Characteristic of Egg Roll Product with Treatment Proportions of Kimpul-Mung Bean Composite Flour

Diana Puspitasari, Endang Noerhartati, and Mujianto
Teknologi Industri Pertanian, Universitas Wijaya Kusuma Surabaya, Surabaya, Indonesia
***diana.puspitasari@uwks.ac.id**

Abstract
Kimpul has potential raw material for egg rolls. The limitation is low protein which can be overcome by adding high protein ingredients, green beans (Vigna radiata). This research aims to find egg roll formulations and determine their characteristics. The research using a completely randomized factorial design. The test parameters are yield, proximate tests (water, ash, fat, protein, carbohydrates), and sensory tests (color, aroma, taste, and texture). Parametric data was analyzed using analysis of variance (ANOVA). If the ANOVA test shows a real difference (significance < BNT 5%), then continue with the Least Significant Difference test. Ordinal data from sensory tests were analyzed using Friedman Test, and descriptive analysis. The results showed that treatment interaction had no significant effect on the yield, water, carbohydrate, ash, fat, and protein content, but had a single significant effect on the yield. The treatment of the proportion of kimpul composite flour and green bean flour had a single significant effect on water content. The results of the Friedman test showed that the treatment proportion of kimpul composite flour and green bean flour with egg addition had a significant effect on aroma, but had no significant effect on the color, texture, and taste of egg rolls.

Keywords**:** *Kimpul, Egg Roll, Green Beans*.

Abstrak
Kimpul berpotensi sebagai bahan baku tepung lokal yang dapat digunakan dalam pembuatan egg roll. Keterbatasannya adalah kandungan protein rendah yang dapat diatasi dengan penambahan bahan berprotein tinggi, salah satunya kacang hijau (Vigna radiata). Penelitian ini bertujuan menemukan formulasi egg roll dengan bahan baku tepung kimpul dan tepung kacang hijau serta menentukan karakteristiknya. Penelitian dilakukan dengan Rancangan Acak Lengkap faktorial. Parameter pengujian yaitu rendemen, uji proksimat (air, abu, lemak, protein, karbohidrat), dan uji organoleptik (warna, aroma, rasa dan tekstur). Data parametrik dianalisis menggunakan analisis ragam (analysis of variance). Selanjutnya jika hasil analisis ragam menunjukkan perbedaan

OPEN ACCESS

Citation**:** Diana Puspitasari, Endang Noerhartati, and Mujianto. 2024. Characteristic of Egg Roll Product with Treatment Proportions of Kimpul-Mung Bean Composite Flour. *Journal of Research and Technology* Vol. 10 No. 1 Juni 2024: Page 113–122.

nyata (signifikansi < BNT 5%), maka dilanjutkan uji Beda Nyata Terkecil (BNT) 5%. Sedangkan data ordinal dari uji organoleptik dianalisis menggunakan Uji Friedman, serta analisis deskriptif. Hasil menunjukkan interaksi perlakuan tidak berpengaruh nyata terhadap rendemen, kadar air, kadar karbohidrat, kadar abu, kadar lemak, kadar protein egg roll kimpul, namun berpengaruh nyata secara tunggal pada rendemen. Perlakuan proporsi tepung komposit kimpul dan tepung kacang hijau berpengaruh nyata secara tunggal pada kadar air. Hasil uji Friedman menunjukkan perlakuan proporsi tepung komposit kimpul dan tepung kacang hijau dengan penambahan telur berpengaruh nyata pada aroma egg roll kimpul, namun tidak berpengaruh nyata terhadap warna, tekstur, dan rasa egg roll kimpul.

***Keywords*:** *Kimpul, Egg Roll, Kacang Hijau.*

1. Introduction

An egg roll is a snack with a crunchy texture and the shape of a long roll like a pipe that is made by baking it and then rolling it with tongs. The characteristic of egg rolls is that they don't taste too sweet and don't break apart. The distinctive aroma of egg rolls comes from the combination of basic ingredients used, such as margarine and eggs. The main raw material for egg rolls on the market is made from wheat flour.

The use of wheat flour in making egg rolls can increase the volume of wheat imports. Efforts to reduce the use of wheat flour include food diversification, one of which is using kimpul flour and green bean flour to increase the protein content of egg rolls.

Kimpul has potential as a raw material for flour considering its high carbohydrate content but low protein content. Efforts to overcome the protein deficiency in kimpul flour in food products can be combined with other protein sources, one of which is green beans (*Vigna radiata*). Green beans are a food plant source of vegetable protein. The protein content of green beans is 22%, ranking third after soybeans and peanuts. Green beans are early maturing (55-65 days), drought resistant, relatively few types of disease, can be planted on less fertile land and the selling price is relatively high and stable.

The addition of green bean flour is expected to increase the protein content of egg rolls. The quality of the egg rolls produced must meet the quality requirements that have been set so that the product is safe for consumption. However, there is no SNI for egg rolls so the quality requirements for egg rolls refer to SNI for dry cakes 01-2973-1992 because egg rolls are included in the type of dry cake. Considering the great potential of kimpul tubers, green beans and eggs, research will be carried out on developing egg rolls from kimpul flour and green bean flour in making egg rolls.

2. Method

The ingredients used are eggs, sugar, emulsifier, kimpul flour, green bean flour, sago flour, baking powder, margarine, and chemicals for proximate analysis.

The tools used are containers, scales, basins, mixers, spatulas, egg roll molds, spoons, napkins, aprons, trays, chopsticks, brushes, knives, stoves, pans, plastic packaging, plastic jars and tools for proximate and organoleptic analysis.

The research was carried out using a factorial Randomized Block Design (RAK) method with two factors which were repeated 3 times on a laboratory scale. The variables tested were yield, chemical test which included water content (AOAC International, 1995; Nielsen, 2010), ash content (AOAC International, 1995; Nielsen, 2010), fat content (AOAC International, 1995; Nielsen, 2010), Protein (AOAC International, 1995; Nielsen, 2010), and carbohydrate content by Difference (AOAC International, 1995; Nielsen, 2010), as well as sensory tests, namely color, aroma, taste, and texture.

The research data in the form of parametric data was analyzed using variance analysis and if it showed a significant difference between treatments (significance > BNT), then it was continued with the 5% Least Significant Difference (BNT) test. Sensory test data in the form of ordinal data was analyzed using the Friedman Test, as well as descriptive analysis.

A weight test is carried out to determine the level of importance of various parameters. In this research, the parameters used are taste, color, aroma, texture, water content, ash content, fat content, protein content, carbohydrate content, and yield expressed in percent. Based on this weight test, it can be seen which parameters have the highest importance.

In selecting alternatives, the basis for calculations used is the product quality results for each parameter and the probability in each basic condition. According to (Haudi and Wijoyo, 2021), the concept of expected value decisions is to choose decisions that have maximum pay-off (profit or utility) or minimum costs (losses or sacrifices).

3. Result and Discussion

3.1 Yield Test Results

Yield is the percentage of the product obtained from comparing the initial weight of the material with the final weight. The yield is obtained by calculating the final weight of the product divided by the total initial weight of the material then multiplied by one hundred percent. The percentage yield results from each treatment can be seen in Table 1.

Table 1. Average Yield Calculation Results (%)

Treatment	Average
K1T1	90.39
K1T2	90.53
K1T3	93.61
K2T1	90.92
K2T2	92.64
K2T3	98.15
K3T1	92.19
K3T2	91.20
K3T3	96.38

The lowest yield was in the K1T1 treatment with the proportion of kimpul-mung bean composite flour (60:40) and the addition of 80% eggs, while the highest yield was in the K2T3 treatment with the proportion of kimpul-mung bean composite flour (70:30) and the addition of 100% egg. The results of the analysis of variance showed that the interaction of the proportion of kimpul-mung bean composite flour and the addition of eggs has no significant effect on the yield. This is based on significance (0.487 > 0.05), but the addition of eggs has a single significant effect on the yield parameters as indicated by significance (0.000 < 0.05). Duncan's test results show real differences between treatments which can be seen in Table 2. The Duncan test results in Table 2 show that treatment T1 is not significantly different from T2, while treatment T3 is significantly different from T1 and T2.

Table 2. Duncan Test Results for T Factor on Yield (%)

Egg	Yield
T1 (80%)	91.17[a]
T2 (90%)	91.46[a]
T3 (100%)	96.05[b]

Remarks: different notations in the same column indicate there is a real difference at α = 5%

The yield is directly related to the water content, if the lower the water content, the lower the yield will be and if the higher the water content in the product, the resulting yield will also be higher. This research shows that the addition of eggs results in a higher yield value being produced. This is thought to be because the addition of eggs causes an increase in the water content of the kimpul-mung bean composite flour egg roll, resulting in a higher yield. According to (Yulistiani et al., 2021), proteins can bind water molecules with strong hydrogen bonds, this ability is because proteins are hydrophilic.

3.2 Chemical Characteristics

The chemical test results of egg rolls can be seen in Table 3.

Table 3. Average Water Content Test Results (%)

Treatment	Water Content (%)	Carbohydrate Content (%)	Ash Content (%)	Fat Content (%)	Protein Content (%)
K1T1	4.44	65,14	2.88	22.29	5.90
K1T2	4.47	61,25	3.23	24.84	6.21
K1T3	5.06	60,90	2.96	23.63	7.11
K2T1	4.22	64,89	3.01	23.04	5.84
K2T2	4.19	64,95	2.37	22.79	6.04
K2T3	5.43	60,61	2.82	23.71	7.76
K3T1	4.55	62,40	2.89	25.26	5.57
K3T2	4.44	62,82	2.56	23.89	6.29
K3T3	6.10	58,87	2.55	24.84	6.98

Water Content

Water is the main component of food. The presence of water in food will affect the texture, taste, appearance, and shelf life. The water content in food also determines the freshness and durability of the food. High water content makes it easy for bacteria, mold and yeast to breed, resulting in changes to the food (Winarno, 1986). The average water content test results ranged from 4.19% to 6.10%, which can be seen in Table 3. The water content of egg rolls meets SNI requirements which is below 10% ((BSN, 1992). Low water content can be caused because egg rolls do not contain gluten. Low gluten content can cause the water-holding capacity to become weaker, resulting in easier release of water molecules during drying (Listy Biyumna et al., 2017).

The results of statistical analysis of water content data using the ANOVA test and Duncan's test show that the interaction between the proportion of kimpul-mung bean composite flour and the addition of eggs did not have a significant effect on water content. This is based on significance (0.791 < 0.05), but the treatment of the proportion of kimpul-mung bean composite flour has a single significant effect on the water content parameter based on the significance results (0.01 < 0.05). Duncan's test results show real differences between treatments which can be seen in Table 3. The Duncan test results in Table 4 show that treatment T1 is not significantly different from T2, while treatment T3 is significantly different from T1 and T2.

Table 4. Duncan Test Results for T Factor on Water Content (%)

Proportions of Kimpul-Mung Bean Composite Flour	Water Content
K2 50% : 50% (Kimpul Flour: Green Bean Flour)	4.37[a]
K1 60% : 40% (Kimpul Flour: Green Bean Flour)	4.40[a]
K3 40% : 60% (Kimpul Flour: Green Bean Flour)	5.52[b]

Remarks: different notations in the same column indicate there is a real difference at α = 5%

Carbohydrates Content

Carbohydrates are the main source of calories for the body and a source of energy. Carbohydrates have an important role in determining the characteristics of food ingredients, for example taste, color, texture and others (Winarno, 1986). The results of the carbohydrate content test ranged from 58.87% to 65.14% can be seen in Table 2. An increase in the proportion of green bean flour, which means an increase in the proportion of kimpul flour, causes an increase in protein levels (Shabnum Shaheen, 2012; Suneja et al., 2011). The results of statistical analysis of data on carbohydrate levels using the ANOVA test showing that the interaction between treatments of the proportion of kimpul-mung bean composite flour and the addition of eggs did not have a significant effect on carbohydrate levels, nor did each treatment alone have a significant effect on carbohydrate levels.

Ash Content

Ash is an organic substance produced by burning organic material, which is related to the amount of minerals present in a substance (Sudarmadji et al., 1984). The ash content of a material indicates the number of particles in it, but it cannot be identified whether the mineral

is important or not (Muthiahwari and Manalu, 2020). The ash content in food can be an indicator of the mineral content in food. Total ash content is part of proximate analysis which aims to evaluate the nutritional value of a product or food ingredient, especially total minerals. Most food ingredients consist of 96% organic materials and water, while the rest are mineral elements (Winarno, 1986). The ash content test results ranged from 2.01% to 3.23% can be seen in Table 2. The results of statistical analysis of ash content data using the ANOVA test showing that the interaction between the treatment proportions of kimpul-mung bean composite flour and the addition of eggs did not have a significant effect on ash content, nor did each treatment alone have a significant effect on ash content.

Fat Content

Fat is a food substance that is important for maintaining the health of the human body, besides that fat and oil are also a more effective source of energy than carbohydrates and protein (Winarno, 1986). The chemical structure of fat in food is generally in the form of triglycerides, namely a combination of one glycerol molecule and three fatty acid molecules. The fat content test results ranged from 22.29% to 25.26% can be seen in Table 2. The results of statistical analysis of fat content data using the ANOVA test showing that the interaction between the treatment proportions of kimpul-mung bean composite flour and the addition of eggs did not have a significant effect on fat content, nor did each treatment alone have a significant effect on fat content.

Protein Content

Protein is a food substance that is very important for the body, because besides functioning as fuel in the body, this substance also functions as a building and regulating substance (Winarno, 1986). The protein content in food is a separate consideration for people who consume food, this is because protein is a nutrient that is a source of energy needed by the body. According to (Winarno, 1986), protein is a source of amino acids which contain the elements C, H, O and N which fat or carbohydrates do not have. The protein content test results ranged from 5.57% to 7.67% can be seen in Table 2. Increasing the use of eggs in eggrolls will increase the protein content (Shabnum Shaheen, 2012; Suneja et al., 2011).

The results of statistical analysis of protein content data using the ANOVA test showing that the interaction between the treatment proportions of kimpul-mung bean composite flour and the addition of eggs did not have a significant effect on protein levels, nor did each treatment alone have a significant effect on protein levels.

3.3 Sensory Test

Sensory test is a preference test using a hedonic scale, including preference for color, aroma, texture and taste. Sensory tests were carried out to test the level of consumer preference for kimpul-mung bean composite flour egg rolls. In this study, Sensory testing used 5 scores, namely score 1 (dislike very much), score 2 (dislike), score 3 (neutral), score 4 (like), score 5 (very like). The results of the sensory test can be seen in Figure 1.

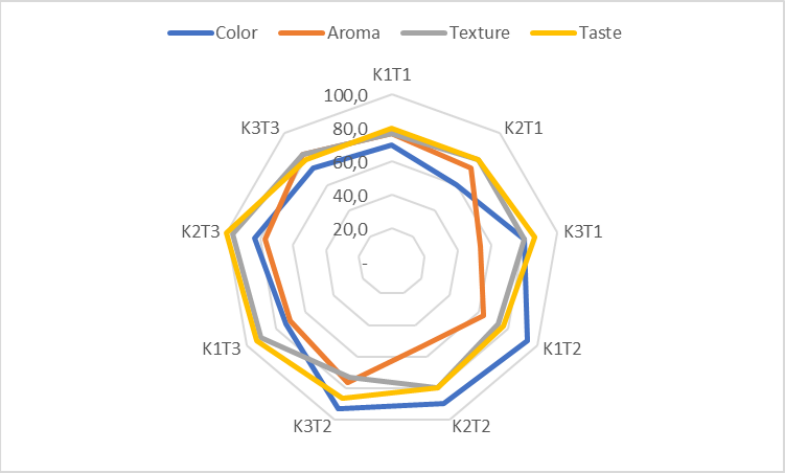

Figure 1. The Results of The Sensory Test

The highest preference test value for the egg roll color parameter was in the K1T2 treatment, namely the proportion of kimpul-mung bean composite flour (60:40) and the addition of eggs 36%, while the smallest level of liking was in the K2T1 treatment, namely the proportion of kimpul-mung bean composite flour (50 :50) and the addition of 24% eggs. The results of the Friedman test on color parameter show that there is no real effect of treatment on color parameters. This is based on the results of the Friedman sensory test for egg roll color (%) with a significance value of (0.108 > 0.05). The egg roll color that the panelists liked was dark brown, typical of egg roll products. Using more kimpul flour than green bean flour affects the color of the egg roll. In general, the more kimpul flour added causes the color of the egg roll to become dark brown. This is thought to be because kimpul flour contains saponin which can cause a brown color when subjected to the heating process (Rafika et al., 2012; Lamusu, 2018; Lidiasari et al., 2006). However, if more kimpul flour is added, it actually reduces the level of liking for egg rolls, because the color becomes darker.

The egg roll aroma parameter was found that the highest preference test value in treatments K1T1 and K3T2, namely the proportion of kimpul-mung bean composite flour (60:40) and the addition of eggs was 24% and the proportion of kimpul-mung bean composite flour (40:60) and the addition of eggs was 48 %, while the smallest level of preference was found in the K2T2 treatment, namely the proportion of kimpul-mung bean composite flour (50:50) and the addition of eggs was 36%. The Friedman test show that there is a real effect of treatment on aroma parameters based on the significance value (0.013 < 0.05). Aroma is one component of food taste and can determine the deliciousness of food. Based on the level of preference, the panelists preferred the egg roll product with the distinctive aroma of green beans compared to the aroma of kimpul flour which tends to be unpleasant. As the proportion of green bean flour increases, the panelists' preference for aroma parameters increases. The aroma of the product is influenced by the addition of green bean flour, the greater the proportion used, the sharper the aroma will be (Rafika et al., 2012).

Texture parameters showed that the highest preference value for egg roll was found in treatment K2T3, namely the proportion of kimpul-mung bean composite flour (50:50) and the

addition of eggs 36%, while the lowest level of preference was found in treatment K1T2, namely the proportion of kimpul-mung bean composite flour (60: 40) and the addition of 36% eggs and the K3T2 treatment, namely the proportion of kimpul-mung bean composite flour (40:60) and the addition of eggs 36%. The Friedman show that there is no real effect of treatment on texture parameters. This is based on a significance value of (0.158 > 0.05). Using green beans can increase crunchiness. This is supported by the results of research conducted by (Suprianto et al., 2015). Beside that, the addition of eggs really affects the texture of the egg roll. The higher the number of eggs added, the crispier the resulting texture will be. This is thought to be due to the presence of lecithin in egg yolk which can improve the texture (Winarno, 1986). According to (Mulyadi Febrianto. A, Wijana. S, Dewi Atsari. I, 2014) eggs serve as ingredients binding starch molecules contained in wheat flour with breadfruit flour, so it can help with formation the texture of the noodles produced. Lecithin in egg yolk it functions as emulsifier, accelerates the hydration of water on flour and to rise the dough.

3.4 Alternative Selection

Alternative selection is carried out with the aim of choosing the best treatment from several existing treatments (Haudi and Wijoyo, 2021). Decision making is a process of selecting the best treatment systematically. Determining the importance weight of each parameter is carried out using a weight test. Meanwhile, determining the best treatment selection is based on the Expected Value method. The weight test results can be seen at Figure 2.

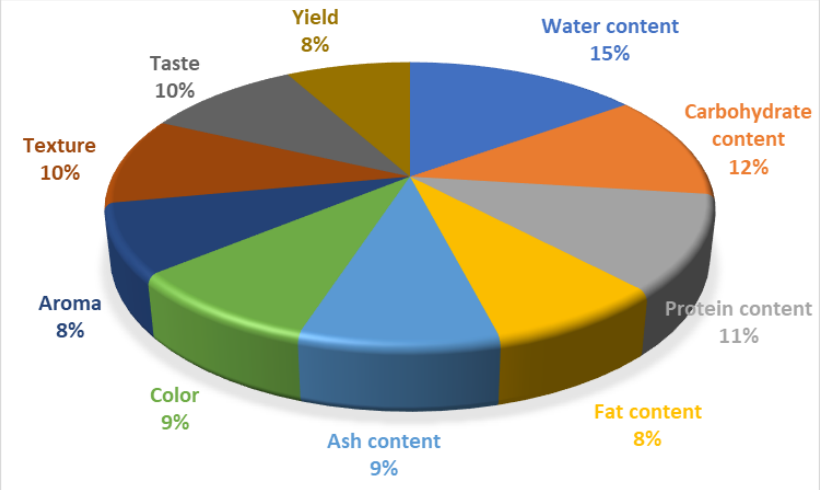

Figure 2. The Weight Test Results

3.5 Expected Value

Expected value is the sum of the values that are expected to occur for a probability. The basis of calculation for the selection of the best treatment is the result of product quality for each parameter and the weight of importance of each of these parameters. In decision making, it should always be endeavored to choose the treatment with the maximum expected value. The results of calculating the expected score for each treatment are shown in Table 5.

Table 5. The Results of Calculating the Expected Score for Each Treatment

Treatment	Total Expected Value
K1T1	5,03
K1T2	3,19
K1T3	4,35
K2T1	5,09
K2T2	6,04
K2T3	5,56
K3T1	4,28
K3T2	6,72
K3T3	4,30

4. Conclusion

The conclusion of the research is:

1. The interaction between the proportions of kimpul composite flour and green bean flour with the addition of eggs had no significant effect on the yield, water content, carbohydrate content, ash content, fat content, and protein content of kimpul egg roll;
2. The treatment of adding eggs had a single significant effect on the yield parameters, and the treatment of the proportion of kimpul composite flour and mung bean flour had a single significant effect on the water content parameters;
3. The treatment of the proportion of kimpul composite flour and green bean flour with the addition of eggs had a significant effect on the aroma of kimpul egg rolls, but had no significant effect on the color, texture and taste of kimpul egg rolls

Appreciation

The Author gratefully acknowledges Institute for Research and Community Service Universitas Wijaya Kusuma Surabaya for funding this research.

REFERENCES

AOAC International. (1995). *AOAC International* (Vol. 78, Nomor 3).

BSN. (1992). SNI 01-2973-1992 Cookies. *Badan Standardisasi Nasional*, 1–5. https://kupdf.net/download/sni-01-2973-1992_58e4a373dc0d60523cda9818_pdf#

Haudi, dan Wijoyo, H. (2021). Teknik Pengambilan Keputusan. In *Penerbit Insan Cendekia Mandiri*. https://doi.org/10.21831/efisiensi.v3i2.3796

Lamusu, D. (2018). Uji Organoleptik Jalangkote Ubi Jalar Ungu (*Ipomoea batatas* L) Sebagai Upaya Diversifikasi Pangan. *Jurnal Pengolahan Pangan*, *3*(1), 9–15. https://doi.org/10.31970/pangan.v3i1.7.

Lidiasari, E., Syafutri, M. I., dan Syaiful, F. (2006). Pengaruh Perbedaan Suhu Pengeringan Tepung Tapai Ubi Kayu terhadap Mutu Fisik dan Kimia yang Dihasilkan. *Jurnal Ilmu-Ilmu Pertanian Indonesia*, *8*(2), 141–146.

Listy Biyumna, U., Siti Windrati, W., dan Diniyah, N. (2017). Karakteristik Mie Kering Terbuat dari Tepung Sukun (*Artocarpus altilis*) dan Penambahan Telur. *Jurnal Agroteknologi*, *11*(01), 23–34.

Mulyadi Febrianto. A, Wijana. S, Dewi Atsari. I, Putri Ika. W. (2014). Studi Pembuatan Mie

Kering Ubi Jalar Kuning (*Ipomoea batatas*). *Seminar Nasional BKS PTN Barat*, *April*, 1186–1194.

Muthiahwari, F., dan Manalu, M. B. F. (2020). Pemanfaatan Tepung Talas Belitung (*Xanthosoma safittifolium*) pada Produk Cookies Bong Li Piang sebagai Alternatif Oleh-Oleh Bangka Belitung. *J. Culinaria*, *2*(2), 1–17.

Nielsen, S. S. (2010). *Food Analysis Laboratory Manual* (D. R. Heldman (ed.); 3rd ed.). Springer International Publishing. http://cst.ur.ac.rw/library/Food Science books/batch1/Food Analysis Laboratory Manual Second Edition.pdf

Rafika, T., Nurjanah, N., dan Hidayati, L. (2012). Sifat Organoleptik Subtitusi Tepung Kimpul dalam Pembuatan Cake. *J. Teknologi dan Kejuruan*, *35*(2), 213–222.

Shabnum Shaheen. (2012). Comparative Nutritional Analysis Between *Vigna radiata* and *Vigna mungo* of Pakistan. *African Journal of Biotechnology*, *11*(25), 6694–6702. https://doi.org/10.5897/ajb11.3496

Sudarmadji, S., Haryono, B., dan Suhardi. (1984). *Prosedur Analisa untuk Bahan Makanan dan Pertanian*.

Suneja, Y., Kaur, S., Gupta, A. K., and Kaur, N. (2011). Levels Of Nutritional Constituents And Antinutritional Factors In Black Gram (*Vigna mungo* L. Hepper). *Food Research International*, *44*(2), 621–628. https://doi.org/10.1016/j.foodres.2010.12.020

Suprianto, A. B., Mamuaja, C. F., dan Tuju, T. D. J. (2015). Substitusi Tepung Kacang Hijau (*Phaseolus radiathus* L) dalam Pembuatan Biskuit Kimpul (*Xanthosoma sagittifolium* (L) schott). *In COCOS*, *6*(12), 1–6.

Winarno, F. (1986). *Kimia Pangan dan Gizi*.

Yulistiani, R., Rosida, R., dan Kumala, I. W. (2021). Karakteristik Fisikokimia dan Organoleptik Flakes : Kajian Proporsi Tepung Talas Termodifikasi dan Tepung Kacang Tunggak serta Penambahan Natrium Bikarbonat. *Jurnal Teknologi Pangan*, *15*(1), 21–36. https://doi.org/10.33005/jtp.v15i1.2717.