple tart. Moisture content is related to the shelf life of nastar products. The high moisture content in katuma pineapple tart can be caused by mung bean flour and katuk leaf flour in the nastar dough. Flour from vegetable materials is usually high in starch; the starch plays a role in retaining water so that the gelatinization process occurs [24]. Mung bean flour has a water content ranging from 26.87 to 33.82% [17]. Cassava leaf flour also has a moisture content of around 8.16% [25]. Based on the results of the study, the constituent components of katuma pineapple tart such as mung bean flour and katuk leaves are very high in moisture content and are associated with a relatively short shelf life.

## **3.2. Sensory Analysis of Katuma's Pineapple Tart**

Sensory analysis test results showed in Figure 1.

### **3.2.1. Color**

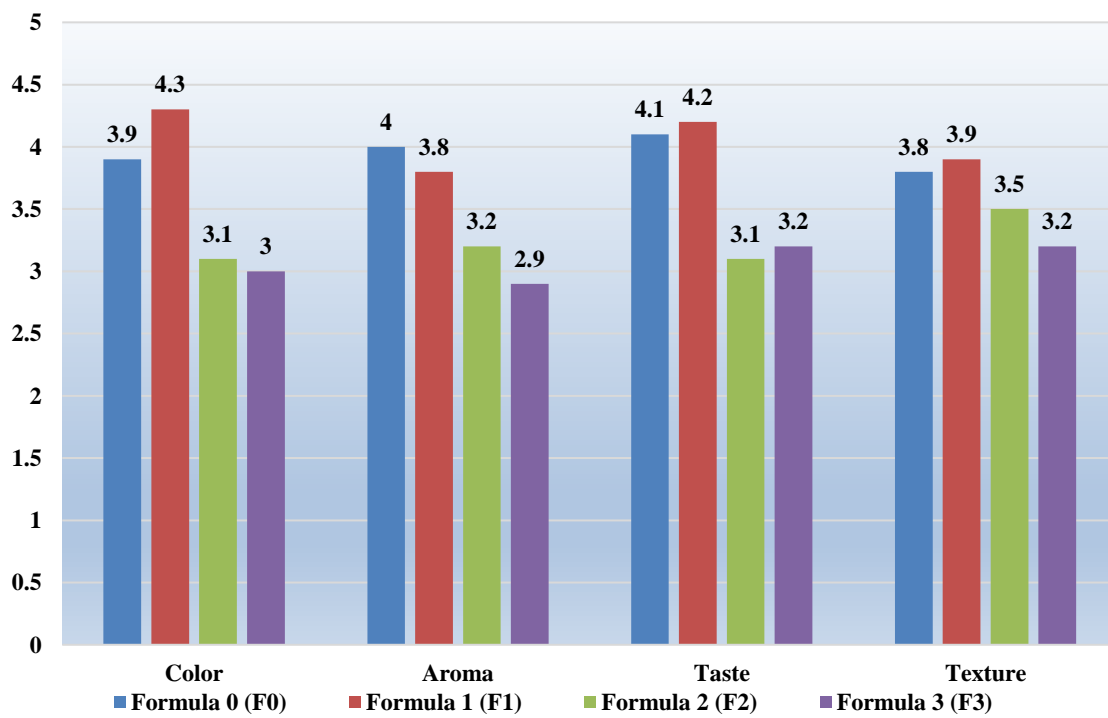
The results of sensory analysis seen from the color parameters of katuma pineapple tart (nastar), the highest percentage of 50% was obtained in formula 1 (F1) with an average value of 4.3. The F1 katuma pineapple tart produces a light green color that is not too intense, while F2 and F3 produce a more intense green color. Katuk leaf flour is high in chlorophyll content, which has a positive impact as a natural color for food products in addition to its lactogenic effect. Chlorophyll levels in katok leaves range from 1136.6 mg kg<sup>-1</sup>chlorophyll-a and 372.5 mg kg<sup>-1</sup> chlorophyll b of dry weight [26]. The green color of katuk leaf flour is what gives a natural green color to the katuma nastar cake product. In the sensory power test results to panelists, some panelists assumed that adding mung bean flour and katuk leaves had a more attractive color and a better taste when combined with date jam in the cake. In addition, katuk leaf flour has quite a lot of essential amino acids, including nine essential amino acids, with the highest content of arginine and eight non-essential amino acids, with the highest content, glutamic acid [27]. The high chlorophyll content in katuk leaves functions as one of the natural antioxidants for the body, such as functioning to increase Hb and ferritin levels for those who experience anemia [28].

### **3.2.2. Aroma**

Based on Figure 1, the highest score from the organoleptic test results was found to be the most preferred aroma in formula F0 [4]. This shows that the aroma of the control formula katuma pineapple tart remains more favorable than the katuma pineapple tart fortified with mung bean flour, katuk leaf flour and dates. Aroma is a distinctive smell that is difficult to measure so it usually causes different opinions for those who judge it. Differences in opinion can be caused because each person has differences in smell, although they can distinguish aromas but each person has

**Table 1.** Comparison of Proximate Analysis, SNI 01-2973-1992 Quality Requirements and Breastfeeding Mother Snack Standards of Katuma's Pineapple tart (Nastar)

Parameters	Katuma's Pineapple Tart (Nastar) /100 grams	Quality Requirements SNI 01-2973-1992/100 g	Breastfeeding Mother Snack Standard (AKG)
Energy	425.71 kcal	Min 400	240 - 270 kcal
Protein	8.03 gr	Min 5	7.5 gr
Fat	21.27 g	Min 9.5	6.72gr
Carbohydrates	50.54 gr	Min 70	39.5 - 41.5 gr
Ash Content	1,59%	Max. 1,6	-
Water Content	18,57%	Max. 5	-



**Figure 1.** Sensory Analysis of Katuma's Pineapple Tart (Nastar)

different preferences. Aroma can be received by the senses working through the mechanism of substances contained in the mouth and is often caused by the effect of folicyl compounds contained in the content of the product [29]. The results of the analysis according to the panelists at the time of the acceptability test of the aroma criteria of the nastar cake with the addition of mung bean flour filled with date jam, the aroma caused by mixing katuk leaves is rather pungent but still acceptable.

### 3.2.3. Taste

Food flavor is an assessment factor for the results of combining ingredient formulations in making a food product that is assessed by the tongue, by measuring sweet, sour, salty, bitter or other combinations and is a determinant of the level of liking in food products [19]. Based on the results of the sensory analysis, it was found that formula F1 was the formula with the highest percentage that was liked with an average value of 4.1. Katuk leaves and mung beans have their own flavor from the panelists' assessment, if combined with wheat flour and dates, the taste of katuma pineapple tart can be well received. The sweet taste of date jam tends to give a taste that can be enjoyed and can disguise the bitter taste obtained from katuk leaves, this is because the taste of dates tends to be more dominant so that it can disguise the taste of other ingredients [30].

### 3.2.4. Texture

The results of the organoleptic test analysis contained in Figure 1, explain that the sensory test results that are most favored by panelists from the texture parameter in katuma's are formula F1 (3.9). Texture is one of the parameters commonly used in sensory tests for a food product, because texture is the value of touch on a surface, both real and apparent. Consistency or texture of food is also a component that helps determine the taste of food because the sensitivity of the sense of taste is influenced by the consistency of food. Food with a solid or thick consistency will provide slower stimulation to the human senses [31]. One of the snacks that can be liked by all ages is biscuits or cookies, nastar is included in the type of snack that is very popular in Indonesia, the use of materials that are easily obtained from nature and has a distinctive taste that is suitable as a snack for breastfeeding mothers who need a lot of energy supply during breastfeeding [32].

## 4. Conclusions

Katuma pineapple tarts studied showed that this food product is very suitable as a lactogenic functional food that is beneficial in increasing the volume of breast milk in nursing mothers. Katuma pineapple tarts, based on the results of chemical and nutrient analysis, are proven to meet the daily snack requirements for breastfeeding mothers.

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