Original Article

QUALITY OF STEAM BROWNIES AS A FUNCTIONAL FOOD FOR PREGNANT ANEMIA IN PREGNANT WOMEN IN STUNTING PREVENTION

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Abstract

Aim: This study aims to study and analyze the effect of beet flour substitution on manufacturing steamed brownies on the physical quality.

Material and Methods: This research was conducted at the Pastry and Bakery Processing Laboratory of the Culinary Education Study Program, State University of Jakarta. The time of research starts from July 2021 to June 2022. The method used in this study is experimental. The research samples used were steamed brownies with beet flour substitution of as much as 35%, 45%, and 55%, then tested three times.

Results: Based on the results of the statistical hypothesis test, the physical quality test using the ANOVA test showed that the aspects of swell ability, stability, and crumb morphology had no significant effect or difference in the substitution of beetroot flour as much as 35%, 45%, and 55% in the manufacture of steamed brownies.

Conclusion: The conclusion of this study is to recommend steamed brownies with 55% beet flour substitution to be developed to optimize the utilization of beetroot flour as a nutritional value enhancer.

Keywords: Beetroot, Nutrition, Culinary, Bakery.

INTRODUCTION

One of the critical phases in the life cycle as an effort to develop human resources is the first 1000 days of life, which is an essential foundation for developing quality human resources and reducing the risk of stunting. The first 1000 days of life are counted, from the first day of conception to the formation of the embryo until the child is two years old. Adequate nutrition during pregnancy until the first years of a child's life plays a role in shaping brain function to help strengthen the immune system. The first 1000 days are a unique period and opportunity to form the foundation for optimal health and development for children's growth and development.

Stunting is a significant threat to the quality of Indonesia's human resources. This is also a threat to the nation's competitiveness due to the inability to compete with other countries due to stunting children having abnormal (short) growth, disturbed brain growth, which affects school achievement, and low productivity and creativity in their productive age. Some nutritional problems that commonly occur in pregnant women are Chronic Energy Deficiency, anemia, and Disorders Due to Iodine Deficiency(Ernawati 2017). Iron deficiency anemia is a condition in which the levels of hemoglobin, hematocrit, and red blood cells are below the normal range, or <11 g/dL in pregnant women. Iron deficiency is the most common cause of anemia in pregnant women due to the increased need for iron during pregnancy(Utama and Hilman 2018).

Anemia during pregnancy is a public health problem in developing countries(Stephen et al. 2018). According to (Sinha et al. 2021), anemia is 90% among pregnant women. Most of the anemia patients (60.5%) were categorized as moderate severity according to the World Health Organization classification. The high incidence of anemia is often caused by the lack of awareness of pregnant women's importance of preventing anemia and the risk of iron deficiency. Riskesdas 2018 states that 48.9% of pregnant women in Indonesia experience anemia. As many as 84.6% of anemia in pregnant women occurs in the age

group 15-24 years(Primadi et al. 2020). Iron status in pregnant women in the first trimester significantly affects iron status in the second trimester but not in the third trimester (Pobee et al. 2021).

One of the functional foods that contain iron is beetroot. Beetroot is one of the purplish red food ingredients that is usually used as a natural colourant. The pigment that affects the purplish red colour of beetroot is betalain pigment which is a combination of the purple pigment betacyanin and the yellow pigment betaxanthin(Astawan and Kasih 2008). According to (Liliana and Oana-Viorela 2020), Beets have high antioxidant and anti-inflammatory properties and can be an essential aid in treating many diseases. In addition, red beet (Beta vulgaris) is also rich in phytochemicals and bioactive compounds that are beneficial in improving several clinical and pathological outcomes (Mirmiran et al. 2020).

The iron content in red beet tubers can help form red blood cells to prevent anemia in pregnant women. One alternative for the prevention of anemia is to use beetroot juice because its nutritional content can help repair blood cells and become material for making blood cells(Putri and Tjiptaningrum 2016). According to (Utaminingtyas 2017), Beetroot juice is a non-pharmacological alternative food source containing iron that pregnant women can use to increase haemoglobin levels.

The aroma of red beetroot is known to emit an unpleasant odour(Rizki 2013). Therefore, red beetroot tubers can potentially be developed into cake products such as steamed brownies to remove the unpleasant odour produced from these tubers. Brownies are sweet chocolate cakes originating from America. Along with the times, brownies have undergone many modifications in various flavours and processing methods. Brownies processing methods can be divided into steamed brownies and baked brownies. One of the brands from Bandung created a new variant of brownies, namely brownies that were ripened by the steaming or cooking processing method(Mastuti and Rozalena 2010).

The maturation of brownies by steaming produces brownies that are softer in texture than baked brownies because they do not remove a lot of water content in the dough. As a result, steamed brownies have a slightly porous surface, are moist, and softer when enjoyed than baked brownies(Elisa 2014). Until now, many people have steamed brownies because of their delicious taste and smooth texture. Although many people like steamed brownies, researchers are interested in making cooked brownies substituted with beetroot flour that pregnant women can consume to reduce the risk of iron deficiency anemia.

In this study, the use of beetroot flour as a substitute material in the manufacture of steamed brownies aims to increase the nutritional value of cooked brownies and is expected to be an alternative for pregnant women who suffer from iron deficiency anemia to prevent stunting.

MATERIAL AND METHODS

This research was conducted at the Pastry and Bakery Processing Laboratory of the Catering Education Study Program, State University of Jakarta, to analyze the quality of steamed brownies with different percentages of beet flour substitution. This study used an experimental method by testing the substitution of beetroot flour in manufacturing cooked brownies with a substitution percentage of 35%, 45%, and 55%. Then the physical quality test was carried out on the aspects of swell ability, swell ability stability, and crumb morphology. Finally, the comprehensive physical examination is assessed from the measurement of a product on the elements of swell capacity, swell ability stability and crumb morphology by using measuring instruments such as rulers and magnifying glasses.

The analysis techniques with IBM SPSS software Version 26 application is used to compare results such as mean, standard deviation and standard deviation error. The dependent variables are conventionally treated wastewater and silver nanoparticles treated wastewater. There are no independent variables (Habibullah, Viktorova, and Ruml 2021). In order to study statistical significance, an independent samples-t-test was used.

RESULTS AND DISCUSSION

Expandability

Based on the results of the physical test of swelling power on steamed brownies with 35%, 45%, and 55% beet flour substitutions with three repetitions, the following data is in Tables 1 and 2.

Table 1: Physical Test of Swell Power before Steaming

Assessment Aspect		Swell Power before Steaming (Cm)		
	Stage	35%	45%	55%
Swell Power	1	2,6	2,45	2,45
	2	2,5	2,55	2,4
	3	2,4	2,55	2,5
Total		7,5	7,55	7,35
Average		2,5 ± 0,10	2,52 ± 0,06	2,45 ± 0,05

Table 2: Physical Test of Swell Power after Steaming

Assessment Aspect		Swell Power after Steaming (Cm)		
	Stage	35%	45%	55%
Swell Power	1	2,99	3,16	2,91
	2	3,04	3,05	2,85
	3	2,83	3,17	2,92
Total		8,86	9,38	8,68
Average		2,95 ± 0,11	3,13 ± 0,07	2,89 ± 0,04

The experimental results determine the percentage of steamed brownies with beet flour substitution using the following formula 1.

$$\text{Swell Power } (\%) = \frac{B-A}{A} \text{ X } 100 \quad (1)$$

Descriptions:

A: The Height of the dough before steaming

B: Height of dough after steaming

Based on the results calculated by formula1, then the results can be seen in Table 3

Table 3: Physical Test Results of Swell Power

Assessment Aspect		Swell Power		
	Stage	35%	45%	55%
Swell Power	1	15	28,98	18,78
	2	21,6	19,61	18,75
	3	17,92	24,31	16,8
Total		54,52	72,9	54,33
Average		18,17 ± 3,31	24,3 ± 4,69	18,11 ± 1,13

The average percentage of steamed brownies with beet flour substitution with three repetitions was between 18.17% - 24.3%. The highest rate is in treatment 2 (45%), and the lowest percentage is in treatment 3 (55%). The percentage results can be illustrated with a graph in Figure 1.

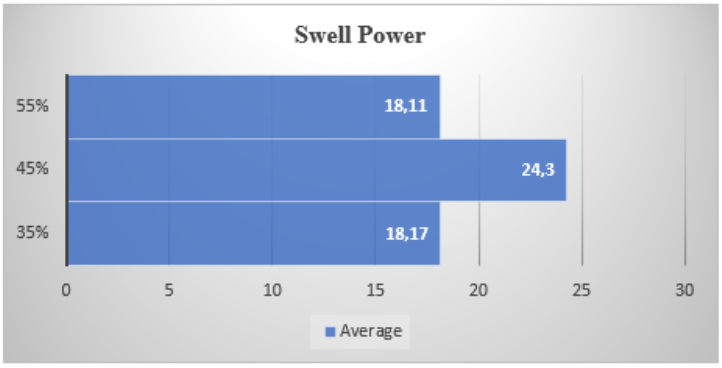

Figure 1: Graph of the Average Value of the Physical Test of Swell Power

The results of data analysis can be continued with the utterly randomized design method or RAL ANOVA, and the test results can be seen in Table 4.

Table 4: Results of Physical Test of Swell Power with ANOVA Test

SK	Db	JK	KT	F-statistic	F-table
Treatment	2	75,86	37,93	3,33	5,14
Error	6	63,35	11,39		
Total	8	144,21	49,32		

Based on the data in table 4, the F statistic result is 3.33 with a significance level of / = 0.05; The treatment-free degree 2 and the error-free degree 6 obtained an F-table of 5.14. This shows that F-statistic < F-table, which means H0 is accepted. So, there is no effect on the swell ability of steamed brownies with beet flour substitution.

Stability of Swell Power

Based on the results of the physical test on the stability of the swelling power of steamed brownies with the substitution of 35%, 45%, and 55% beet flour with three replications, the following data is in Tables 5 and 6.

Table 5: Physical Test Results of Stability of Swell Power After Steaming

Assessment Aspect	Stability of Swell Power			
	Stage	35%	45%	55%
Stability of Swell Power	1	2,99	3,16	2,91
	2	3,04	3,05	2,85
	3	2,83	3,17	2,92
Total		8,86	9,38	8,68
Average		2,95 ± 0,11	3,13 ± 0,07	2,89 ± 0,04

Table 6: Physical Test Results of Swell Stability After being left for 30 minutes

Assessment Aspect	Stability of Swell Power			
	Stage	35%	45%	55%
Stability of Swell Power	1	2,94	3,12	2,87
	2	3	3,02	2,81
	3	2,78	3,14	2,86
Total		8,86	8,72	9,28
Average		2,95 ± 0,11	2,91 ± 0,11	3,09 ± 0,06

The experimental results determine the percentage of Stability of Swell Power steamed brownies with beet flour substitution using formula 2.

$$\text{Stability of Swell Power (\%)} = \frac{C}{B} \text{ X } 100 \quad (2)$$

Description:

B = Height of dough after steaming

C = Height of steamed brownies after 30 minutes

After being calculated using the formula, the calculation results are obtained as in table 7.

Table 7: Calculation Results of Physical Test of Swell Stability

Assessment Aspect		Stability of Swell Power		
Stability of Swell Power	Stage	35%	45%	55%
	1	98,33	98,73	98,63
	2	98,68	99,02	98,60
	3	98,23	99,05	97,95
Total		295,25	296,80	295,17
Average		98,42 ± 0,24	98,93 ± 0,17	98,39 ± 0,38

Results The average percentage stability of steamed brownies with beet flour substitution with three repetitions was between 98.93% - 98.39%. The highest percentage is in treatment 2 (45%), and the lowest is in treatment 3 (55%). The average value can be illustrated with a graph, as shown in Figure 2.

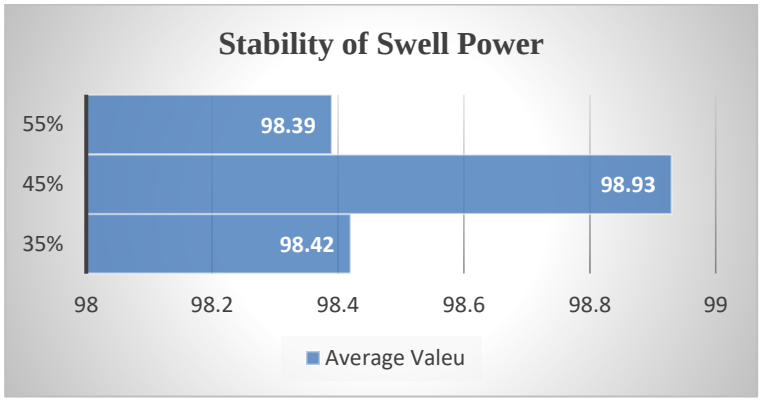

Figure 2: Graph of the Average Value of the Physical Test of Swell Stability

Results Data analysis can be continued with a completely randomized design method or RAL ANOVA, which then results are shown in Table 8.

Table 8: Results of Physical Stability Test Results with ANOVA Test

SK	Db	JK	KT	F-statistic	F-table
Treatment	2	0,57	0,28	3,63	5,14
Error	6	0,47	0,08		
Total	8	1,04	0,36		

Based on the data in table 8, the result of the F-statistic is 3.63 with a significance level of / = 0.05; The treatment-free degree 2 and the error-free degree 6 obtained an F-table of 5.14. This shows that F-statistics < F-table, which means H0 is accepted. So there is no effect on the stability of the swell ability of steamed brownies with beet flour substitution.

Morphology of Crumb

Based on the results of the physical test of crumb morphology on steamed brownies with 35%, 45%, and 55% beet flour substitutions with three repetitions, the data was obtained as shown in table 9.

Table 9: Calculation Results of the Morphological Crumb

Assessment Aspect		Morphology of Crumb		
	Stage	35%	45%	55%
Morphology of Crumb	1	4,6	5,2	5,2
	2	4,4	4,6	3,6
	3	5,6	4,6	4,2
Total		14,6	14,4	13
Average		4,87 ± 0,64	4,80 ± 0,35	4,33 ± 0,81

Results The average morphological percentage of steamed crumb brownies with beet flour substitution with three repetitions was between 4.87% - 4.33%. The highest rate is in treatment 1 (35%), and the lowest percentage is in treatment 3 (55%). The average value can be illustrated with a graph as in Figure 3.

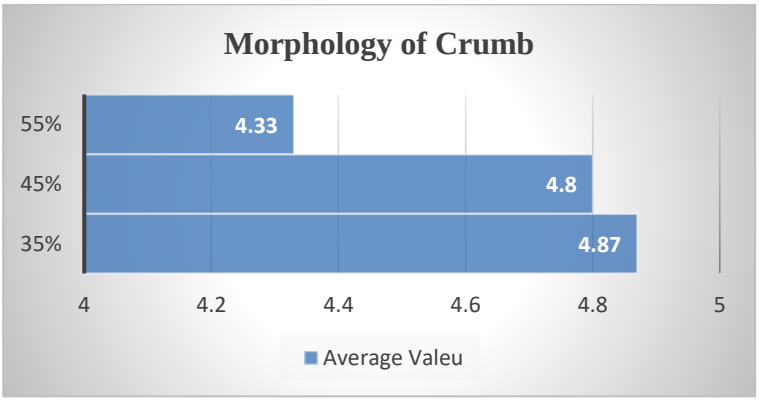

Figure 3: Graph of the Average Value of Morphology Crumb

Results Data analysis can be continued with the utterly randomized design method or RAL ANOVA, which then results are shown in Table 10.

Table 10: Morphological Crumb Physical Test Results with ANOVA Test

SK	Db	JK	KT	F-statistic	F-table
Treatment	2	0,51	0,25	0,64	5,14
Error	6	2,37	0,40		
Total	8	2,88	0,65		

Based on the data in table 10, the F-statistic result is 0.64 with a significance level of / = 0.05; The treatment-free degree 2 and the error-free degree 6 obtained an F-table of 5.14. This shows that F-statistics < F-table, which means H0 is accepted. So there is no effect on the morphology of steamed crumb brownies with beet flour substitution.

Discussion

The results of the physical test of swelling power were repeated three times. The results of the ANOVA test ($\alpha = 0.05$) on the swelling power showed no effect on the swelling capacity of steamed brownies with beet flour substitution. Swelling power is the ability of brownies to increase in size after the steaming process. The level of brownie development was determined by measuring the volume of brownies before and after steaming. The result of brownies is closely related to the substitution of beet flour. The swelling power of cooked brownies can be influenced by various factors, including adding gas-forming agents such as emulsifiers, steaming techniques, or mixing techniques (Hajrah, Hintono, and Bintoro 2019).

The results of the physical test of swelling power stability were repeated three times. The results of the ANOVA test ($\alpha = 0.05$) on the strength of the swelling power showed no effect on the strength of the swelling capacity of steamed brownies with beet flour substitution. The strength of the swell ability of cooked brownies is a condition in which the brownies retain their swell ability after being allowed to stand for a specific time until the temperature of the brownies reaches the same temperature as room temperature. The level of stability of brownie development was determined by measuring the volume of brownies after being steamed and after being allowed to stand for 30 minutes. The strength of the brownie's swell ability is closely related to the previous test of swell ability. According to(Hajrah et al. 2019), stable gas bubbles will form the final structure and good cake volume.

The results of the physical test of crumb morphology were repeated three times. The results of the ANOVA test ($\alpha = 0.05$) on crumb morphology showed no morphological effect of steamed brownie crumbs with beet flour substitution. When viewed from the results of the crumb morphology measurement, the 55% treatment had a smaller average value than the control treatment, 35%, and 45%. The morphological significance of the crumb is influenced by the amount of beet flour used. The higher the use of beetroot flour, the smaller the resulting pores. According to (Wulandari and Lembong 2016), in his journal, he stated that substituting flour other than wheat can reduce the percentage of gluten in the dough, which results in a reduced amount of CO2 that can be trapped. As a result, the pores become too small and tight, and there are also large pores in some areas, so the pores that are formed are not uniform.

Conclusion

Based on the results of the statistical hypothesis test of the physical examination using the ANOVA test with a significant level of = 0.05. It shows that the aspects of swell ability stability and crumb morphology have no considerable effect or difference in the use of beet flour substitution as much as 35%, 45%, and 55% in making steamed brownies. The finding of this study is that steamed brownies are substituted for 55% beet flour to be developed to optimize the use of beet flour as a nutritional value enhancer. However, the weakness of this study has not been tested on pregnant women to consume the product developed. Further research is needed with respondents according to the expanded product's benefits to knowing the product's actual benefits.

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