



EFFECT OF TOLO BEAN FLOUR (*Vigna unguiculata*) SUBSTITUTION ON ORGANOLEPTIC TESTS AND PROTEIN CONTENT IN STEAMED BOLU

By

Nurul Hidayati

Department of nutrition science program Institute of Health and Business of Surabaya

Email: nurul.hidayati@ikbis.ac.id

Article Info

Article history:

Received July 11, 2021

Revised August 13, 2021

Received Sept 26, 2021

Keywords:

Steamed Tolo Bean Cake,
Protein content, Organoleptic
test

ABSTRACT

Indonesia is an agricultural country that has a unique diversity of agricultural products. Where each region has different agricultural products according to their environment. Tolo beans are local food ingredients that are easily found in Indonesia. The yield potential of tolo beans is quite high, reaching tons/hectare to 2 tons/hectare and is determined by the variety. This study aims to determine the substitution of tolo beans on steamed cakes with different additions, protein content and organoleptic tests. Experimental design research, using a completely randomized design (CRD) with the addition of tolo beans (50gr, 75gr, 100gr). Untrained panelists were 25 adults around the researcher's house in Madura and analyzed for protein levels. The results of the protein content of 14.05 grams using the Kjeldahl method. The results of the research on the substitution of tolo beans showed that there was an effect on the results of organoleptic tests of color, aroma, texture, taste and preference. Laboratory test for steamed sponge cake with tolo bean substitution. The result of the highest protein content in BK3 is 14.05mg/100g and the lowest protein content in BK1 was 6.81 mg/100g

This is an open access article under the [CC BY-SA](https://creativecommons.org/licenses/by-sa/4.0/) license.



Corresponding Author:

Nurul Hidayati

Department of nutrition science program Institute of Health and Business of Surabaya

Email: nurul.hidayati@ikbis.ac.id

1. INTRODUCTION

Indonesia is an agricultural country that has a variety of unique agricultural products. Where each region has different agricultural products according to the place of the environment. The uniqueness of biodiversity (agricultural, livestock and fishery products) and human resources in managing this biodiversity are assets in the development of local products and become the identity of an area (Abidin et al, 2020).

One of the agricultural food ingredients that has great potential to be developed is plain pea. Tolo bean is a local food that is easily found in Indonesia. The potential for tolo bean yields is quite high, reaching 1.5 tons/hectare to 2 tons/hectare and is determined by the variety (Balitkabi, 2017).

Tolo beans are usually only consumed directly by steaming. The development of products made from tolo beans is growing to facilitate the processing of tolo beans into tolo bean flour. Tolo bean flour is a gluten-free flour derived from tolo bean seeds that have gone through a milling process. The advantage of tolo beans is that they have a lower fat content so that they can minimize the negative effects of using fatty food products. Tolo beans also have a higher vitamin B1 content than green beans (Rosidah, 2013). The protein content of tolo beans is very high, namely 23.52 g/100g protein (USDA, 2016). Diversification of legumes in the form of peanut flour is more flexible in its use and has a longer shelf life. One of the diversified products is steamed sponge cake with the addition of tolo beans.

Steamed sponge is a traditional Indonesian food that is liked by the community. This cake is very easy to make because the ingredients to make it are affordable. This cake has a round characteristic like a blooming flower. However, nowadays the shape and taste of sponge cake has been modified a lot (Elisa, 2013). Based on this background, the researchers wanted to make steamed cakes with the substitution of tolo beans as a way to utilize the tolo beans and add nutritional value to the steamed cakes.

2. RESEARCH METHOD

This research is an experimental study, using a completely randomized design (CRD). In this study the number of repetitions for each treatment was 3 repetitions in 3 treatments. The substitution of tolo beans in a process of making steamed cakes is:

- a. Treatment 1: given as much as 50 gr of tolo beans
- b. Treatment 2: given 75 grams of tolo beans
- c. Treatment 3: given 100 gr of tolo beans

The location of product manufacture and organoleptic tests were carried out at the researcher's house. Tests for protein nutrient levels were carried out at the Surabaya Industrial Research and Consultation Center in September 2021. Requires 25 untrained panelists in Tedunan Socah Village, Bangkalan Madura Regency. By using a purposive random sampling technique, panelists from the population were taken randomly

To test the effect of tolo bean substitution on steamed cakes, only one treatment was tested which was the most preferred (descriptive). Meanwhile, to test the effect of organoleptic quality (taste, aroma, color and texture) steamed sponge was tested using Friedman

3. RESULTS AND ANALYSIS

Organoleptic Test of Tolo Bean Steamed sponge cake

a. Color

The color of the tolo bean steamed cake in the BK1 sample was 12% of the respondents choosing slightly beige and 88% of the total respondents who stated white. The results of the color of the steamed tolo bean cake in the BK2 sample were 16% of the respondents choosing beige and 84% of the total respondents who stated slightly beige. The results of the color of the steamed tolo bean cake in the BK3 sample were 5% of respondents choosing slightly beige and 80% who stated cream. So that from the results of the analysis of the color of the steamed sponge cake in the 3 treatments the most that stated white in sample BK1 was with the addition of 50 g of tolo beans.

From the results of the analysis of the color of the steamed sponge cake with the Friedman Test, a significant result was obtained of 0.000 ($p < 0.05$), thus the HI hypothesis was accepted, namely that there was an effect of the addition of tolo beans on the organoleptic quality of the tolo steamed cakes.

b. Aroma

The aroma of steamed tolo bean cakes in the BK1 sample of 16% of respondents chose a slightly distinctive tolo bean flavor, 21% of respondents chose quite a tolo bean flavor and those who stated a slightly distinctive tolo bean aroma were 84% of the total respondents. The results of the aroma of steamed tolo bean cakes in the BK2 sample were 20% of respondents who chose the distinctive tolo bean flavor and those who stated that they had a distinctive tolo bean aroma were 80% of the total respondents. The results of the aroma of steamed tolo bean cake in the BK3 sample were 88% of respondents who chose the distinctive tolo bean flavor and those who stated that it had a distinctive tolo bean aroma were 12%. So from the results of the analysis of the aroma of steamed sponge cake in the 3 treatments, the most that stated that it had a slightly distinctive flavor of tolo beans in sample BK1, namely with the addition of 50 g of tolo beans.

From the analysis of the aroma of steamed sponge cake with the Friedman Test, a significant result was obtained 0.000 ($p < 0.05$), thus the HI hypothesis was accepted, namely that there was an effect of the addition of tolo beans on the organoleptic quality of steamed tolo bean cakes.

c. Flavor

The taste of steamed tolo bean cake in the BK1 sample of 12% of respondents chose a somewhat distinctive tolo bean taste and 88% of the total respondents stated that it tasted rather tolo. The results of the taste of steamed tolo bean cakes in the BK2 sample were 52% of respondents choosing the distinctive taste of tolo beans and 48% of the total respondents stated that they had a distinctive taste of tolo beans. The results of the taste of steamed tolo bean cakes in the BK3 sample amounted to 80% of respondents choosing the distinctive taste of tolo beans and those who stated that they had a distinctive tolo bean taste were 20%. So that from the results of the analysis of the aroma of steamed sponge cake in the 3 treatments, the most that stated that it had a rather distinctive taste of tolo beans in sample BK1, namely with the addition of 50 g of tolo beans.

From the analysis of the taste of steamed sponge cake with the Friedman Test, a significant result was obtained of 0.000 ($p < 0.05$), thus the HI hypothesis was accepted, namely that there was an effect of adding chickpeas to the organoleptic quality of steamed tolo bean cakes.

d. Texture

The texture of the steamed tolo bean cake in the BK1 sample was 12% of the respondents choosing rather dense and 88% of the total respondents who stated that it was not dense. The results of the texture of the tolo bean steamed cake in the BK2 sample were 44% of respondents who chose quite dense and 56% of the total respondents who stated that it was rather dense. The results of the texture of the tolo bean steamed sponge cake in the BK3 sample were 76% of respondents choosing solid and 24% who stated that it was quite dense. So from the results of the texture analysis of the steamed sponge cake in the 3 treatments, the most that was not solid was in sample BK1, namely with the addition of 50 g of tolo beans.

From the texture analysis of the steamed sponge cake with the Friedman Test, a significant result was obtained of 0.000 ($p < 0.05$), thus the HI hypothesis was accepted, namely that there was an effect of the addition of tolo beans on the organoleptic quality of the steamed tolo bean cakes.

e. Levels of pleasure

The level of preference for steamed tolo bean cakes in the BK1 sample was 16% of respondents choosing quite like it and those who said they liked it were 84% of the total respondents. The results of the preference level for steamed tolo bean cakes in the BK2 sample were 76% of respondents choosing quite like them and those who said they liked them were 24% of the total respondents. The results of the preference level for steamed tolo bean cakes in the BK3 sample were 12% of respondents who chose not to like them and those who said they quite liked them were 88%. So that from the results of the analysis of the level of preference for steamed sponge cake in the 3 treatments, most of them said they liked the BK1 sample, namely with the addition of 50 g of tolo beans.

From the results of the texture analysis of the steamed sponge cake with the Friedman Test, a significant result was obtained of 0.000 ($p < 0.05$), thus the HI hypothesis was accepted, namely that there was an effect of the addition of tolo beans on the level of preference for steamed tolo bean cakes.

Protein Level Test

The protein content in the steamed sponge cake substituted for the broad beans substitution, the highest total protein content was found in the BK3 treatment of 14.05 ($\mu\text{g}/100\text{g}$) with the addition of 100 g of plain beans. While the lowest total protein content was found in the BK1 treatment of 6.81 ($\mu\text{g}/100\text{g}$) with the addition of 50 g of green beans.

The results of the analysis of the protein content test with different substitutions of chickpeas with the one way ANOVA test, obtained significant results of 0.000 ($p < 0.05$) thus HI was accepted, that is, there was an effect of adding different chickpeas

4. CONCLUSION

Organoleptic Test of Tolo Bean Steamed sponge cake

a. Color

Organoleptic test data on the color of the steamed tolo bean cake tested by the Friedman test showed that there was an effect on the addition of tolo beans on the color of the steamed sponge cake, while the highest average value was 3.88 in sample BK1 and the lowest average value was 2.20 in BK3.

Friedman's test results showed that the value of $p = 0.000$ ($p < 0.05$) which means that the steamed sponge cake with the addition of different green beans has a significant effect on the color of the steamed sponge cake. This is due to the addition of tolo beans in each treatment so that there is a significant difference in color.

According to Astawan, 2004, the color of a food is very important, because it can stimulate appetite. Attractive food colors will arouse one's appetite. Color also has a role and meaning in food because it can affect consumer acceptance of the food.

The color obtained in bread products containing higher levels of tolo bean flour results in a darker and brownish color. The darkening of the tolo bean bread product is due to the Maillard reaction that occurs during the process of making the bread product due to the high lysine content in the tolo bean. In the Maillard reaction it reacts to amino acid groups in proteins, especially lysine, and causes sugar reactions to amino acid products (proteins polymerize and produce brown pigments).

b. Aroma

Data on organoleptic test results for the aroma of steamed tolo bean cakes tested by the Friedman test showed that there was an effect on the addition of tolo beans on the aroma of steamed cakes, while the highest average value was 2.88 in sample BK1 and the lowest average value was 1.12 in BK3.

Friedman's test results showed that the value of $p = 0.000$ ($p < 0.05$) which means that the steamed sponge cake with the addition of different green beans has a significant effect on the aroma of the steamed sponge cake. This is due to the addition of tolo beans in each treatment so that there is a significant difference in aroma.

The higher the addition of tolo beans and the lower the use of wheat flour, the resulting steamed cakes have a stronger aroma of tolo beans. The aroma of tolo bean flour is stronger than that of wheat flour, giving rise to a distinctive aroma in steamed sponge products. (Darmatika et al, 2018). The distinctive aroma of tolo bean flour is also generated because in the process of making cowpea flour it goes through the roasting process. According to Sunaryo (1985), roasting can also inactivate enzymes and enzyme inhibitors, kill microbes, improve digestibility, and produce a distinctive taste and aroma.

c. Flavor

Data from the organoleptic test results for the taste of steamed tolo bean cakes tested by the Friedman test showed that there was an effect on the addition of tolo beans on the taste of steamed cakes, while the highest average value was 2.88 in sample BK1 and the lowest average value was 1.20 in BK3. .

The results of the Friedman test showed that the value of $p = 0.000$ ($p < 0.05$) which means that steamed cakes with the addition of different green beans have a significant effect on the taste of steamed cakes. This is due to the addition of tolo beans in each treatment so that there is a significant difference in taste.

The more substitution of tolo bean flour will affect the level of sweetness in the steamed sponge. This is presumably because in cowpea there are compounds that cause unpleasant taste. In the manufacture of legume flour, an unpleasant taste, namely rancidity, often arises. The bad taste is caused by a reaction assisted by the lipoxygenase enzyme found in nuts. The activity of these enzymes gives rise to an unpleasant taste (beany flavour). There are several types of lipoxygenase enzymes that can be active at different pH (acidity). This enzyme breaks down the oil to produce hexanal and hexanol, which have an unpleasant aroma. These substances can be sensed at very low concentrations. Therefore, in the process of making tolo bean flour, further processing of tolo bean seeds is an important process that is always included. Heating varies greatly, among others, by steaming, boiling, roasting (frying without oil). The heating process aims to inactivate some enzymes and eliminate the unpleasant taste (Utomo, 1998).

d. Texture

Data on organoleptic test results for the texture of steamed tolo bean cakes tested by the Friedman test showed that there was an effect on the addition of tolo beans on the texture of steamed cakes, while the highest average value was 3.76 in sample BK1 and the lowest average value was 1.88 in BK3.

Friedman's test results showed that the value of $p = 0.000$ ($p < 0.05$) which means that the steamed sponge cake with the addition of different green beans has a significant effect on the texture of the steamed sponge cake. This is due to the addition of tolo beans in each treatment so that there are significant differences in texture.

Texture is determined by the content of water, fat, carbohydrates and proteins that make up it (Fauzia et al., 2016). According to Winarno, 2002 that the water content contained in food products greatly influences the quality of food and one of them is the water content that is removed or reduced by evaporation or drying during food processing. It can be concluded that the more substitution of plain pea flour has an effect on the texture density and brittleness. As the results of this research on the BK3 sample, the more plain pea flour, the denser and more brittle the texture of the steamed sponge cake.

e. Levels of pleasure

Test data on the preference level of steamed tolo bean cakes tested by the Friedman test showed that there was an effect on the addition of tolo beans on the preference level of steamed tolo beans while the highest average value was 32.84 in sample BK1 and the lowest average value was 1.88 in BK3

The results of the Friedman test showed that the value of $p = 0.000$ ($p < 0.05$) which means that steamed sponge cake with the addition of different green beans has a significant effect on the level of preference for steamed sponge cake. This is due to the addition of tolo beans in each treatment so that there is a significant difference in the level of preference.

The more substitution of tolo bean flour will affect the level of sweetness in the steamed sponge. This is presumably because in cowpea there are compounds that cause unpleasant taste. In the manufacture of legume flour, an unpleasant taste, namely rancidity, often arises. The bad taste is caused by a reaction assisted by the lipoxygenase enzyme found in nuts.

Protein Content

The results of the protein content in the steamed sponge cake with the substitution of broad beans, the highest amount of protein content was found in the BK3 treatment of 14.05 ($\mu\text{g}/100\text{g}$) with the addition of 100 g of plain beans. While the lowest total protein content was found in the BK1 treatment of 6.81 ($\mu\text{g}/100\text{g}$) with the addition of 50 g of green beans. The high protein content in the steamed sponge does not only come from the plain beans, but the mixing ingredients such as eggs and wheat flour also contribute to the protein content in the steamed sponge.

The results of the analysis of the protein content test with different substitutions of broad beans and the one way Anova test, obtained a significant result of 0.000 ($p < 0.05$) thus HI was accepted, that is, there was an effect of adding different beans.

The protein requirement for men aged 19-29 is 65 g per day while women aged 19-29 is 60 g per day. This steamed cake is included as a snack between main meals so that it takes 10% of the nutritional needs. So that the nutritional adequacy is around 6.5 g per day for men and 6 g per day for women.

Steamed tolo bean cakes can be used as a snack of vegetable protein having protein content with the addition of 50 grams of tolo beans as much as 1 portion of 100 grams (3 steamed cakes) can contribute 6.91 g of iron.

The need for protein nutrients is 10% of the RDA by consuming 50 grams of steamed tolo bean cakes as much as 1 portion of 100 grams can contribute 6.91 g of protein. Protein functions and is very useful for living things, especially humans, all sources of protein in our body are very good for human health. Here we can see the function of proteins, including the following (Ellya, 2010). Therefore, protein plays an important role in the human body, because if humans don't have enough protein, they will suffer from malnutrition.

REFERENCES

- [1] [USDA] United States Department of Agriculture Food Composition Database. (2016). *Cowperas, Coomon (Blackeyes, crowder, southem) matures seeds, raw*.
- [2] Abidin, D., Purnomo, & Pradhana, C. (2020). *KEANEKARAGAMAN HAYATI SEBAGAI KOMUNITAS*. Jombang: Fakultas Pertanian Universitas KH.A Wahab Hasbullah.
- [3] Anni, F., Kasmita S, Asmar Yulastri, & Liswati Yusuf. (2008). Patiseri Jilid. *Direktorat Jendral Pendidikan Dasar dan Menengah, Departemen Pendidikan Nasional*.
- [4] Anonimus. (2006). *Beragam Bahan Pangan dari Tempe Kacang* (12-14 ed.). Sinar Tani .
- [5] Balai Penelitian Tanaman Kacang dan Umbi. (2015, juli 23). *Kacang Tunggak, Komoditas Potensial di Lahan Kering Masam*.
- [6] *Blok AhliGiziID*. (n.d.). Retrieved Desember 16, 2020, from Tabel Komposisi Pangan
- [7] BPOM. (2013). *Laporan Tahunan Badan Pengawasan Obat dan Makanan*.
- [8] Chavan, J., S.S, K., & D.K, S. (1989). *Handbook of Food Legumes: Nutritional Chemistry, Processing Technology and CRC Press*. (B. Rato, Ed.) Florida.
- [9] De Kay, J. E. (1979). *Crop and Product Digest No.3- Food Legumes*.
- [10] Elisa. (2013). *Bolu Kukus: Dari Masa kr Masa Klasik Modern*. Surabaya : Linguakata.
- [11] Elisa. (2013). (P. Linguakata, Ed.) *Bolu Kukus dari Masa ke Masa Klasik dan Modern*.
- [12] Erwin, L. T. (2004). *Variasi Bolu Kukus*. (Gramedia, Ed.) Jakarta.
- [13] Kholis, Muhammad Nur., Purwanti, S., Adriani, G., Permata, Alvin., Giyanti, D. (2010). *Optimalisasi Pemanfaatan Kacang Tunggak (Vigna unguiculata) dalam Pembuatan Tempe*.
- [14] Mitayani, & Sartika . (2010). *Buku Saku Ilmu Gizi*.
- [15] Mudjajanto, E. S. (2004). *Membuat Aneka Roti*. Jakarta: Penebar Swadaya. Ningrum, M. R. (2012). *Pengembangan Produk Cake dengan Subtitusi Tepung Kacang*.
- [16] Sayekti, d. (2011). *Karakteristik Delapan Aksesori Kacang*. *Journal Penelitian Sains dan Teknologi*, 2(1), 1-10.
- [17] Setyabudhy, A. P. (n.d.). *Mengenal Lebih dalam tentang Food Origin, Food Source, Karakteristik, Standar Quality, Produk dan Manfaat dari Kacang Tunggak (vigna unguiculata)*.
- [18] Suhardjito, Y. (2006). *Pastry Dalam Perhotelan*. Yogyakarta: Andi Publisher. Widodo. (2003). *Bioteknologi Industri Susu*.

THIS PAGE HAS INTENTIONALLY BEEN LEFT BLANK