SENSORY AND CHEMICAL QUALITY ANALYSIS OF YELLOW PUMPKIN STEAMED SPONGE (CUCURBITA MOSCHATA) AS AN ALTERNATIVE HIGH-FIBER SNACK

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ABSTRAK

Labu kuning merupakan bahan pangan lokal Indonesia yang tingkat produksinya cukup tinggi, namun pemanfaatannya masih sangat terbatas oleh masyarakat. Labu kuning memiliki keunggulan karena mengandung karotenoid sebagai antioksidan dan kandungan serat yang tinggi. Tujuan dari penelitian ini adalah untuk menganalisis kandungan gizi bolu kukus labu kuning dengan menggunakan uji proksimat. Penelitian ini merupakan penelitian deskriptif dengan uji kualitas kimia yang dilakukan di laboratorium pengujian makanan. Penelitian dilakukan di laboratorium pastry dan bakery Universitas Negeri Jakarta. Laboratorium SIG yang telah membantu dalam proses analisis proksimat dan serat pangan pada produk penelitian. Hasil uji mutu kimiawi menyatakan bahwa bolu kukus labu kuning memiliki kadar air 39,35%, kadar abu 0,63%, kadar lemak 14,36%, dan kadar protein 4,82% dimana angka-angka tersebut masih dalam batas standar SNI Bolu Kukus. Kandungan serat pangan produk bolu kukus labu kuning sebesar 4,53% yang dihasilkan dari penambahan puree labu kuning. Produk ini diharapkan dapat menjadi alternatif kudapan tinggi serat bagi masyarakat sehingga dapat memenuhi kebutuhan gizi harian.
Kata Kunci: kue kukus, labu kuning, camilan sehat, mutu sensori, kualitas kimiawi.

ABSTRACT

Yellow squash is a local Indonesian food ingredient with high production rates, but its use is still very limited by the community. Yellow pumpkin has the advantage of containing carotenoids as an antioxidant and high fiber content. The aim of the study was to analyze the nutritional content of the pumpkin steamed sponge cake by means of the proximate test. This research is a descriptive research with a chemical quality test conducted in a food testing laboratory. The research was conducted in the pastry and bakery laboratory, Jakarta State University. SIG Laboratory which has assisted in the process of proximate analysis and food fiber in research products. The results of the chemical quality test stated that the pumpkin steamed sponge had a moisture content of 39.35%, ash content of 0.63%, fat content of 14.36%, and protein content of 4.82% where these numbers were still within the standard limits SNI Steamed Sponge. The food fiber content of the pumpkin steamed cake product is 4.53% which is produced from the addition of pumpkin puree. This product is expected to be an alternative high-fiber snack for many people so that they can meet their daily nutritional needs.
Keywords: *steamed cake, yellow squash, healthy snack, sensosry quality, chemical quality.*

INTRODUCTION

According to data from the Central Statistics Agency in 2018, the average yield of pumpkin production throughout Indonesia from 2018 was around 55.74 tons per hectare, while pumpkin consumption in Indonesia is still very low, namely less than 5 kg per capita per year. This type of plant has high benefits because most of the plants can be consumed from the young leaves to the fruit. Yellow pumpkin has several advantages and disadvantages, including its various nutritional content such as the content of carbohydrates, protein, calcium, phosphorus, B vitamins, vitamin C, and fiber. Another advantage of pumpkin is that it has a natural yellow color thanks to its very high carotenoid content (Ranonto, Nurhaeni, & Razak, 2015).

The production rate for pumpkin in Indonesia is quite high, it can reach 20-21 tons per hectare, but its utilization is still very low, at less than 5 kilograms per capita per year

(Halimah and Rahmawati, 2021). Yellow pumpkin on a household scale is usually processed by boiling and steaming, while for other food products it will be made puree or porridge first. One of the ways to use pumpkin is to use it as an additional ingredient in making steamed cakes.

Steamed sponge is a cake made from wheat flour, granulated sugar, chicken eggs, water and emulsifier, mixed until fluffy then finished by steaming (Sari and Jairani, 2019). In making steamed cakes, pumpkin is usually made into flour or puree first. Puree is a term that comes from French which is defined as a mashed food ingredient or in English it is called mashed. Puree is a fruit or vegetable that contains a lot of starch, which is steamed until soft and then mashed and filtered (Rahayu, & Winarni, 1997).

Pumpkin puree is widely used in pastry and bakery products, it can be added to cakes and donuts. The use of 60% pumpkin puree in the manufacture of steamed blossom cakes has a relatively high swelling capacity of 72.2% and is a preferred product in terms of color, aroma, taste and texture (Stefania, Ludong, & Oessoe, 2021). Puree can also be used in donut products with a usage percentage of 40% and results in good consumer acceptance in terms of size, color, aroma, taste and texture (Halimah & Rahmawati, 2021). Another application of pumpkin puree is the tiger roll cake product with a percentage of using pumpkin puree of 50% which produces the best acceptability in terms of sensory aspects (Sayekti & Rahmawati, 2021).

Pumpkin puree is also used in the manufacture of steamed black glutinous rice cakes as much as 40% and produces good characteristics with an ash content of 1.32%, a moisture content of 37.73% and good sensory qualities in the form of color, taste, texture and aroma (Sholin, Suparthana & Yusa, 2022). Making eclairs using pumpkin puree as much as 20% produces good development compared to the percentages of 30% and 40% (Rahma & Palupi, 2021)

The use of pumpkin puree in steamed cakes is one of the developments in the use of local food ingredients that have potential and advantages. The high content of carotenoids can be used as a natural dye for steamed sponge products so as to produce a natural yellow sponge color. In addition, the nutritional content of pumpkin can also add to the nutritional value of steamed sponge products. Therefore, it is necessary to test the nutritional content through a proximate test so that the nutritional content of these products can be known so that they can be used as healthy snacks for all groups.

METHOD

The objectives of this research are (1) Analyzing the sensory quality (color, aroma, taste, texture) of pumpkin (Curcubita moschata) steamed sponge cake products as an alternative to high-fiber snacks tested on expert panelists. (2) Analyzing the nutritional content (water content, ash content, fat content, protein content, carbohydrate content, dietary fiber, total calories, moisture content, total fat, saturated fat, sodium) of steamed pumpkin sponge cake (Curcubita moschata) as an alternative high-fiber. The research method used is an experimental method by conducting trials of making pumpkin steamed sponge products to get the best formula. Furthermore, an objective assessment is carried out on the best product. Objective assessment is a way of assessing a product using a special tool so that the measurement can be measured. The assessment is carried out through a proximate test to measure the fiber, carbohydrate, protein, fat, moisture content and ash content of the product produced. The results of the proximate test are then described to make it easier to read and understand.

RESEARCH AND DISCUSSION

Research result

1. Yellow Pumpkin Steamed Sponge

Steamed pumpkin sponge cake is an innovation from using pumpkin as a raw material for steamed sponge cake. This innovation aims to increase the diversification of processed pumpkin products and increase the variety of processed pumpkin products. The ingredients used in making pumpkin steamed cakes include flour, sugar, white chocolate, castor oil, margarine, sweetened condensed milk, eggs, vanilla, and cake emulsifier. Yellow pumpkin is ripened by steaming, then mashed into a pulp or what is known as puree.

Pumpkin puree is then added to the ingredients for making steamed cakes. In making pumpkin puree, 250 grams of pumpkin (without skin) are used and it produces 50 grams of pumpkin puree. This is due to the addition of water content during the steaming process. Steamed pumpkin sponge cake in this study will use fillings in the form of pumpkin srikaya jam to add variations in taste and texture.

Pumpkin steamed cake formulation consists of pumpkin puree (100%), wheat flour (50%), granulated sugar (40%), white chocolate (50%), cooking oil (20%), margarine (20%), Sweetened condensed milk (20%), Egg (80%), Cake emulsifier (4%), Vanilla (2%). The filling uses sarikaya pumpkin jam which consists of pumpkin (100%), coconut milk (50%), sugar (33.3%), pandan leaves (2%), salt (5%).

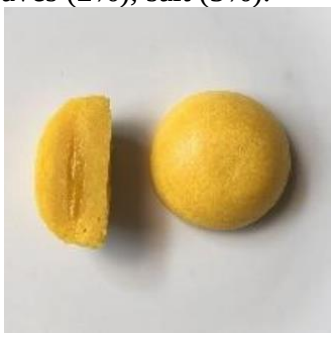

Figure 1. Yellow Pumpkin Steamed Sponge

The purpose of pumpkin innovation in making pumpkin steamed cakes is to maximize the function of pumpkin commodities and can be an alternative to healthy snacks by utilizing the nutritional content of pumpkin.

2. Results of Overall Aspects of Sensory Quality

Assessment results for the overall aspect of sensory quality of the pumpkin sponge product with pumpkin syrup filling which includes the color aspect of the pumpkin sponge cake, the color aspect of the pumpkin sponge cake, the taste aspect of the pumpkin sponge cake, the taste aspect of the pumpkin syrup apple jam, the fishy aroma aspect the egg on the pumpkin sponge cake, the aroma aspect of the pumpkin cake, the tenderness aspect of the pumpkin sponge cake, the smoothness aspect of the outer surface of the pumpkin sponge cake, the consistency aspect of the pumpkin syrup apple jam, and the softness aspect of the yellow pumpkin cake apple jam, the assessment results showed that the color aspect of the pumpkin sponge cake was obtained a value an average of 4.7 or close to bright yellow and the color aspect of pumpkin syrup was obtained an average value of 4 or yellow. In the aspect of the taste of pumpkin sponge cake, an average score of 5 or sweet taste was obtained and the taste of yellow pumpkin srikaya jam obtained an average score of 4.6 or close to sweet taste. In terms of the fishy aroma of eggs in pumpkin sponge cake, an average value of 4.6 was obtained or close to the non-fishy aroma of pumpkin and the pumpkin aroma aspect was obtained an average of 3.5 or close to a slightly yellow pumpkin aroma. In the aspect of the texture of the tenderness of the pumpkin sponge cake, an average score of 4.3

was obtained or the sponge cake was soft, the texture of the smoothness of the outer surface of the pumpkin sponge cake was obtained an average value of 4.4 or the outer surface of the pumpkin sponge cake was smooth, the consistency of yellow pumpkin sponge cake jam was obtained an average score -an average of 4.7 or close to thick, and the softness of the yellow pumpkin srikaya jam obtained an average value of 4.5 or close to soft.

3. Hypothesis Testing for Aroma Aspects

a. *The Fishiness of Eggs in Yellow Pumpkin Cake*

Normality testing on the data on the fishiness aspect of eggs in pumpkin sponge cake obtained a Shapiro Wilk Sig value of 0.000 < 0.05 so it can be concluded that the assessment of the fishiness of eggs in pumpkin cake cakes does not have a normal distribution. Assuming the data is not normally distributed, continue testing the hypothesis using the binomial test. The results of calculations for 10 expert panelists regarding the fishiness aspect of eggs in pumpkin sponge cake obtained p = 0.754 at a significance level of α = 0.05. These results show 0.754 > sig 0.05, so H0 is accepted and H1 is rejected, which means that in the aspect of the fishy aroma of eggs in sponge cake, there is no significant difference in the average assessment of the sensory quality of pumpkin sponge cake.

b. *Yellow Pumpkin Aroma*

Normality testing on the pumpkin aroma aspect data obtained a Shapiro wilk sig value of 0.010 < 0.05 so it can be concluded that the pumpkin aroma assessment data does not have a normal distribution. These results show 0.021 < sig 0.05, so H0 is rejected and H1 is accepted, which means that in the aroma aspect of pumpkin there is a significant difference in the average sensory quality assessment of pumpkin sponge cake with pumpkin syrup filling.

c. *The tenderness of Yellow Pumpkin Sponge Cake*

Normality testing on the data on the tenderness aspect of the pumpkin sponge cake obtained a Shapiro Wilk Sig value of 0.000 < 0.05 so it can be concluded that the assessment of the tenderness of the pumpkin sponge cake did not have a normal distribution. These results show 0.344 > sig 0.05, so H0 is accepted and H1 is rejected, which means that in the tenderness aspect of the sponge cake there is no significant difference in the average assessment of the sensory quality of the pumpkin sponge cake.

d. *Smoothness of the Outer Surface of Yellow Pumpkin Sponge*

Normality testing on the data on the smoothness of the outer surface of the pumpkin sponge cake obtained a Shapiro Wilk Sig value of 0.006 < 0.05 so it can be concluded that the data for assessing the smoothness of the outer surface of the pumpkin sponge cake is not normally distributed. These results show 1 > sig 0.05, so H0 is accepted and H1 is rejected, which means that in the aspect of smoothness of the outer surface there is no significant difference in the average sensory quality assessment of pumpkin sponge cake with pumpkin jam filling.

e. *Tenderness of Yellow Pumpkin Srikaya Jam*

Normality testing on the data on the softness aspect of yellow pumpkin apple cider jam obtained a Shapiro wilk sig value of 0.001 < 0.05 so it can be concluded that the data assessing the softness of yellow pumpkin sugar apple jam is not normally distributed. These results show 0.754 > sig 0.05, so H0 is accepted and H1 is rejected, which means that in the softness aspect of the jam there is no significant difference in the average assessment of the sensory quality of pumpkin jam.

4. Proximate Test Results

The result of the proximate analysis research is a method of chemical analysis to identify the nutritional content such as protein, fat and fiber in a food substance from pumpkin kuku cake products carried out at the SIG Laboratory or PT. Saraswanti Indo

Genetech Jl. Tasmala No. 20, Taman Yasmin, Bogor, West Java. This study used a method according to SNI 01-2891-1992 and was supported by adequate laboratory equipment. Based on the proximate test results of the pumpkin steamed sponge product, the following results were obtained:

a. Proximate Analysis and Dietary Fiber of Selected Yellow Pumpkin Steamed Sponge Based on SNI (Indonesian National Standard)

The quality requirements for steamed pumpkin sponge cake with pumpkin srikaya jam filling can refer to the semi-wet *cake* product standard set out in SNI 01.3840-1995. Proximate test results at GIS Laboratory for steamed pumpkin products Table 1 below:

Table 1. Proximate Test Results for Steamed Pumpkin Steamed Sponge

Parameters	**Results**	***SNI standard**
Water content	39.35%	max. 40% w/b
Ash Content	0.63%	max. 3% w/b
Fat level	14.36%	max. 30% w/b
Protein Content	4.82%	max. 9% w/b
Carbohydrate Content	40.94%	max. 40% w/b
Food Fiber	4.53%	-
Total Calories	312.28 kcal/100gr	-
Total Sugar	25.94%	-
Total fat	14.36%	-
Saturated fat	8.61%	-
Sodium	120.31mg/100gr	-

Source: GIS Laboratory Test Results, 2023.
*SNI 01-3840-1995

Based on the results of the proximate test for ash content, water content, fat content, and protein content are still included in the SNI standard, for carbohydrate content the level is 0.49% higher. This is due to the use of wheat flour and pumpkin which also contain carbohydrates. The carbohydrate content of pumpkin in one cup of pumpkin that has been boiled and drained is 12 grams (Brotodjojo, 2010). This allows for a slightly higher carbohydrate content.

The dietary fiber contained in the pumpkin steamed cake is 4.53%. Dietary fiber is a carbohydrate polymer with three or more monomer units, which are not hydrolyzed by digestive enzymes in the human small intestine (BPOM, 2021). Dietary fiber can be obtained from pumpkin which is added to steamed cakes so that it adds value to dietary fiber.

Total calories are all the amount of energy that comes from total fat, protein, and total carbohydrates or available carbohydrates from food fiber (BPOM, 2021. The total calories produced by the proximate test on pumpkin steamed cakes are 312.28kcal/100gr. The caloric value is due the use of ingredients such as eggs, condensed milk, butter, vegetable oil and wheat flour The energy value calculation is based on the value of fat, protein and carbohydrates in 100 g of pumpkin flour (Mardiah, et.al., 2020).

Based on the results of the proximate test of steamed pumpkin sponge cake, the total fat content was 14.36%. Total fat describes all the fatty acids in food and is expressed as triglycerides (BPOM, 2021). The value of saturated fat based on the proximate test results is 8.61%. Saturated fat is the total amount of fatty acids that do not contain double bonds (BPOM, 2021). The criteria for a good steamed sponge cake are that the texture is soft, fluffy and the top of the steamed sponge is split into four parts. Factors that affect the development rate include chicken egg whites, baking soda or cake developer and protein,

namely gluten. (Melisa, 2014). According to Putri (2010), the quality of steamed sponge cake is determined by taste, texture, aroma and level of development. The level of rise is the ratio of the height of the steamed sponge cake to the height of the dough. Factors that affect the development rate include chicken egg whites, baking soda or cake developer and protein, namely gluten. The main ingredient of steamed sponge is wheat flour. However, this flour can be replaced with other mixed ingredients to produce steamed cakes with a more varied taste. One of the ways is to substitute pumpkin flour in the manufacture of steamed cakes which can provide a variety, color, texture, aroma and specific taste. Besides being able to provide variety, it can also add to the nutritional value of steamed cakes. (Melisa, 2014).

In conclusion, the results of the proximate analysis and dietary fiber of steamed pumpkin sponge cake with pumpkin srikaya jam filling are water content 39.35 % wb, ash 0.63 % wb, protein 4.82 % wb, fat 14.36 % wb, dietary fiber 4.53 % wb, carbohydrates 40.94 % wb, and sodium 120.31mg/100gr. Using 100% pumpkin as the main ingredient, optimal use can increase the potential of pumpkin as an alternative snack with high fiber and low glycemic index. The glycemic index of the best steamed sponge cake is 70% pumpkin treatment with a low glycemic index category (Sepni Asmira, et al., 2022). Food sources of fiber are usually vegetables, fruits, nuts and whole grains (Susilowati et al., 2020). One of the foodstuffs that has a low glycemic index and high fiber is found in pumpkin.

b. Comparative Analysis of Nutritional Value (Nutritional Needs/RDA) Steamed Yellow Pumpkin Sponge based on Indonesian Food Composition Table (TKPI)

The following is Table 2. Information on the nutritional value of the pumpkin steamed sponge product:

Table 2. Information on the Nutritional Value of Yellow Pumpkin Steamed Sponge

Nutritional Value Information		
Serving Measure 50 g		
Amount Per Serving		
Total Energy		**160 kcal**
Energy from fat		70 kcal
Energy from saturated fat		40 kcal
		%AKG *
Total fat	7 g	11%
Saturated fat	4.5 g	22%
Proteins	2 g	4%
Total carbohydrates	21g	6%
Food Fiber	2 g	8%
Sugar	13g	
Sodium	60mg	4%

* Percent AKG based on energy needs of 2150 kcal.

Source: GIS Laboratory Calculation Results, 2023

The total energy produced is 160 kcal with 7 grams of total fat, 4.5 grams of saturated fat, 2 grams of protein, 21 grams of total carbohydrates, 16 grams of sugar, 60 mg of sodium and 2 grams of dietary fiber. These ingredients make steamed sponge cake a ready-to-sell product with potential as a healthy snack.

Comparison of the nutritional content of pumpkin steamed sponge cake based on TKPI can be seen in Table 3. As for data on the nutritional content of steamed pumpkin sponge cake with pumpkin srikaya jam filling, primary data was used from chemical analysis.

Table 3. Comparison of Nutritional Value (Nutritional Needs/RDA) of Yellow Pumpkin Steamed Sponge based on the Indonesian Food Composition Table (TKPI)

Component	Yellow Pumpkin Steamed Sponge	TKPI Summer squash	TKPI Tape Cake
Energy (kcal)	160	25.5	**161.5**
Water (g)	39.35	43,3	**16,1**
Ash (g)	0.6	0.6	**0.7**
Proteins (g)	2	2.45	**2.45**
Fat (g)	7	0.25	**5.75**
Dietary Fiber (g)	2	1.35	**0.7**
Carbs (g)	21	5	**25.05**
Sodium (*mg*)	**60**	**140**	**-**

Description : Serving size 50 g

Source: Indonesian Food Composition Table (https://www.panganku.org/id-ID/beranda)

Based on Table 3. it can be seen that the results of the nutritional value of steamed sponge cake with a serving size of 50 grams when compared with the TKPI of pumpkin (25.5 kcal) and TKPI of tape cake products the energy value (161.5 kcal) shows the energy value of steamed pumpkin cake of 160 kcal higher so it is more filling if consumed. The water value of the pumpkin steamed sponge cake was 39.35 gr lower than the water in the pumpkin TKPI of 43.3 because the steamed sponge cake was reduced due to the process of making pumpkin puree, while compared to the TKPI cake tape it was 16.1 gram higher, this was because The main ingredient content in tape is lower than pumpkin water. The ash content of pumpkin steamed cakes (0.6 gr), pumpkin (0.6 gr) and tape cake (0.7 gr) did not show a significant difference and complied with the standard below 2 g per 50/gr. The results of the nutritional value of pumpkin steamed sponge protein (2 gr), pumpkin (2.45 gr) and tape cake (2 gr) show that the protein value is not significantly different, but if you look at it from the coma number it is lower this is because the protein evaporates/melts because of the processing/heating process during steaming for making puree and steaming sponge cakes when compared to yellow pumpkin at TKPI, whereas tape cake is not steamed before mashed. The results of the nutritional value of fat from pumpkin steamed sponge cake (7 gr), pumpkin (0.25 gr), cake tape (5.75 gr) show the nutritional value of fat from TKPI in pumpkin and tape cake, due to the use of other ingredients such as milk, fats (margarine, cooking oil) and eggs. The fiber content in pumpkin steamed cakes (2 gr), pumpkin (1.7 gr) and tape cake (0.7 gr) showed that pumpkin steamed cakes had the highest fiber content among the others. This shows that pumpkin substitution can increase the fiber content in the cake steamed yellow squash.

The results of the nutritional analysis of carbohydrates for steamed pumpkin sponge cake (21 gr), pumpkin (5 gr), cake tape (25.5 gr) show that the carbohydrate value of steamed pumpkin sponge cake increases compared to unprocessed pumpkin carbohydrates, this is due to the addition of carbohydrates. from other ingredients such as flour and sugar in the ingredients for steamed cakes. Meanwhile, when compared to cake tape, the TKPI is lower, because tape is a type of starchy tuber in the form of cassava, which has a higher carbohydrate value. The sodium value in pumpkin steamed cakes is lower (60 mg) than pumpkin (140 mg) this is because the processing process can reduce sodium content. Yellow pumpkin contains many nutrients needed by the body such as protein, carbohydrates, fiber, vitamin A, beta-carotene or provitamin A, Vitamin B1, Vitamin B3, vitamin C, Vitamin K, iron, calcium, phosphorus, potassium and magnesium (Stefania *et al*., 2021; Halimah and Rahmawati, 2021; Thenir *et al.,* 2017; Damayanti, 2016; Bardiati *et al.,* 2015). Yellow pumpkin also has a sweet taste and attractive color so it can be used to improve the taste and

color of a processed food product (Stefania *et al*., 2021). Yellow pumpkin (*Cucurbita moschata*) is a food ingredient that is rich in dietary fiber, high content of dietary fiber in the form of pectin can control serum insulin levels, lower blood sugar levels, increase glucose and provide protection against various diseases such as diabetes (Millati et al., 2020). Given the nutritional content of pumpkin which is quite complete and the price is relatively cheap, pumpkin has the potential to be developed as an alternative food for the community. Yellow pumpkin can be processed into various kinds of food, one of which is steamed cake. Steamed sponge is a cake made from wheat flour, granulated sugar, chicken eggs, water and emulsifier, mixed until fluffy then finished by steaming (Sari and Jairani, 2019). In making steamed cakes, pumpkin is usually made into flour or *puree* first. The process of making pumpkin flour takes time and is not an easy process (Bardiati *et al.*, 2015).

Based on Table 3, it is clear that there is a clear difference in the comparison of the nutritional content of steamed pumpkin sponge cake from the results of chemical analysis and TKPI analysis. The results of chemical analysis for energy/calories, fat content and dietary fiber were much higher than TKPI. As for ash content, protein and carbohydrates both the results of chemical analysis and TKPI have relatively the same value.

Discussion

a. Sensory Quality Assessment of Yellow Pumpkin Sponge Cake

Color is the first impression the eye receives due to the reflection generated from a product (Januarta et al., 2018). One of the simple color classification systems is the CIE (Commission International de l'Enclairage), Hunter, and Munsell system. Color is a pattern that is difficult to measure so it will provide different assessments when assessing color quality. Differences in color assessment are caused by each person having different visions and preferences. In the organoleptic test on the color of steamed pumpkin sponge cake filled with pumpkin syrup, it showed that the color aspect of the pumpkin sponge cake obtained an average value of 4.7 or close to bright yellow. The results of hypothesis testing show a p value of 0.344 > sig 0.05, so H0 is accepted and H1 is rejected, which means that in the sponge color aspect there is no significant difference in the average assessment of the sensory quality of pumpkin sponge cake. Meanwhile, the color aspect of the yellow pumpkin apple cider jam obtained an average value of 4 or yellow. The hypothesis result is p 0.109 > sig 0.05, so H0 is accepted and H1 is rejected, which means that in the jam color aspect there is no significant difference in the average sensory quality assessment of pumpkin jam. Enriching those products with carotenoids could improve product taste and appearance (e.g. colour), and could also increase the product functionality (de Souza Mesquita et al., 2020).

The brightness level of steamed pumpkin sponge cake is influenced by the color pigment in the pumpkin itself. Yellow pumpkin gives a yellowish orange color to steamed sponge cake because pumpkin contains carotenoid pigments, namely β-carotene, which can also act as a natural coloring in food products (Holinesti and Isnaini, 2020). The more pumpkin you use, the brightness level of the steamed cake decreases because the color of the product becomes yellower and moves away from the white color value based on measurements using a color reader test. Color is the main attraction for someone towards the food product they see (Holinesti and Isnaini, 2020). Using yellow pumpkin makes the color of the steamed cake more attractive. The steamed sponge cake and srikaya jam filling had good color quality which was assessed by the panelists because it was more colorful compared to steamed sponge cake without the use of yellow pumpkin. So there is no significant difference in the assessment of color categories. In the treatment of steamed pumpkin sponge cake with pumpkin srikaya jam filling, there is not much difference in color because the composition of the main ingredients provides color. It was found that noodles

made from pumpkin powder were more attractive with their yellow colour and were more popular in terms of their appearance, taste, texture and acceptability (Pongjanta *et al.*, 2006).

The taste of steamed pumpkin sponge cake with pumpkin filling is a combination of taste and aroma created to meet the preferences of the panelists. Taste also influences panelists' preferences for food, because panelists can assess the taste of the food using their sense of taste, namely their tongue. From the results of organoleptic testing on taste, it shows that the taste aspect of pumpkin sponge cake obtained an average value of 5 or sweet taste. The results of hypothesis testing show a p value of 0.1 > sig 0.05, so H0 is accepted and H1 is rejected, which means that in the taste aspect of sponge cake there is no significant difference in the average assessment of the sensory quality of pumpkin sponge cake. Meanwhile, the taste of yellow pumpkin srikaya jam obtained an average score of 4.6 or close to sweetness. The results of hypothesis testing show a p value of 0.344 > sig 0.05, so H0 is accepted and H1 is rejected, which means that in the jam taste aspect there is no significant difference in the average assessment of the sensory quality of pumpkin jam.

The resulting taste of steamed pumpkin sponge cake filled with pumpkin srikaya jam has a sweet taste. The combination of sugar and pumpkin dominates. The sweet taste is influenced by the amount of ripe yellow pumpkin used. Taste is also a very dominant aspect in acceptance by the panelists. The sweet taste of the product will be more attractive to someone (Holinesti and Isnaini, 2020). Steamed bolu Steamed bolu also has taste parameters that are tastier, sweeter and less unpleasant due to the use of yellow pumpkin. The use of yellow pumpkin provides a natural sweet taste from the pumpkin itself. In the treatment of steamed pumpkin sponge cake with pumpkin srikaya jam filling, the panelists did not get the same taste difference because the composition of the main ingredients gave a sweet taste.

Aroma is the distinctive smell of a food that can be felt through the sense of smell. Testing the smell or aroma of food is considered important because it can be used to evaluate a food product. In this study, the results of the organoleptic test on aroma showed that the fishy aroma aspect of the eggs in pumpkin sponge cake obtained an average value of 4.6 or close to the non-fishy aroma of pumpkin. The results of hypothesis testing show a p value of 0.754 > sig 0.05, so H0 is accepted and H1 is rejected, which means that in the aspect of the fishy aroma of eggs in sponge cake, there is no significant difference in the average assessment of the sensory quality of pumpkin sponge cake. The aroma aspect of pumpkin obtained an average of 3.5 or close to slightly aromatic of pumpkin. The results of hypothesis testing show a p value of 0.021 < sig 0.05, so H0 is rejected and H1 is accepted, which means that in the aroma aspect of pumpkin there is a significant difference in the average sensory quality assessment of pumpkin sponge cake with pumpkin syrup filling. The use of yellow pumpkin makes the aroma produced by the steamed cake more fragrant. The fragrant aroma emitted from pumpkin is caused by an oxidation reaction between linoleic and linolenic acids to produce aldehydes as volatile compounds (Leffingwell et al., 2015).

Evaluation of the texture of a food can be observed with the mouth, that is, it can be felt when bitten and chewed and can be touched by holding it with a finger. In the organoleptic testing of the texture of steamed sponge cake filled with pumpkin syrup, the panelists showed that the texture aspect of the tenderness of the pumpkin cake had an average value of 4.3 or soft sponge cake, the results of hypothesis testing showed a p value of 0.344 > sig 0.05, so H0 accepted and H1 rejected, which means that in the tenderness aspect of the pumpkin sponge cake there is no significant difference in the average assessment of the sensory quality of the pumpkin sponge cake. The smoothness of the outer surface of the pumpkin sponge cake obtained an average value of 4.4 or the outer surface of the pumpkin sponge cake was smooth, the results of hypothesis testing showed that the value

of p 1 > sig 0.05, then H0 was accepted and H1 was rejected, which means that in terms of surface smoothness Outwardly, there was no significant difference in the average sensory quality assessment of yellow pumpkin sponge cake with yellow pumpkin sugar apple jam filling.

The consistency of yellow pumpkin srikaya jam obtained an average value of 4.7 or close to thick, the results of hypothesis testing showed a p value of 0.109 > sig 0.05, so H0 was accepted and H1 was rejected, which means that in the aspect of jam consistency there was no significant difference in average assessment of the sensory quality of yellow pumpkin sugar apple jam. The softness aspect of yellow pumpkin srikaya jam obtained an average value of 4.5 or close to soft, the results of hypothesis testing showed a p value of 0.754 > sig 0.05, so H0 was accepted and H1 was rejected, which means that in the softness aspect of the jam there was no significant difference. on the average assessment of the sensory quality of yellow pumpkin syrup.

Texture is a parameter that is assessed to determine the quality of food which can be felt by touch or tasting (Holinesti and Isnaini, 2020). The texture of the steamed pumpkin cake with serikaya jam filling is of good quality because the texture is soft, smooth, the consistency of the jam is thick and soft and is more delicious when eaten. Using yellow pumpkin provides a texture that melts more easily when eaten. So the assessments from the researchers do not differ significantly, namely leading to the best quality of the product. The texture and consistency of an ingredient can affect the speed of stimulation of the salivary glands, thereby influencing the taste produced by the ingredient.

The addition of yellow pumpkin will add tenderness, moisture and density to the sponge cake, and produce a steamed sponge product which also has the highest level of insoluble fiber. The higher the fiber contained in the cake, the firmer the product texture, so that the density value of the cake product is higher (Haliza et al., 2012). Insoluble fiber will reduce the water absorption capacity of starch granules, so that the starch gelatinization process is less than perfect and the resulting texture becomes hard (Harijono et al., 2001). The fiber content in the flour used will complicate the process of mixing cake dough, resulting in less than perfect gluten formation in the dough and causing low rising volume and producing a denser cake texture (Naging, 2019). In line with research an acceptance test was carried out on 30 young women by giving 100 grams of Laculo steamed cake and showed that 27 people (90%) belonged to good acceptance and three people (10%) belonged to poor acceptance (Ellisabeth Mellisa D. et al, 2022).

b. Proximate Analysis and Dietary Fiber in Selected Yellow Pumpkin Steamed Sponge

Results of proximate analysis and dietary fiber sponge cake Steamed pumpkin with pumpkin srikaya jam filling in this study refers to the quality requirements for semi-wet cakes (SNI 01-3840-1995) (Paramita, 2020), because the quality requirements for sponge cake steam until now there is no. The proximate analysis carried out in this study was the analysis of water content, ash, protein, fat, carbohydrates and analysis of dietary fiber in sponge cake steamed pumpkin with pumpkin srikaya jam filling. The substitution of pumpkin pasta and fermentation time significantly affect characteristic chemical and physical of traditional steamed (A M Handayani et al, 2020).

1) Water content

Based on the results in Table 5.2 it can be seen that the water content contained in the cake Steamed pumpkin with the selected pumpkin srikaya jam filling is 39.35 g/100g (39.35 % wb). Determination of the water content in pumpkin flour using the same method, namely the *oven method*. The water content in food affects the stability or durability of food. Low water content indicates that the quality of the product is good and can slow down the deterioration of the pumpkin steamed cakes . Conversely, the higher the water content in a

food, the more easily the food will be damaged, both due to microbiological damage and chemical reactions. An increase in water content in some foods can be an indication of a decrease in quality. Food products such as flour experience an increase in water content through absorption of moisture from the environment causing the quality of the product to decrease (Adebobale, AA, et.al. , 2017).

According to Kusnandar (2010), high water content in food products is caused by the high water content of the raw materials, the shape, size, thickness, time and temperature of steaming the sponge cake. steamed pumpkin. Water in food plays a role in influencing the level of freshness, stability, durability and ease of occurrence of chemical reactions, enzyme activity and microbial growth. In line with the results of the study, the addition of pumpkin flour resulted in a higher water content of the steamed sponge cake because pumpkin flour absorbed water more easily, so that if the substitute for pumpkin flour was used the higher the water absorption capacity of the product being substituted would be higher (Purnamasari and Putri, 2015).

The quality requirement for water content of semi-wet cake/ sweet bread based on SNI is a maximum of 40% wb. Thus, with a water content of 39.35 % bb sponge Steamed pumpkin with yellow pumpkin srikaya jam filling already meets SNI standards.

2) Ash Content

Besides affecting the water content, the processing of steamed cakes can also affect the ash content of the flour. According to Copeland, I, J., tt.al. (2009), ash content is a mixture of inorganic or mineral components contained in a food ingredient. Determination of total ash content can be used for various purposes, such as to determine whether a processing is good or not, to know the type of material used and as a determinant of the parameters of the nutritional value of a food ingredient. The ash content of a product is influenced by the mineral content of the raw materials used (Pratama et al., 2014).

Based on Table 5.2 it can be seen that the ash content contained in the cake Steamed pumpkin with a filling of pumpkin srikaya jam is about 0.63 g/100g (0.63 % wb). Increasing the percentage of ash content in the cake The resulting steamed pumpkin is influenced by the pumpkin used in the cake steamed pumpkin (Wulandari, 2019). Soil that is rich in organic nutrients will produce plants with high levels of minerals (Jovita, 2018). High mineral content is usually indicated by high ash content. Ash content refers to the inorganic residue remaining after oxidation perfect from organic components of food ingredients (Gumolung, 2019). Quality requirements for sponge ash content Steamed pumpkin based on SNI for semi-wet cake/ sweet bread, which is a maximum of 3% wb. Thus with an ash content of 0.63 % bb sponge Steamed pumpkin with yellow pumpkin srikaya jam filling meets the standard.

3) Proteins

Proteins are complex compounds consisting of amino acids linked together by peptide bonds. Protein is a very important nutrient for the body because apart from being a source of energy, protein also functions as a body building agent and a regulatory substance in the body. Aside from being a building substance, the function of protein is to form new tissues and maintain existing ones (OR Puspitarini, 2018). Based on Table 5.2 it can be seen that the proximate analysis of protein content using the *Kjeldahl method* shows that the protein content contained in the sponge cake is Steamed pumpkin with 4.82 g /100g (4.82 % wb) filling of srikaya jam . Protein measured in the *Kjeldahl method* is considered as crude protein content because all measured components containing nitrogen are considered as protein (Muchtadi *et al*, 2010). Yellow pumpkin contains the same type of gluten protein as wheat flour, so it is able to form a cohesive and elastic three-dimensional network (Budoyo, 2014). L gray yellow has levels high protein (11.5%) compared to the protein content in

wheat flour (9%), so that yellow ash L can be used as an alternative to wheat flour or as an additional coloring agent. Protein quality requirements sponge steamed pumpkin based on SNI for semi-wet cake/ sweet bread, which is a maximum of 9 % wb. Thus with protein 4.82 % bb sponge Steamed pumpkin with yellow pumpkin srikaya jam filling meets the standard.

4) Fat

Fat is an energy source that provides the highest calorie unit compared to carbohydrates and proteins. Based on Table 5.2, the measurement uses the *Soxhlet method* to analyze the fat content of the cake Steamed pumpkin with srikaya jam filling showed that the fat content was 14.36 /100g (14.36 % wb). According to Nissa (2013), pumpkin has a fairly low fat content, so pumpkin can be used as an alternative to wheat flour. The addition of pumpkin flour resulted in an increase in the fat content of the steamed sponge cake (Anna, et al., 2022). On sponge steamed pumpkin with srikaya jam filling, pumpkin fat content is also affected because of the fat content in vegetable oil, margarine and eggs. While in the manufacture of sweet bread does not use these three ingredients. Quality requirements for sponge fat content Steamed pumpkin with srikaya jam filling based on SNI for semi-moist cake/ sweet bread, which is a maximum of 30 % wb. Thus with a fat content of 14.36 % BW sponge Steamed pumpkin with srikaya jam filling meets SNI standards.

5) Carbohydrate

Carbohydrates are the main source of energy for the body, one of which can be obtained from root products, cereals, starches, and some starchy vegetables. L gray has specific properties with a distinctive aroma. In general, yellow ash has the potential to be a companion to wheat flour in various processed food products. Processed products from pumpkin have a specific taste, so they are preferred by consumers (Purwanto *et al.,* 2013). Based on Table 5.2 the results of carbohydrate content in sponge Steamed pumpkin with srikaya jam filling, namely 40.94 g/100g (40.94 % wb). The results of this study are the same as the 2018 Pitaloka study, which is 33.86-41.86% body weight. The high carbohydrate content is influenced by the amount of wheat flour and pumpkin used. It is supported by the research of Anna., et al that the increase in protein content in steamed cakes was affected by the use of pumpkin flour and sword bean tempeh flour. Pumpkin flour and sword bean tempeh flour contain higher protein than wheat flour. Pumpkin flour contains 18.60% protein, while sword bean tempeh flour contains 35.18% protein (Anna , et al., 2022). This is because the carbohydrate content in wheat flour is higher than the carbohydrate content in pumpkin (TKPI, 2023). Quality requirements for sponge carbohydrate content Steamed pumpkin with srikaya jam filling based on SNI for semi-moist cake/ sweet bread, which is a maximum of 40 % wb. Thus the fat content of 40.94 % bb is more than the SNI standard of 0.94% . However, it is still relatively safe, for carbohydrate levels because it is not too far from the maximum requirements.

6) Food Fiber

Dietary fiber in pumpkin can increase the nutritional value Dietary fiber in pumpkin flour can increase the nutritional value of cake Steamed pumpkin with srikaya pumpkin jam filling and can help the digestive process. Dietary fiber can be obtained from vegetables, cereals, fruits and nuts. The benefits of consuming dietary fiber are that it can reduce appetite, stabilize blood sugar levels, reduce the risk of heart and blood vessel disease, help regular bowel movements and prevent constipation (Hardinsyah et al., *2016*) . and can help the digestive process. Dietary fiber can be obtained from vegetables, cereals, fruits and nuts. The benefits of consuming dietary fiber are that it can reduce appetite, stabilize blood sugar levels, reduce the risk of heart and blood vessel disease, help regular bowel movements and prevent constipation (Hardinsyah et al., *2016*).

Based on Table 5.2 the results of the sponge cake fiber analysis Steamed pumpkin with srikaya jam filling, namely 4.53 g/100g (4.53 % wb). High yellow pumpkin will increase the level of dietary fiber in the cake steamed pumpkin with srikaya jam filling, this is due to the high food fiber content in pumpkin. The dominant soluble fiber in pumpkin is pectin, which has a melting point of around 192 °C (Lee et al., 2004). In addition, the effect of heating will also change food fiber through changes in the ratio of soluble fiber to insoluble fiber (Putri et al., 2019; V. Sajidah, et.al., 2022). Food fiber quality requirements for semi-moist cake/ sweet bread do not exist, so that the quality of food fiber content in sponge cake Steamed pumpkin with srikaya jam filling cannot be compared with SNI quality requirements.

c. Analysis of the Nutritional Value of Steamed Sponge Yellow Pumpkin with TKPI Comparison

The use of pumpkin in 100% steamed sponge products as the main ingredient. The results of chemical analysis for energy/calories, fat content and dietary fiber were much higher than TKPI. As for ash content, protein and carbohydrates both the results of chemical analysis and TKPI have relatively the same value. Fiber content in sponge steamed substitutes are higher with increasing use of pumpkin. This shows that pumpkin can increase the energy/calorie content and fiber in sponge steam. Comparison of chemical analysis results for energy, fat content and food fiber is much higher than TKPI. Meanwhile, the water content is higher in TKPI compared to chemical analysis (Mahalia, 2022). As for the ash, protein and carbohydrate content of food both the results of chemical analysis and TKPI have relatively the same value. This large cultivation of pumpkin is primarily because of its affordable price, and high nutritional value ascribed to high levels of flavonoids, carotenoids, macro- and micro-elements in flesh (Hosen et al., 2021; Hussain et al., 2021).

The results showed that chemical analysis and TKPI analysis had different results, especially on the nutritional content of water, fat and food fiber. On the other hand, the levels of calories, fat and food fiber results of chemical analysis is higher than the results of TKPI analysis. This shows that the ingredients for making sponge cake Steamed pumpkin with srikaya jam filling has relatively high levels of fat and fiber compared to the ingredients in TKPI. Thus it can be said that the pumpkin can increase the nutritional content of the sponge steamed, especially the content of dietary fiber. Additional carotenoids were probably contributing from other raw materials such as soy lecithin (Bot et al., 2021). This result is surprising as fat is supposed to promote carotenoid transfer to mixed micelles (Kopec & Failla, 2018). The study reported increase in polyphenols and dietary fibre without impacting consumer acceptance of the products. Majzoobi *et al.* (2015) determined the potential of oat fibre in the preparation of sponge cakes. In the study on incorporation of mango dietary fibre in muffins, the amount of dietary fibre was doubled (David, 2014).

In children aged 1-3 years, the need for fiber is 19 grams or the equivalent of one tablespoon more. Whereas in children aged 4-6 years, the fiber requirement is 20 grams or about 2 tablespoons. The daily fiber requirement for children aged 3-10 years is 19-23 grams/day (RDA, 2019). Individual fiber needs based on the 2019 Nutritional Adequacy Rate (RDA) are as follows: Females aged 16-18 years are 29 grams per day, while males are as much as 37 grams per day. Women aged 19-29 years are 32 grams per day, while men are 37 grams per day (AKG, 2019). Food is said to be high in dietary fiber if it contains 6 grams per 100 grams in food (BPOM, 2016). Based on the results of the TKPI analysis, the comparison between pumpkin and cake tape contributed 1.7 g/ 5 0g and 0.7 gr of dietary fiber . Meanwhile, based on chemical analysis, it contributes 2 g/ 50 g of dietary fiber, thus one portion (50 g) of steamed pumpkin cake can contribute 2 g of dietary fiber per serving measure (50gr).

Sponge Steamed pumpkin as a snack can contribute 10 -11 % of total daily energy. If the daily fiber requirement for toddlers is 1.052 g /day and children aged 3-10 years is 19-23 g/day, then 10% of the daily fiber requirement is 1.9-2.3 g/day. While teenagers 29-37 g /day, then 5-7 % of the daily fiber requirement is 5-7 g /day. One serving of sponge *Steamed* pumpkin with srikaya jam filling contains 2 g of dietary fiber per 50 gram serving size. So to meet 10% of daily fiber needs, a child aged 1-6 years consumes 10 g or about 5 pieces of sponge cake . Steamed pumpkin per serving size 50gr. Meanwhile, for teenagers, the daily fiber requirement is 5-7 g/day or about 3 pieces of sponge steamed pumpkin per serving size of 50gr. As for in one serving of sponge *Steamed* pumpkin with srikaya jam filling (50 g) contains 2 g dietary fiber (based on chemical analysis). α-Carotene was the main carotenoid in raw pumpkin, but lutein exhibited the highest bioaccessibility in porridge, cookies and sponge cakes. Cookie micelles led to the highest percentage of α-carotene cell uptake (2.33% and 1.38% for cookies with butter and cookies with vegetable oil, respectively) compared to the other baked products, followed by dry pumpkin puree micelles (1.31%) (Milana Roˇsul, et al., 2022).

Loh et al. (2018) stated that based on recommendations from *the American Diabetes Association* , the recommended consumption of soluble fiber is 16 g/day. The highest soluble fiber content in the steamed sponge cake in this study was 2 grams . Consumption of one serving of steamed sponge (50 g) with this soluble fiber content will contribute 5-11 % to the total soluble fiber requirement per day. The dominant insoluble fiber in pumpkin, which is cellulose, has a melting point of around 260-270 °C (National Center for Biotechnology Information, 2021). Insoluble fiber content can also be caused by the formation of heat-resistant starch which is counted as insoluble fiber (Putri Anggriani, et al., 2019). The recommended consumption of insoluble fiber is based on *the American Diabetes Association* according to a statement by Loh et al. (2018) is as much as 8 g/day. The highest insoluble fiber content in the steamed sponge cake in this study was 6%. Consumption of one serving of pumpkin steamed sponge cake (50 g) with this insoluble fiber content will contribute up to 5-11% of the insoluble fiber requirement per day. Adding pumpkin powder not only increases the nutritive value of muffins, but also brings about a value addition to pumpkin (Sathiya Mala et al, 2018).

CONCLUSION

Based on the results of the proximate test, steamed pumpkin pumpkin cakes have high nutritional value and have the potential to be high-fiber healthy snacks with a dietary fiber content of 4.35% and in the Nutritional Value Information the dietary fiber content is 2gr or 8%. The results of the proximate analysis and food fiber of steamed pumpkin steamed pumpkin cake with pumpkin srikaya jam filling were water content 39.35 % wb, ash 0.63 % wb, protein 4.82 % wb, fat 14.36 % wb, dietary fiber 4.53 % wb, carbohydrates 40.94 % wb, and sodium 120.31mg/100gr. The results of proximate analysis and dietary fiber comply with SNI 01-3840-1995 standards for semi-wet cake products. The results of the analysis of the nutritional value of steamed pumpkin sponge cake according to the serving size of 50 grams of Energy 160 kcal, Water 39.35 gr, Ash 0.6 gr, Protein 2 gr, Fat 7 gr, Food Fiber 2 gr, Carbohydrate 21 gr, Sodium 60 mg. The results of chemical analysis for energy/calories, fat content and dietary fiber were much higher than TKPI. As for ash content, protein and carbohydrates both the results of chemical analysis and TKPI have relatively the same value. This research only modifies food products so that they have a high fiber content for children's snacks based on the fiber content contained in the constituent food ingredients. So further research is needed to study and analyze the bioavailability of fiber in steamed pumpkin cakes so that the utilization of these fibers in the body can be determined. There

needs to be another innovation in the utilization of pumpkin into a variety of other culinary products and testing of both organoleptic and proximate tests so as to enrich processed pumpkin products that are healthy and tested.

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