NHIJ
NHI Hospitality International Journal
Vol. 2, No. 1, 2024, pp. 15 - 20
https://journal.poltekpar-nhi.ac.id/index.php/nhij

e-ISSN: 2987-2693

Alternative Use of Breadfruit Flour as a Partial Substitute for Wheat Flour in Making Scones

Shabrina Kamila[1], Selvi Novianti[2], Djauhar Arifin[3]
[1,2,3] NHI Bandung Tourism Polytechnic
*Email: milashabrinamila@gmail.com

Keywords:
Artocarpus Altilis, Breadfruit, Scone

Article History
Received on November 19, 2023
Accepted on March 3, 2024
Published on June 25, 2024

Cite this article.
Kamila, S., Novianti, S., Arifin, D. (2024), Alternative Use of Breadfruit Flour as a Partial Substitute for Wheat Flour in Making Scones. *NHI Hospitality International Journal*, 2(1), 15-20.
https://doi.org/10.34013/nhij.v2i1.1473

Abstract

Purpose: This research aims to analyze the influence and differences between scones using breadfruit flour as partial substitution of wheat flour and scones using full wheat flour on the appearance, texture and flavor. Furthermore, to find out the best formula of breadfruit flour substitution in the making of scones which has the most likeliness for the consumers.

Design/Methodology/Approach: This research was carried out using quantitative approach with data collection through literature study, observation and hedonic test. Experimental methods carried out 3 formula of experiments with 3 different percentages, namely 30%, 50% and 70% breadfruit flour substitution to wheat flour. The hedonic test was given to 30 untrained panellists with random selection.

Findings: The research results shown that formula which has the most likeliness is scone with maximum of 30% breadfruit flour substitution.

Research limitations/conclusions: The limitation of this research is the limited data and information about scones because scones are still rarely discussed in various journals or other literature, so the reliance was only on a few books and secondary data that came only from previous literature studies.

Originality/value: This research on the use of breadfruit flour as a partial substitute for wheat flour in making scones can be used as a reference to other studies which relate with the use of breadfruit flour and can be seen as an alternative substitution of wheat flour which is came from Indonesian local food ingredients. Breadfruit flour which is made into a rare but unique scone dish can also be used as a innovation or idea in business.

INTRODUCTION

Scones are traditional English cakes originating from Scotland. Scones are a quick bread dish, a dish that is easy to make and does not require a long processing time compared to processing bread in general because the dough does not need to be kneaded until it is smooth. Scones are made from a mixture of wheat flour, baking powder, butter, eggs and milk. This scone dough is kneaded, thinned, then molded into a round shape, then cut into four pieces and baked on a sheet pan (Bastin, 2010).

The basic ingredient for making scones is wheat flour because wheat flour has high flexibility in various kinds of preparations. The large use of wheat flour in Indonesia has resulted in an increasing number of wheat flour imported to Indonesia. Furthermore, Indonesia is one of the countries in the world that imports the most wheat, around 11.43 million tons per year, which increases every year (Badan Pusat Statistik, 2017). According to the Indonesian Farmer's Seed Bank and Technology Association (AB2TI) said that the consumption of wheat flour-based foods in Indonesia in 1970 was only around 3%. However, as time goes by and the population increases, consumption of wheat flour also continues to increase. In 2010 it has reached to 18.9% and 28%. Moreoever, it is estimated that it will continue to experience a significant increase in 2045, reaching 50% of the total need for basic food consumption (Sayekti, 2023).

Wheat flour is predominantly used as a basic ingredient for making food, but consuming too much food made from wheat flour is not good and can have a negative impact on the body, especially for people with diabetes, which can trigger an increase in blood sugar because wheat flour contains high glycemic content around 80. Nowadays, there is a potential alternative substitute for wheat flour in order to reduce the negative effects for diabetes sufferers by replacing it with breadfruit flour because the glycemic content of breadfruit flour is lower

than wheat flour, around 37-50 (Pratiwi, 2020). It can be seen as a part of the efforts to reduce dependency of wheat flour and supporting food security programs through utilizing available local ingredients and turn it into flour (Richana et al, 2010). There are many biological resources that can be processed into food sources, in this case breadfruit flour is included one.

Using breadfruit flour as a food ingredient is a good alternative, so that breadfruit plants can be cultivated more widely and productively because hence they will have higher economic value. Most of the use of breadfruit in society is still in the form of staple foods and traditional snacks which are prepared by boiling, steaming, frying and grilling. This is related to the character of harvested breadfruit which does not last long and is easily damaged (rot) because the water content in breadfruit is quite high, around 67.8% (Tabel Komposisi Pangan Indonesia, 2017). Because of this characteristic resulting the price of breadfruit relatively cheap on the market. However, when we search for breadfruit flour, the price is quite high, this is due to the low level of availability of breadfruit flour in the market. Nevertheless, if the demand for breadfruit continues to increase, it will be the same as wheat flour, therefore in that in the future the price of breadfruit flour will decrease according to market demand.

The largest producer of breadfruit in Indonesia is Central Java, which reached 44,258 tons (Badan Pusat Statistik, 2020). Therefore, to anticipate abundance amount of breadfruit when it has been harvested and to increase its economic value, as well as to reduce wheat flour imported, it is necessary to make efforts to process the breadfruit into flour, so that it will last longer and can be used for a wide range of variative products (Widowati, 2009).

LITERATURE REVIEW

Scone Product Introduction

As what mentioned before, scones are a traditional English cake that originates from Scotland. However, scones are starting to become well known in Indonesia too. Scones are usually served for afternoon tea. Scones are a type of quick bread whose sales increased by around 25% in the Jakarta area in 2009 (Agustina, 2014). Scones have sensory characteristics that can be perceived by the five senses. Scones have an attractive color with golden and light brown, scones do not have a definite shape but are usually molded into small rounds and triangular, have a consistent shape structure but there are also parts that split like cracks in the the outer surface of the sides and sometimes on the top, and the volume expands due to its content of baking powder. Scones have a texture on the outside that is crisp but the inside is soft, when the scone is cut open the have fine and soft crumbles. Furthermore, scones have a buttery and savory aroma which depends on the fat used and have a balanced savory and sweet taste (Gisslen, 2016).

Moreover, the production of scones is very easy and fast because it only uses dry ingredients and liquid ingredients which are then combined until homogeneous. The manufacturing process is called quick bread because the method used to make the dough is by baking but without requiring a long fermentation time like making bread in general. The process of making quick bread only involves the use of chemical leavening agents, namely baking soda and baking powder and relies on steam in the baking process to help the dough rise (Labensky, 2016).

There are 3 mixing methods in making quick bread which are biscuit method, creaming method and blending method. This research used biscuit method in making scones because the mixing process can be controlled based on the sense of touch of both palms. This mixing process is carried out by rubbing in the flour and fat, which is the term for coating fat and flour by rubbing the two ingredients together using the palm of your hand. The rub in process aims to prevent the formation of gluten. Moreover, it is then continue by adding the liquid either milk and or sour cream liquid. This method will produc scones that are crunchy but still soft. Mixing process is very important because. If the mixing process is carried out for too long, the gluten will form too elastic, resulting in a hard scone texture.

Breadfruit Commodities Introduction

Breadfruit is a plant that is resistant to various pest diseases while cultivating. Breadfruit plants originate from the Indonesian Archipelago were spread during population migration activities and trade routes such as Madagascar, Africa, Central America, South America. Caribbean, Southeast Asia, Sri Lanka, India and Australia (Marjoni, 2022). The existence of breadfruit was first discovered in the Ambon (Papua Island) area by the Japanese. The breadfruit plant was then spread to the island of Java (Harmanto, 2012). Breadfruit plants can grow all year round (evergreen) in areas with monsoon climates which occur due to the influence of the monsoon winds. Breadfruit plants can survive for around 75 years (Marjoni, 2022). There are 2 types of breadfruit plants in Indonesia, namely Javanese breadfruit and Bangkok breadfruit. What differentiates the two is the size of the fruit and the surface of the breadfruit skin. Javanese breadfruit is smaller than Bangkok

breadfruit. Javanese breadfruit has a rougher skin surface than Bangkok breadfruit because Javanese breadfruit has short, soft spines (Marjoni, 2022). Breadfruit in Indonesia has 3 groups which are small breadfruit, medium breadfruit and bald breadfruit (Utami, 2013). Breadfruit plants produce fresh fruit, but damage can easily occur if left unprocessed for too long. Breadfruit contains a fairly high water content of around 60-80%, making it easily rot. Breadfruit can be stored for only about 2-4 days after the breadfruit is harvested from the tree (Adinugraha, 2014).

Breadfruit flour is an alternative for preserving breadfruit because it goes through a drying process so that the water content in it can be reduced. Breadfruit flour can be stored long term for up to 9 months. Breadfruit flour has a greater hydration capacity around 290% compared to wheat flour, which is around 191.55%. The high hydration capacity is caused by the content of starch, amylose and amylopectin compounds which have a sticky function in flour. A high hydration capacity will indicate a higher amount of water absorbed by the flour. Breadfruit flour contains water content of 16.59%, ash content of 3.22%, protein content of 3.80%, crude fiber content of 4.22%, starch content of 61%, amylose content of 24.89%, and amylopectin content of 36.14 % (Gardjito, 2013).

METHODOLOGY

The research gone through procedures in the product development approach consist of searching for relevant information, studying and deepening the author's knowledge about the commodities used in the experiment through the literature, determining which ingredients and products that are unique and can be used as the object of the research which are breadfruit flour and scones, looking for recipes and trying them out. Furthermore, researcher conducted pre-experiments, carried out pre-experiments three times to test the stability of the recipe, and then determined experiment percentage of the breadfruit flour which are 30%, 50% and 70%, made observations and analysed the results of the experiments regarding the differences that emerged from the percentages used on the product, determine the best results to be used as product experiment. Moreover, researcher used hedonic test to measure the likeliness of three sensory aspect of the product experiment, appearance, texture and flavour (aroma and taste). Data is collected through questionnaires addressed to the panelists and then the results of the data were used as material to be processed to draw experimental finding and conclusions.

RESULTS AND DISCUSSION

The hedonic test was carried out and distributed to 30 untrained panellists (random sampling). Scones are given code which are scone 1804 for the standard scone and scone 2402 for the experiment scone where panellists compared three assessment aspects which are appearance, texture and flavour. The distribution of the questionnaire was carried out in the city of Bandung, in the neighbourhood where the author conducted the experiment and in the environment around the NHI Tourism Polytechnic Bandung, the results can be seen in Table 1,2,3, and 4.

Results From Appearance Aspects

Table 1: Average Hedonic Test Results Based on Appearance Aspects

Appearance Assessment Aspects	1		2		3		4		5		Total		$\frac{\sum f(x)}{n}$
	f	$nf(x)$	F	$nf(x)$	f	$nf(x)$	f	$nf(x)$	f	$nf(x)$	f	$\sum f(x)$	
***Scone* 1804**	-	-	-	-	9	27	12	48	9	45	30	120	4
***Scone* 2402**	-	-	-	-	8	24	11	44	11	55	30	123	4,1

Source: Authors' own work, 2023

Results From Texture Aspects

Table 2: Average Hedonic Test Results Based on Texture Aspects

Texture Assessment Aspects	1		2		3		4		5		Total		$\frac{\sum f(x)}{n}$
	f	$nf(x)$	F	$nf(x)$	f	$nf(x)$	f	$nf(x)$	f	$nf(x)$	f	$\sum f(x)$	
***Scone* 1804**	-	-	-	-	3	9	22	88	5	25	30	122	4,06
***Scone* 2402**	-	-	5	10	6	18	11	44	8	40	30	112	3,73

Source: Authors' own work, 2023

Results From Flavour Aspects

Table 3. Average Hedonic Test Results Based on Aroma Aspects

Aroma Assessment Aspects	1		2		3		4		5		Total		$\frac{\sum f(x)}{n}$
	f	$nf(x)$	F	$nf(x)$	f	$nf(x)$	f	$nf(x)$	f	$nf(x)$	f	$\sum f(x)$	
***Scone* 1804**	-	-	-	-	6	18	14	56	10	50	30	124	4,13
***Scone* 2402**	-	-	5	10	7	21	11	44	7	35	30	110	3,66

Source: Authors' own work, 2023

Table 4. Average Hedonic Test Results Based on Taste Aspects

Taste Assessment Aspects	1		2		3		4		5		Total		$\frac{\sum f(x)}{n}$
	f	$nf(x)$	F	$nf(x)$	f	$nf(x)$	f	$nf(x)$	f	$nf(x)$	f	$\sum f(x)$	
***Scone* 1804**	-	-	-	-	5	15	17	68	8	40	30	123	4,1
***Scone* 2402**	-	-	5	10	5	15	8	32	12	60	30	117	3,9

Source: Authors' own work, 2023

Information:

1 = very dislike
2 = dislike
3 = quite like
4 = like
5 = very like
Scone 1804 = standard scone Scone
2402 = eksperimental scone

f = frequency of panelist ratings
n = total panelist
X = value / score
Σf = number of frequencies

DISCUSSION / ANALYSIS

Appearance Aspects

Based on the results of observations made by the author, there are differences and similarities that emerged between the standard scones and the experimental scones. The similarity lies in the volume of the scones before baking, both are almost the same, with a height of around 4.5-5 cm and a weight of 40 grams. However, there is difference in weight after the scones are baked. The weight of the standard scones reduced by around 5-7 grams, while the weight of the experimental scones reduced by around 3-5 grams. Another difference was in the color of the scones, where the standard scones had a golden white and light brown color, while the experimental scones had a darker color because breadfruit flour contains flavonoid compounds and ash content which mixes with sugar and then Maillard reaction occurred during the ripening process in the oven. Therefore, there were also differences when both scones are baked. The experimental scones were baked at a lower temperature than the standard scones so that the color of the experimental scones did not become too dark. Another difference was on the size of the scones.

Moreover, another difference was on the shape of both scones. The standard scones were spreadier compared to the experimental scones. However, this difference is not very clear because the difference was not very significant. Spready scones are caused by the use of sugar and can occurred because the texture of the dough using 100% medium protein wheat flour is too sticky and soft so that the shape of the scone that has been molded using a ring cutter is not sturdy. Then another difference is in the cracks that expand like a layer of cracks on the side of the scone. The standard scones had more cracks and the cracks expanded more open compared to the experimental scones. This is because the experimental scones had a heavier and denser dough structure so that the dough was more difficult to lift to rise. The layer of cracks is formed due to the rolling process which was done several times so that layers are formed when the scones are baked. The rolling process must be done slowly and carefully not to press too hard to avoid the formation of gluten in the scones that can make scones become tough. Meanwhile, results on hedonic test shown that appearance aspect of both scone has similar score with range liked by the panellists. Therefore, the appearance of experimental scone is acceptable by the consumer.

Texture Aspects

In texture, the similarity lies in the crispy outer texture but the soft inner texture, however the experimental scones were moister and stickier so they required a longer baking process because breadfruit flour contains a fairly high starch content of 61% (Gardjito, 2013). Meanwhile, the difference was in the dough. The dough from the standard scones was whiter than the experimental scone dough which used 30% breadfruit flour because breadfruit flour has flavonoid compounds and an ash content of 3.22% (Gardjito, 2013). The dough from the standard scones was stickier than the dough from the experimental scones. So there were differences in the process of rolling out the scone dough.

The standard scone dough required more dusting with flour to prevent the dough from sticking. If the dough

sticks then the surface of the scone will not be smooth. Meanwhile, the experimental scone dough was firmer and drier because breadfruit flour had a higher hydration capacity compared to wheat flour therefor the dough for the experimental scones which used 30% breadfruit flour required a higher amount of water (Gardjito, 2013). Then another difference was on the texture of the scones when eaten.

The standard scones felt lighter, crisper and softer because the wheat flour had a higher fiber content of around 2,01% compared to the experimental scones. The experimental scones tasted heavier because breadfruit flour had a fiber content of around 8.06%. Therefore, the more breadfruit flour is added to a product, the water content decreases and it becomes drier (Gardjito, 2013). Therefore, the analysis is also aligned with the result of hedonic test taken from texture aspect. Panelists preference are leaning towards standard scone. Panellists in average like standards scone texture rather than experimental texture.

Flavour Aspects

Furthermore, the standard scones had a buttery and milky and significantly occurred because wheat flour does not have any aroma hence it enhanced other aroma of other ingredients to the surface. The comparison scones had a savory taste and strong breadfruit aroma. In addition there were also bitter taste because breadfruit flour contains tannin compounds. Therefore, the more breadfruit flour you add to a product, the stronger the breadfruit aroma will be and the more bitter the taste will be. As well as texture, panelists also prefer the taste and aroma of standard scone rather than experimental scone. Nevertheless, the differences are slightly.

CONCLUSIONS

Based on the analysis, it can be concluded that scones using 30% breadfruit flour can be used as a partial substitute for wheat flour and become threshold in order to obtain the best scone with the best sensory evaluation, however hedonic tests shown that preference of consumer is still on the standard scones in overall aspects. Moreover, the overall average result of experimental scone is 3.84. These results are a calculation of the average results from the appearance aspect with a value of 4.1, the texture aspect with a value of 3.73, the aroma aspect with a value of 3.66 and the taste aspect with a value of 3.9. The overall average results of the experimental scones can be interpreted that panellists who were a sample of consumer in Indonesia were able to accept and like the experimental scones using 30% breadfruit flour. Therefore, the opportunity for developing products made from breadfruit flour is wide open.

Limitation of the study are the availability of breadfruit flour is limited, as well as literature study who raise research on breadfruit flour. Furthermore, in order to have higher acceptance, further study is needed to develop the product with several innovation by improving and adjust the recipe to enhance the likeliness of consumer in the aspect of taste, texture and flavour (aroma and taste).

REFERENCES

Abbey, D. (2020). *The Official Downton Abbey Afternoon Tea Cookbook: Teatime Drinks, Scones, Savories & Sweets*. Weldonowen.

Adinugraha, H. A., Kartikawati, N. K., Setiadi, D. (2014). *Pengembangan teknik budidaya sukun (Artocarpus altilis) untuk ketahanan pangan*. Jakarta: Kementrian Kehutanan.

Agustina I. (2014). Starbucks Corporation. Program Pascasarja Program Magister Ilmu Manaj Universitas Brawijaya Malang.

Badan Pusat Statiska. (2017). *Data Impor Biji Gandum dan Meslin Menurut Negara Asal Utama 2010-2017*. Jakarta: Badan Pusat Statistik.

Badan Pusat Statiska. (2020). *Produksi Tanaman Buah-buahan. Jakarta.*

Bastin, S. (2010). *Quick Breads*. University of Kentucky. College of Agriculture. Lexington.

Gardjito, M., Djuwardi, A., Harmayani, E. (2013). *Pangan Nusantara Karakteristik dan Prospek Untuk Percepatan Diversifikasi Pangan*. Jakarta: Kencana.

Gisslen, W. (2016). *Professional Baking.* (edisi ketujuh). Canada: Published in John Willey & Sons.

Harmanto, N. (2012*). Daun Sukun, Si Daun Ajaib Penakluk Aneka Penyakit*. Jakarta: AgroMedia.

Labensky, S., Martel, P., Damme, E. (2016). *On Baking: A Text Book of Baking and Pastry Fundamentals.*

Marjoni M. R. (2022). *Monografi Potensi Antioksidan Ekstrak Kulit Buah Sukun (Artocarpus Altilis).* Jogjakarta: Resitasi Pustaka.

Pratiwi H. A. (2020). *Nilai Indeks Glikemik Cookies dan Muffin Substitusi Tepung Sukun Artocarpus communis)*. Fakultas Ilmu Kesehatan: Universitas Ngudi Waluyo. Unggaran.

Richana, N., Budiyanto, A., & Mulyawati, I. (2010). Pembuatan tepung jagung termodifikasi dan pemanfaatannya untuk roti. *Prosiding Pekan Serealia Nasional, 2010*, 446-454.

Sayekti, I. M. S. (2023). *Konsumsi terigu terus menanjak*. Pressrelease.id. Diakses dari https://pressrelease.kontan.co.id/news/konsumsi-terigu- terus-menanjak-trgu-incar-peningkatan-penjualan

Setiawan, M. A. (2018). *Pengaruh Substitusi Sukun (Tepung Sukun dan Lumatan Sukun) Terhadap Karakteristik Fisikokimia Dan Organoleptik Donat.* Universitas Brawijaya Malang.

Tabel Komposisi Pangan Indonesia. (2017). *Direktorat Jenderal Kesehatan Masyarakat.* Jakarta: Kementrian Kesehatan Republik Indonesia.

Utami, P. (2013). *The Miracle of Herbs*. Jakarta: Agromedia Pustaka.

Widowati, S. (2009). *Prospek Tepung Sukun Untuk Berbagai Produk Makanan Olahan Dalam Upaya Menunjang Diversifikasi Pangan.*