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Formulating Baked-Roll Cake by Using a Composite of Wheat Flour, Soy Flour, and Vegetable Flour (Carrot, Purple Yam, and Red Bean) as a Healthy Snack for Children aged 5-6 Years at Kindergarten in Tangerang

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Abstract

This research is aimed to get a product formulation of baked-roll cake by using a composite of soy flour, carrot flour, purple yam flour and red bean flour as a healthy snack is accepted and preferred by children aged 5-6 years based on sensory quality analysis and nutritional food analysis. To make this product, a process was conducted at Pastry Bakery Laboratory, Culinary Art-Family Welfare Science, Faculty of Engineering at the State University of Jakarta. An organoleptic test of baked-roll cake product was conducted at Kindergarten in Tangerang. Research method used was an experimental method by applying a composite of soy flour, carrot flour, purple yam flour and red bean flour in baked-roll cake. Friedman test was used as a statistical analysis to find out an effect of a composite of those flours through sensory quality analysis result of baked-roll cake. Based on a laboratory test, a comparison usage of baked-roll cake was 50:30:20 (wheat flour: carrot flour/red bean flour/purple yam flour: and soy flour). A protein content was resulted by using Kjeldahl method was 7,0559 grams for baked-roll cake through red bean flour, 4,4642 grams for baked-roll cake through purple yam flour, and 6,0240 grams for baked-roll cake through carrot flour. A total carotene content was resulted by using Spectrophotometric method was 9,2197 ppm for baked-roll cake through red bean flour, 10,9012 ppm for baked-roll cake through purple yam flour, and 11,7955 ppm for baked-roll cake through carrot flour. It meant that the highest total carotene content with applying Spectrophotometric method was baked-roll cake through carrot flour.

Keywords: *Baked-Roll Cake, Composite Flour, Vegetable Flour (Carrot, Purple Yam, Red Bean), A Healthy Snack, Children aged 5-6 years.*

1. Introduction

In this modern era, some developments in the field of food and beverage industry is aimed to attract consumers' attention. Therefore, food and beverage manufacturers added food additives in its products. Food additives are other a compound or mixture of compounds with basic foodstuffs contained in certain foods as a result of production, processing, storage, or packing. The food additives is purposed to improve the character which increases a food quality. It may include sweeteners, flavorings, preservatives, antioxidants, flavors, emulsifiers/thickeners, nutrition, dyes, etc. (Wirasto, 2008). Determining the quality of foodstuffs in general, it depends on several factors such as taste, texture and nutritional value.

Indonesian community dependence on certain foodstuffs weaken national food security that is seen by a high-level imports of wheat and wheat flour. The use of wheat flour in household level is still often used to refine the product that will be presented to family. Most of Indonesian agricultural land, there are types of side dishes, vegetables, and fruits. One of the local commodities that have potential as a food additive are soy, carrot, purple yam and red bean. These food products can be used as an alternative ingredient for making a food product that is healthy and enticing, particularly obtained from the nutrients in foodstuffs as well as dyes in these foods.

In the storage process, the ingredients such as soy, carrot, purple yam and red bean have a shelf life which only lasted 4 up to 5 days. To minimize that shelf life, it will be done alternatively ingredients processed flours with soy, carrot, purple yam and red bean. It is aimed to be used for a relatively long time in order to solve the shelf life food. Roll cake through purple yam needs a protein in the form of gluten that owned by wheat flour. The gluten produces a soft texture, a taste improvement, a source of protein and carbohydrate source in roll cake. But, researchers partially substituted wheat flour with soy

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flour and vegetable flour such as carrot flour, purple yam flour, and red bean flour.

Baked-roll cake product with each flour is consumed by children aged 5-6 years. Their characters are identically known by growth period. During this period, it takes nutrition from food. The snacks from school will became one of the variants of food that be consumed by children. It determined the types of nutrients food that are consumed by children at school. In addition, there needs to be an interesting color by adding of carrot flour, purple yam flour and red bean flour in the baked-roll cake that would be given to children aged 5-6 years as a healthy snack at Kindergarten in Tangerang

Additional ingredient of carrot flour, purple yam flour and red bean flour in baked-roll cake are expected to be beneficial in terms of procurement of healthy snacks for children aged 5-6 years at Kindergarten in Tangerang. Baked-roll cake has nutrient content of protein and vitamin A and has to improve the quality of food processe that can be accepted by consumers, especially for children aged 5-6 years.

Based on this background, the researchers will be conducted research on a product formulation of baked-roll cake by using a composite of soy flour, carrot flour, purple yam flour and red bean flour as a healthy snack. This research is aimed at getting a product formulation of baked-roll cake through some flours that can be consumed by people, especially children aged 5-6 years as a healthy snack due to a rich protein and vitamin A.

Research Methodology

This research was conducted at *Pastry Bakery Laboratory, Culinary Art-Family Welfare Science, Faculty of Engineering at State University of Jakarta* and Tangerang Kindergarten. This research was conducted from May to November 2015. The research method used was an experimental method. It is aimed to investigate the possibility of causality by using one or more treatments to one or more experimental group and comparing the results of one or more control group were not subjected to the treatment condition. The experiments were carried out by making the composition of wheat flour: soy flour: vegetable flour (carrots, purple yam, and red bean) that would be the basic ingredient of baked-roll cake. The next step was laboratory tests to assess the nutritional protein and vitamin A as well as sensory quality test. For the sensory quality test, it included some aspects such as color, taste, flavor, and texture.

In this preliminary research, it is aimed at finding the formulations of baked-roll cake. The basic formula was:

First Trial

The first test result performed (70%, 20%, 10%) in the processing a composite of roll cake flour: wheat flour, vegetable flour (carrot / purple yam / red bean), soy flour. The first experiment results were:

a. The dough was easily broken
b. The texture was hard and too thin.
c. The texture of the flour was still rough and speckled

Carrot Flour

Purple Yam Flour

Red Bean Flour

Picture 1 The first Experiment dough result

Picture 2 The first experiment roll cake result

The first experiment revision was:

a. Changing the roll cake formula
b. Fixing the texture of the flours by sieving to 100 mash
c. Thickening the process of dough pouring

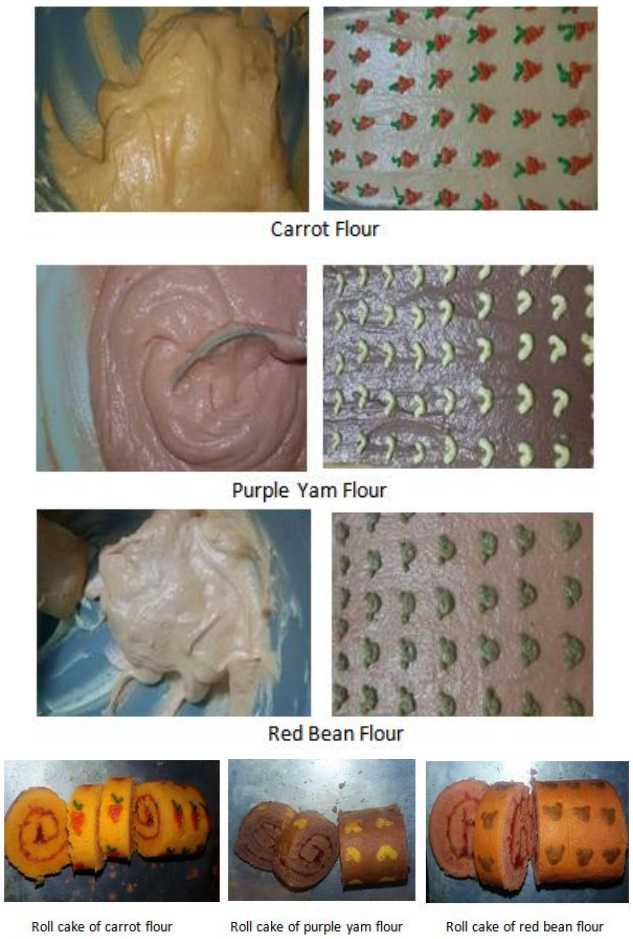
Second Experiment

The second test result performed (50%, 25%, 25%) in the processing a composite of roll cake flour: wheat flour, vegetable flour (carrot / purple yam / red bean), soy flour. The second experiment results were:

a. The dough was softer and not broken easily,

b. The texture were also been refined flour and not grainy.
c. The pattern color was a little bit contrast

The second experiment revision was that added the use of flours until roll cake's discoloration.



Picture 4 The second experiment roll cake result

Third Trial

The third test result performed (50%, 30%, 20%) in processing a composite of roll cake flour: wheat flour, vegetables flour (carrot / purple yam / red bean), soy flour. The third experiment results were:

a. The dough was softer and not easily broken,
b. The texture was also been refined flour and not grained.
c. The pattern color was more contrast than before
d. Panelists test consisted of experts and children were the next step.

An organoleptic test was a way of tested by using human senses as the main tool for measuring reception power of the product (Soekarto, 1981). Aspects assessed in this research include color, taste, flavor, and texture. Each texture had the highest score of three and the lowest score was one. The instrument of validity panelist assessment also used as an assessment to collect data.

Picture 5 The third experiment dough result

Picture 6 The third trial roll cake result

The organoleptic test was conducted for 50 children aged 5-6 years. To hedonic quality adjustment from children, it was conducted several stages such as noticing or playing together, requesting their response to assess the product by using sad for dislike, so-so for like slightly, and laugh for like of Snoopy doll, and guiding them to give an assessment of baked-roll cake through 3 treatments (carrot flour, purple yam flour and red bean flour). Because of this research data were categorises data and nonparametric analysis, data analysis used to test the hypothesis was Friedman test. If there were differences, it was followed by Tuckey's multiple comparison tests to determine the best formula. Furthermore, a healthy snack product also performed a. Test of laboratory for measuring beta-carotene and protein in products.

Result and Discussion

Descriptive Result of Organoleptic Test

The organoleptic test conducted for 50 children aged 5-6 years. In this test, it included some aspects' result such as color, taste, flavor, and texture as follow:

Color Aspect

Based on 50 untrained panelists' result, they gave a variety of preference level ratings in each product formula of baked-roll cake by using a composite flour of different ingredients. It consisted of purple yam flour, red bean flour and carrot flour. The results of organoleptic test for color aspect were 34 panelists (68%) stated "like", 15 panelists (30%) stated "like slightly" and 1 panelist

(2%) stated " dislike" in baked-roll cake through purple yam flour; 32 panelists (64%) stated "like", 15 panelists (30%) stated " like slightly", and 3 panelists (6%) stated "dislike" in baked-roll cake through red bean flour; 24 panelists (48%) stated "like", 25 panelists (50%) stated "like slightly", and 1 panelist (2%) stated "dislike" in baked-roll cake through carrot flour.

The average scores of organoleptic test based on color aspect in baked-roll cake were 2.66 for purple yam flour, 2.24 for red bean flour, and 2.46 for carrot flour. It can be concluded that on average of baked-roll cake through purple yam flour was the most preferred by panelists based on color aspect. It had 2.66 for a mean value, 3 for a mode value, and 3 for a median value 3. Based on baked-roll cake through purple yam flour, children aged 5-6 years assuming that it seemed as chocolate cake.

Taste Aspect

The results of organoleptic test for taste aspect were 35 panelists (70%) stated "like", 14 panelists (28%) stated "like slightly", and 1 panelist (2%) stated "dislike" in baked-roll cake through purple yam flour; 24 panelists (48%) stated "like", 25 panelists (50%) stated "like slightly", and 1 panelist (2%) stated "dislike" in baked-roll cake through red bean flour; 16 panelists (32%) stated "like", 20 panelists (40%) stated "like slightly", and 4 panelists (8%) stated "dislike" in baked-roll cake through carrot flour. The average scores of an organoleptic test based on taste aspect in the baked-roll cake were 2.68 for purple yam flour, 2.46 for red bean flour and 2.44 for carrot flour. It can be concluded that on average of baked-roll cake through purple yam flour was the most preferred by panelists based on taste aspect as a healthy snack. It had 2.68 for a mean value, 3 for a mode value, and 3 for a median value 3.

Flavor Aspect

The results of organoleptic test for flavor aspect were 37 panelists (74%) stated "like", 11 panelists (22%) stated "like slightly", and 2 panelists (4%) stated "dislike" in baked-roll cake through purple yam flour; 20 panelists (40%) stated "like", 26 panelists (52%) stated "like slightly", and 4 panelists (8%) stated"dislike" in baked-roll cake through red bean flour; 26 panelists (52%) stated "like", 23 panelists (46%) stated "like slightly", and 1 panelist (2%) stated "dislike" in baked-roll cake through carrot flour. Average scores of an organoleptic test based on flavor aspect in the baked-roll cake were 2.7 for purple yam flour, 2.32 for red bean flour and 2.5 for carrot flour. It can be concluded that on average of baked-roll cake through purple yam flour was the most preferred by panelists based on taste aspect as a healthy snack. It had 2.7 for a mean value, 3 for a mode value, and 3 for a median value 3.

Texture Aspect

The results of organoleptic test for texture aspect were 36 panelists (72%) stated "like", 13 panelists (26%) stated "like slightly", and 1 panelist (2%) in baked-roll cake through purple yam flour; 28 panelists (56%) stated "like", 21 panelists (42%) stated "like slightly", and 1 panelist (2%) stated "dislike" in baked-roll cake through red bean flour; 26 panelists (52%) stated "like", 20 panelists (40%) stated "like slightly", and 4 panelists (8%) stated "dislike" in baked-roll cake. Average scores of an organoleptic test based on flavor aspect in the baked-roll cake were 2.7 for purple yam flour, 2.54 for red bean flour, and 2.44 for carrot flour. It can be concluded that on average of baked-roll cake through purple yam flour was the most preferred by panelists based on taste aspect as a healthy snack.

Hypothesis Testing Results

Acceptability Test

Based on the test results obtained from an ordinal scale of the category data, it can be analyzed by nonparametric statistical test that used Friedman test with significance level α = 0.05. This test covered four aspects, namely:

Hypothesis Testing based on Color Aspect of Baked-roll cake through a composite flour

Based on the results of 50 panelists, it obtained x^2_{count} = 8.02 and α = 0.05 for significance level, while x^2_{tabel} on confidence level db = 3-1 = 2 was 5.99. Table analysis based on a color aspect of baked-roll cake through a composite flour as follows:

Table 1 Results of Hypothesis Testing based on color aspect of baked-roll cake through a composite flour

Ranks	
	mean Rank
Color of baked-roll cake through Purple yam Flour	2:29
Color of baked-roll cake through Red Bean Flour	1.72
Color of baked-roll cake through carrot flour	1.99
Statistical Test	
N	50
Chi-Square	12 318
df	2
Asymp. Sig.	.002
a. Friedman Test	

To determine whether the acceptability of children aged 5-6 years in baked-roll cake through different composite flours such as purple yam flour, red bean flour, and carrot flour as a healthy snack or not. Based on the mean rank in color of baked-roll cake through different composite flours, it showed an average rank of 2.29 for purple yam flour that was higher than baked-roll cake through other composite flour. Friedman test results were 12.318 for chi-square values, df = 2 (k-1) where k was a total group of samples (3 samples), the significance level was 0.002

for p-value. Because of p-value (0.002) was less than 0.05, it can be concluded that there were differences in the color of baked-roll cake with different composite flours such as purple yam flour, red bean flour, and carrot flour as a healthy snack for acceptability of children ages 5-6 year.

Hypothesis Testing based on Taste Aspect of Baked-roll cake through a composite flour

Based on the results of 50 panelists, it obtained x^2_{count} = 62.6 and α = 0.05 for significance level, while x^2_{tabel} on confidence level db = 3-1 = 2 was 5.99. Table analysis based on the taste aspect of baked-roll cake with a composite flour as follows:

Table 2 Results of Hypothesis Testing based on taste aspect of baked-roll cake through a composite flour

Ranks	
	mean Rank
Taste of baked-roll cake through Purple yam Flour	2:20
Taste of baked-roll cake through Red Bean Flour	1.87
Taste of baked-roll cake through carrot flour	1.93

Statistical Test	
N	50
Chi-Square	5024
df	2
Asymp. Sig.	.081
a. Friedman Test	

Based on the mean rank in a taste of baked-roll cake through different composite flours, it showed an average rank of 2.20 for purple yam flour that was higher than baked-roll cake through other composite flour. Friedman test results were 5.024 for chi-square values, df = 2 (k-1) where k was a total group of samples (3 samples), the significance level was 0.081 for p-value. In order to 0.081 for p-value was higher than 0.05, it can be concluded that there were not any differences in the taste of baked-roll cake through different composite flours such as purple yam flour, red bean flour, and carrot flour as a healthy snack for acceptability of children ages 5-6 year.

Hypothesis Testing based on flavor Aspect of Baked-roll cake through a composite flour

Based on the results of 50 panelists, it obtained x^2_{count} = 2.12 and α = 0.05 for significance level, while x^2_{tabel} on confidence level db = 3-1 = 2 was 5.99. Table analysis based on flavor aspect of baked-roll cake through a composite flour as follows:

Table 3 Results of Hypothesis Testing based on flavor aspect of baked-roll cake through a composite flour

Ranks	
	mean Rank
Flavor of baked-roll cake through Purple yam Flour	2:28
Flavor of baked-roll cake through Red Bean Flour	1.76
Flavor of baked-roll cake through carrot flour	1.96
Statistical Test	
N	50
Chi-Square	10 835
df	2
Asymp. Sig.	.004
a. Friedman Test	

Based on the mean rank in a flavor of baked-roll cake through different composite flours, it showed an average rank of 2.28 for purple yam flour that was higher than baked-roll cake through other composite flour. Friedman test results were 10.835 for chi-square values, df = 2 (k-1) where k was a total group of samples (3 samples), the significance level was 0.004 for p-value. Because of p-value (0.004) was less than 0.05, it can be concluded that there were differences in the flavor of baked-roll cake with different composite flours such as purple yam flour, red bean flour, and carrot flour as a healthy snack for acceptability of children ages 5-6 year.

Hypothesis Testing based on texture Aspect of Baked-roll cake through a composite flour

Based on the results of 50 panelists, it obtained x^2_{count} = 0.87 and α = 0.05 for significance level, while x^2_{tabel} on confidence level db = 3-1 = 2 was 5.99. Table analysis based on texture aspect of baked-roll cake with a composite flour as follows:

Table 4 Results of Hypothesis Testing based on texture aspect of baked-roll cake through a composite flour

Ranks	
	mean Rank
Texture of baked-roll cake through Purple yam Flour	2:18
Texture of baked-roll cake through Red Bean Flour	1.94
Texture of baked-roll cake through carrot flour	1.88

Statistical Test	
N	50
Chi-Square	4800
df	2
Asymp. Sig.	.091
a. Friedman Test	

Based on the mean rank in a texture of baked-roll cake through different composite flours, it showed an average rank of 2.18 for purple yam flour that was higher than baked-roll cake through other composite flour. Friedman test results were 4.800 for chi-square values, df = 2 (k-1) where k was a total group of samples (3 samples), the significance level was 0.091 for p-value. Because of p-value (0.091) was higher than 0.05, it can be concluded that there were not any differences in the texture of baked-roll cake with different composite flours such as purple yam flour, red bean flour, and carrot flour as a healthy snack for acceptability of children ages 5-6 year.

Laboratory Test Results

Nutritional content analysis of a protein and beta-carotene on baked-roll cake with a composite of wheat flour soy flour, carrot flour, purple yam flour, and red bean flour was determined by chemical analysis in the laboratory experiments based on certain methods and analyzed descriptively. Based on laboratory test results, it described in the sections below :

Table 5 Laboratory Test Results for Protein Content

No	Analysis	Repetition	Baked-roll cake		
			Red Bean Flour	Purple Yam Flour	Carrot Flour
1	Protein (g / 100 g) (Kjeldahl) (AOAC, 1995)	1	7.0895	4.4848	6.0246
		2	7.0223	4.4436	6.0233
		Average	7.0559	4.4642	6.0240

Table 6 Laboratory Test Results for Carotene Content

No	Analysis	Repetition	Baked-roll cake		
			Red Bean Flour	Purple Yam Flour	Carrot Flour
1	Total Carotene (ppm) (SPECTRO) (AOAC, 1995)	1	9.0706	10.8549	11.8611
		2	9.3687	10.9474	11.7298
		Average	9.2197	10.9012	11.7955

Based on laboratory test results, baked-roll cake by flour comparison that was 50: 30: 20 (wheat flour: carrot flour / red bean flour / purple yam flour: soy flour) obtained the results of protein content through Kjeldahl method. It was baked-roll cake that used 7 red beans flour and 0559 grams; 4.4642 grams of purple yam flour; and 6.0240 grams of carrot flour.

Conclusion

Based on organoleptic test of color aspect in baked-roll cake were 2.66 for purple yam flour, 2.24 for red bean flour, and 2.46 for carrot flour. It can be concluded that on average of baked-roll cake through purple yam flour was the most preferred by panelists based on color aspect. It had 2.66 for a mean value, 3 for a mode value, and 3 for a median value 3. Based on baked-roll cake through purple yam flour, children aged 5-6 years assuming that it seemed as chocolate cake. The average scores of an organoleptic test based on taste aspect in baked-roll cake were 2.68 for purple yam flour, 2.46 for red bean flour and 2.44 for carrot flour. It can be concluded that on average of baked-roll cake through purple yam flour was the most preferred by panelists based on taste aspect as a healthy snack. It had 2.68 for a mean value, 3 for a mode value, and 3 for a median value 3.

Average scores of an organoleptic test based on flavor aspect in baked-roll cake were 2.7 for purple yam flour, 2.32 for red bean flour and 2.5 for carrot flour. It can be concluded that on average of baked-roll cake through purple yam flour was the most preferred by panelists based on taste aspect as a healthy snack. It had 2.7 for a mean value, 3 for a mode value, and 3 for a median value 3. Average scores of organoleptic test based on flavor aspect in baked-roll cake were 2.7 for purple yam flour, 2.54 for red bean flour, and 2.44 for carrot flour. It can be concluded that on average of baked-roll cake through purple yam flour was the most preferred by panelists based on taste aspect as a healthy snack.

Friedman test results were 12.318 for chi-square values, df = 2 (k-1) where k was a total group of samples (3 samples), the significance level was 0.002 for p-value. In order to 0.002 for p-value was less than 0.05, it can be concluded that there were differences in the color of baked-roll cake through different composite flours such as purple yam flour, red bean flour, and carrot flour as a healthy snack for acceptability of children ages 5-6 year. Friedman test results were 5.024 for chi-square values, df = 2 (k-1) where k was a total group of samples (3 samples), the significance level was 0.081 for p-value. In order to 0.081 for p-value was higher than 0.05, it can be concluded that there were not any differences in the taste of baked-roll cake through different composite flours such as purple yam flour, red bean flour, and carrot flour as a healthy snack for acceptability of children ages 5-6 year.

Friedman test results were 10.835 for chi-square values, df = 2 (k-1) where k was a total group of samples (3 samples), the significance level was 0.004 for p-value. In order to 0.004 for p-value was less than 0.05, it can be concluded that there were differences in the flavor of baked-roll cake through different composite flours such as purple yam flour, red bean flour, and carrot flour as a healthy snack for acceptability of children ages 5-6 year. Friedman test results were 4.800 for chi-square values, df = 2 (k-1) where k was a total group of samples (3 samples), the significance level was 0.091 for p-value. In order to 0.091 for p-value was higher than 0.05, it can be concluded that there were not any differences in the texture of baked-roll cake with different composite flours such as purple yam flour, red bean flour, and carrot flour as a healthy snack for acceptability of children ages 5-6 year.

Based on laboratory test results, baked-roll cake by flour comparison that was 50: 30: 20 (wheat flour: carrot

flour / red bean flour / purple yam flour: soy flour) obtained the results of protein content through Kjeldahl method. It was baked-roll cake that used 7 red beans flour and 0559 grams; 4.4642 grams of purple yam flour; and 6.0240 grams of carrot flour. Based on laboratory test results, baked-roll cake by flour comparison that was 50: 30: 20 (wheat flour: carrot flour/red bean flour/purple yam flour: soy flour) obtained the results of carotene content through Spectrophotometric method. It was baked-roll cake that used 9.2197 ppm for red bean flour, 10.9012 ppm for purple yam flour, and 11.7955 for carrot flour.

This research implication affected the improvement of the nutritional content in a snack of children aged 5-6 years that used a composite of wheat flour, soy flour and vegetable flour (carrot, purple yam red bean). The implications were as follows:

1) Based on the organoleptic test, the average of baked-roll cake with purple yam flour was the most preferred by panelists based on color aspect. The average of baked-roll cake with purple yam flour was the most preferred by panelists based on taste aspect as a healthy snack. The average of baked-roll cake with purple yam flour was the most preferred by panelists based on taste aspect as a healthy snack. The average of baked-roll cake with purple yam flour was the most preferred by panelists based on taste aspect as a healthy snack for children aged 5-6 years. According to this research result, the implication was that formulation of baked-roll cake with a composite of wheat flour, soy flour, and purple yam flour did very well. Furthermore, formulation of baked-roll cake through red bean flour and carrot flour needed to be improved to make children more preference them as a healthy snack. It implied that the formulation and presentation especially baked-roll cake through red bean flour and flour carrot was still lacking be accepted.
2) Based on laboratory test results, baked-roll cake by flour comparison that was 50: 30: 20 (wheat flour: carrot flour/red bean flour/ purple yam flour: soy flour) obtained the results of carotene content through Spectrophotometric method. It was baked-roll cake that used 9.2197 ppm for red bean flour, 10.9012 ppm for purple yam flour, and 11.7955 for carrot flour. It implied that the formulation of baked-roll cake through a composite of wheat flour, soy flour and carrot flour has been good on the total of carotene content.

Besides, the formulation result of baked-roll cake through red bean flour and purple yam flour was still needed to be improved by adding the mount of flour or using the particular method to increase carotene. It implied that total carotenoids in particular baked-roll cake with red bean flour and purple yam flour was still less than the total carotene of baked-roll cake with carrot flour.

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