

The Innovation of Steamed Bun (Pau) Using Water Roux: Bakery Students' Acceptance

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Abstract

Water roux also known as Tang Zhong of China's society is one of the ingredients used in bread making to produce bread that is soft and fluffy. The use of chemicals in food that is increasingly prevalent may cause the water roux to be studied as a value-added product in the production of dough steamed bun instead of bread softener. The aim of this study was to develop a standard formulation quantity of water roux required in the production of dough steamed bun and examine the level of customer acceptance of the use of water roux in making steamed bun. A total of 290 respondents participated in the study and item structured questionnaire was distributed to UPSI students. The data analysis technique used is descriptive analyses. The study found that the standard formulation quantity of water roux chosen by respondents was Sample A which is 80g per 1kg flour. A sample of survey respondents chose a product that meets the tastes based on the hedonic steamed bun in terms of color, appearance, taste, and texture. Recommendations for further research in this field are to modify the ratio of flour and water to produce water roux.

Keywords: Consumer; Acceptance; Innovation; Steamed bun; Pau.



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1. Introduction

Steamed buns have existed in China since the Dynasty of Western Han in 206 BC. [Ming et al. \(2012\)](#), also said that the steamed bun is one of the staple food of the people in East Asia. Formulation, processing, and taste of steamed bun are different not only in China but also in the countries around the world ([Huang et al., 1995](#)). Pau is also a kind of steam filled bun made of flour and yeast, kneaded and shaped into a round, in which a core of sweets, savory or vegetables. According to [Ming et al. \(2012\)](#), wheat flour suitable for use in the production of steamed bun dough is simple protein wheat flour (10% - 12%). Steamed bun is usually white, fine and smooth with a variety of internal texture of dense texture to open with a cell - a large air cell ([Abidin, 2008](#)). According to [An and Assefaw dan \(2014\)](#), the biggest product in China that involves the wheat flour is steamed bun. Steamed buns are also very popular in Japan, Korea, and Southeast Asian countries ([Lin et al., 1990](#)). Normally in Malaysia, the steamed buns are to be eaten at the time breakfast and afternoon tea ([Abidin, 2008](#)). In Malaysia, one of the famous steamed buns consumed by the society is called 'pau'. Normally pau are eaten while still hot, but today, there is also pau that can be found in frozen condition. The most common method to cook pau is by using the steaming methods. In order for developing countries to reduce the quantity of preservatives in the food production, one way is to study and learn the use of water roux in pau. The use of water roux considerably less popular among Malaysian pau producers. Therefore, water roux should be studied in greater depth because, in order to soften and refine the dough, water roux is also said to have the potential to soften and refine pau without using bread softeners. In this study, the researchers

focused on standard formulation quantity of water roux required in the production of pau dough and getting feedback on the level acceptance of the value added pau.

In this study, a conceptual framework was constructed to explain how to measure the hedonic characteristics (sensory evaluation) such as appearance, color, texture, taste, and aroma of the value added pau, with the buying intention. The hedonic characteristics are defined as independent variables and correlate with the buying intention. According to Stone and dan Sidel (1993) and Ramcharitar *et al.* (2005), the hedonic characteristics can be categorized into four dimensions, namely as the appearance, color, texture, and taste. However, in this study, aroma is also considered as hedonic characteristics because in making pau, the scent very important. The objective of this study was to develop a standard formulation of water roux quantity for the production of pau dough and to assess the respondents' level of acceptance of the product.

2. Literature Review

Pomeranz *et al.* (1997) studied the effect of steamed bun softness with the use of lipids, fats, vegetable oils and emulsifiers (hydroxylated lecithin, ethoxylated monoglycerides and distilled monoglycerides [EMG]). The study found that the amount of lipids in wheat flour is one of the most important components in making dough for steamed bun serves to reduce the quantity of defatting. However, the presence of fats and vegetable oils in the production of steamed bun dough can replace four types of lipids found in wheat flour. The use of 2% shortening produces the best-steamed bun instead of using soybean or corn oil.

According to Faridi and dan Rubenthaler (1983) there were significant differences between China and Pacific Northwest (United States) steamed bun in which the higher the protein, the more quality of steamed bun produced. Lukow *et al.* (1990) also investigated the potential of high-protein flour (average flour protein = 13.2%) from Canada and the Republic of China to produce steamed bun. The study found that the higher protein and gluten strength, the more quality of steamed bun produced. Addo *et al.* (1991) studied the characteristics of traditional steamed bun using a combination of fermentation and ripening methods. Response Surface Method to determine the formula used is 8% sugar, 1% instant yeast, fermentation time of 31/2 hours, 58 minutes of the marinade and 10 minutes of steaming produced steamed bun that is soft, moist, good texture, soft crust with the white and bright surface. In the study of Addo *et al.* (1991), he found that flour produced from combined hard and soft wheat produces steamed bun in optimal condition. The content of protein in the production of the steamed bun is very important. Abidin (2008) also conducted a study to reduce the consumption of imported wheat in the production of the steamed bun and replace it with flour produced from the banana. The use of composite flour in the production of steamed bun showed high health value because of the nutrient content in banana flour. Results showed that replacement green banana flour increased significantly ($p > 0.05$) content of 3.64-5.65% total dietary fiber and soluble fiber of 3.17 to 5.15% in a pau.

According to Singh-Ackbarali and Maharaj (2014), the hedonic characteristics is an important tool used to determine the level of acceptance of the respondents towards the product and to determine the standard formulation of new product development. Hedonic characteristics cover dimensional appearance, texture, aroma, color, and taste of a food product. Hedonic characteristics allow researchers to control the quality of product development and making correlations between the chemical and physical analysis of a food product. Muresan *et al.* (2012) stated that the quality of the hedonic characteristics play an important role in choosing or receiving a food product. Normally, the hedonic test is used to determine the attitude of the respondents towards foods by measuring the level of acceptance of the respondents to the development of new products.

3. Materials and Method

3.1. Sampling, Research Design and Data Analysis

In this study, researchers chose to implement a quantitative study. The researcher has chosen experimental design as the research design. According to Ary *et al.* (2010), experimental design refers to a framework in which an experiment was carried out and involves the manipulation of independent variables. In experimental design, we test ideas, procedures or practices to determine whether it affects the outcome or dependent variable. In this study, there are two main variables, namely as the characteristics of hedonic characteristics of the pau with the intention of respondents to buy the value added pau. In addition, the survey was also used in this study to evaluate the respondent's feedback the characteristics of hedonic characteristics of the pau and its marketability. The instrument used was a set of questionnaire and a total of 310 questionnaires were distributed to the respondents. A simple random sampling design has been implemented to select respondents of Faculty of Technical and Vocational, Universiti Pendidikan Sultan Idris (FTV, UPSI). The selected samples have criteria for bakery students. The rationale why the researchers chose these people is because the researchers believe that they are experienced and familiar with the value of a food based on their knowledge and experience about bakery products.

3.2. Water Roux Standard Recipe

Yvonne Chen in his book *The 65 Bread Doctor* stated that the quantity of water roux that should be included in the dough is about 35% of the weight of main flour. To generate a loaf of bread weighing 1 kg, the author proposed to use 480g flour, 200g liquid, and 170g of water roux (30g flour and 150g liquid). In this study, researchers used the water roux in making pau dough (50g wheat flour and 150g water).

3.3. Water Roux Preparation Method

Firstly, all ingredients will be weighed according to the correct measurement. The two ingredients will be mixed well using a stainless steel wire whisk until the mixture no longer viscous. Then, the mixture will be heated over medium heat until the temperature reaches 65°C then the mixture will be stirred using a wooden spoon until it becomes thick using a wooden spoon, "whisk" or spatula to avoid dough sticking or burning on the surface of the pot. After the mixture becomes thick, it will be removed from the heating source. Finally, the mixture will be poured into a container and cover with plastic wrap then left to be cooled to room temperature. The unused water roux needs to be stored in the refrigerator. The water roux has to reach the room temperature before it can be used to avoid decolorization.

3.4. Preparation of Pau

Firstly, the water roux has to be prepared. Ingredients to make the dough will be weighed. Wheat flour, yeast, baking powder will be put in a mixing bowl. Then, it will be kneaded until smooth and water will be poured bit by bit. Next, water roux, vegetable fats, and water will be added and all ingredients will be kneaded again until the dough does not stick to the bowl. The dough will be divided into 10 sections and will be arranged on a tray. The filling will be inserted into the dough and the dough will be formed nicely so that the filling is covered and not exposed. Each pau will be placed on paper squares (2"x 2") and arranged in the steamer. The pau will be rested for 30 to 35 minutes in the steamer. Water will be boiled in a steamer. Once the water boiled, all pau will be steamed for 10 minutes. It is very important to ensure that the water in the steamer is boiled before the pau is being steamed in order to maintain the pau quality.

4. Results

4.1. Respondent's Background

The frequency distribution and percentage of respondents' demographics by gender, race and total monthly income were investigated. Table 1 describes the overall demographic profile of the respondents.

Table-1. Demographic Profile of Respondents

Profile of respondents	Classification	Frequency (n = 290)	Percentage (%)
Gender	man	114	39.30
	woman	176	60.70
Nationality	Malay	263	90.70
	Chinese	8	2.80
	India	2	0.70
	Others	17	5.90
	Total Income Per Family	RM 1999 and below	112
	RM 2000 - RM 3999	61	21.00
	RM 4000 - RM 4999	29	10.00
	RM 5000 - RM 5999	26	9.00
	RM 6000 and above	62	21.40

4.2. Total Mean Score of Hedonic Characteristics and Respondents Acceptance

Table 2 shows the mean scores of the hedonic characteristics and respondents acceptance of sample A and sample B to further support that the quantity of water roux 80 g per 1 kg of flour is more suitable to be used in the preparation of pau dough.

Table-2. Total Mean Score of Hedonic Characteristics and Respondents Acceptance

Variables	Sample A			Sample B		
	n	Mean	Standard Deviation (SD)	n	Mean	Standard Deviation (SD)
Hedonic characteristics	290	3.88	.549	290	3.85	.533
Respondents Acceptance	290	4.16	.550	290	4.09	.585

The mean scores are measured based on three levels, namely, the mean score of 1.00 to 2.33 at a low level, the mean score of 2.34 to 3.66 at a moderate level and the mean score of 3.67 to 5.00 is at a high level (Pallant, 2007). According to Table 1.1, the mean is the range of values ranging from 3.85 to 4.16 and is at a high level. It can be seen that the mean value of the variables for hedonic characteristics and acceptance of the survey respondents for sample A was higher than in sample B. The mean value of hedonic characteristics for sample A (Mean = 3.88, SD = 0.549) was higher compared to Sample B (Mean = 3.85, SD = .533). The mean value of the acceptance of the respondents also indicated that the sample A (Mean = 4.16 SD = .550) was higher than Sample B (Mean = 4.09, SD = .585). With reference to Table 1.1 and Figure 1.0, it can be concluded that the standard formulation quantity of for 1 kg flour is 80g water roux.

4.3. Descriptive Analysis of Hedonic Characteristics based on Appearance Dimension

The results show that the hedonic dimension for sample A is higher with a mean value of 3.74 and a standard deviation of 0.772 compared to Sample B with a mean value of 3.52 and a standard deviation of 0.831. The mean value of the hedonic dimension of sample A is higher than Sample B in terms of 'the surface of the sample is smooth' (mean = 4.03, SD = 0.907) followed by 'the surface of the sample is glossy' (mean = 3.72, SD = .964) and the spun formed to cover the dough was well formed (Mean = 3.49, SD = 1.098). Please refer to Table 3.

4.4. Descriptive Analysis of Hedonic Characteristics Based on Textures Dimension

From the result, there is a difference between the mean value of hedonic characteristics of texture dimension and the appearance dimension in which the mean value of the hedonic characteristics of texture sample B was higher than sample A. The mean value of the hedonic characteristics of texture dimension for samples B is higher than in sample A where for 'dough texture is elastic when pressed with a finger' (Mean = 4.24, SD = .756) followed by 'texture does not stick to the mouth palate when chewed' (Mean = 4.23, SD = .811) and the samples are soft (Mean = 4.16, SD = .829). Please refer to Table 3.

4.5. Descriptive Analysis of Hedonic Characteristics Based on Taste Dimension

The mean value of the hedonic characteristics on taste for sample B was higher than sample A sample in terms of 'dough sweetness' (Mean = 3.88, SD = .901) and followed by the 'rich fatty taste' (mean = 3.73, SD = .960). Please refer to Table 3.

4.6. Descriptive Analysis of Hedonic Characteristics Based on Color Dimension

Overall, there was no difference between the mean value of the sample A and the mean value of sample B on the hedonic characteristics of color dimension. The mean value of the hedonic dimension of color to sample B is 3.58 and the SD of 0.913, while the mean value of sample A is 3.57 and a SD of 0.766. For sample B, item for 'color is yellowish white' shows mean value of Mean = 3.73, SD = 2.080 which is higher than sample A (Mean = 3.59, SD = 1.174). For item 'color is milky white and white' the mean value of sample A was higher than sample B. Please refer to Table 3.

4.7. Descriptive Analysis of Hedonic Characteristics Based on Aroma Dimension

There were two items for the aroma dimension which are the 'aroma is delightful' and the dough is 'free from yeast odor'. The mean value for the hedonic characteristics for sample A aroma dimension (Mean = 4.01, SD = 0.754) was higher than sample B (Mean = 3.96, SD = .784). The mean value of the items on pleasant aroma for sample A (Mean = 4.15, SD = 0.805) was higher than sample B (Mean = 4.03, SD = 0.860). In contrast, item with 'free from yeast odor' shows mean value of sample B (Mean = 3.89, SD = 0.993) was higher than in sample A (Mean = 3.86, SD = 1.033). It can be concluded that, respondents are more receptive to the quantity of water roux of 80g in sample A compared to Sample B based on the aroma (Mean = 4.01, SD = 0.754) followed by taste (Mean = 3.76, SD = .832) and appearance (mean = 3.74, SD = 0.772) (Table 3).

Table-3. Descriptive Analysis of Hedonic Characteristics for Sample A and Sample B

Item	Sample A			Sample B		
	N	Mean	Standard Deviation (SD)	N	Mean	Standard Deviation (SD)
Appearance	290	3.74	.772	290	3.52	.831
The surface is smooth	290	4.03	.907	290	3.82	.972
The surface is glossy	290	3.72	.964	290	3.58	1.009
Pau flower	290	3.49	1.098	290	3.17	1.120
Texture	290	4.10	.690	290	4.13	.599
Texture is soft	290	4.08	.943	290	4.16	.829
Texture is fluffy	290	4.08	2.003	290	4.09	.903
The sample is withy when pressed with finger	290	4.21	.769	290	4.24	.756
Sample does not stick to mouth palate when chewed	290	4.19	.859	290	4.23	.811
Sample texture fine hollow	290	4.07	.816	290	4.00	.838
Color	290	3.57	.766	290	3.58	.913
Sample color milky white	290	3.94	1.070	290	3.84	1.095
Sample color white	290	3.19	1.236	290	3.16	1.216
Sample color yellowish white	290	3.59	1.174	290	3.73	2.080
Taste	290	3.76	.832	290	3.81	.809
Dough is sweet	290	3.82	.925	290	3.88	.901
Fatty dough	290	3.71	.995	290	3.73	.960
Aroma	290	4.01	.754	290	3.96	.784
Delightful aroma	290	4.15	.805	290	4.03	.860
Free from yeast odor	290	3.86	1.033	290	3.89	.993

4.8. Descriptive Analysis Level of Acceptance of Respondents on the Use of Water Roux in the Pau Dough

Figure 1 shows the number of respondents who chose samples A and sample B. Based on Figure 1, 156 respondents have chosen sample A compared to sample B (134 respondents). Majority of the respondents agreed that they chose sample A because it met their expectations and taste (Figure 2-4). Based on the research findings, the amount of water roux added in the dough really affected the hedonic characteristics of the product. The difference quantity of water roux for sample A and sample B are 80 g and 120 g for every 1 kg flour respectively. Other ingredients such as pau flour, baking powder, castor sugar, vegetable fat, and water are added at a constant quantity.

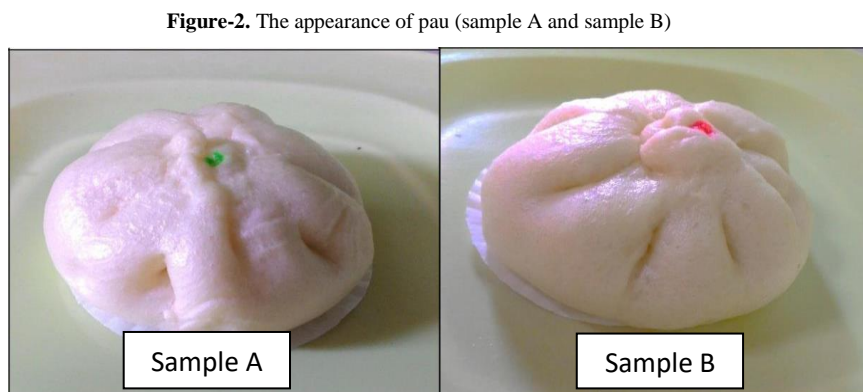
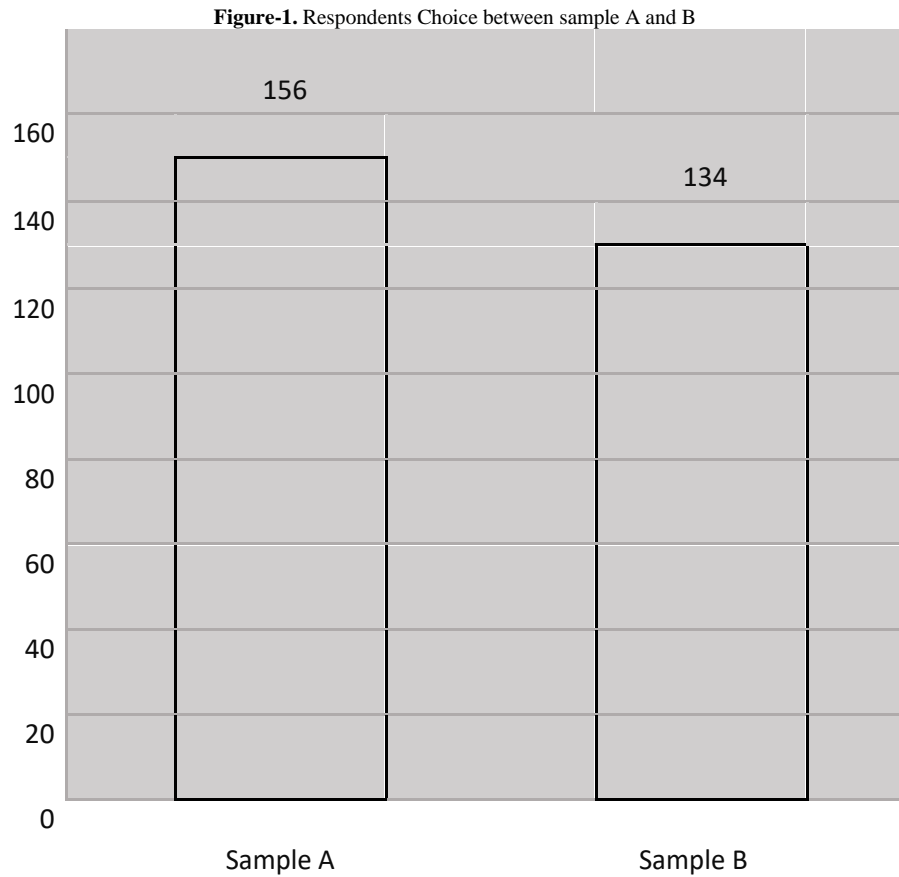
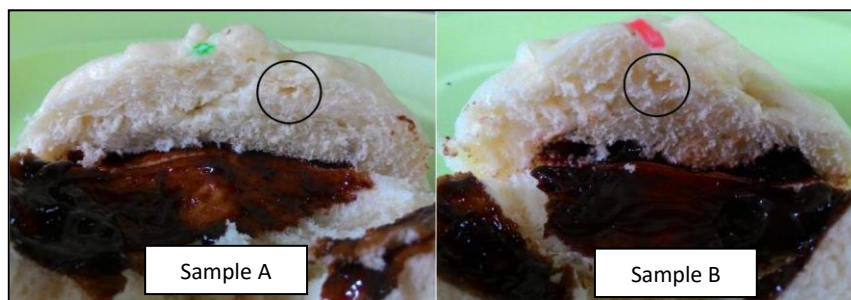
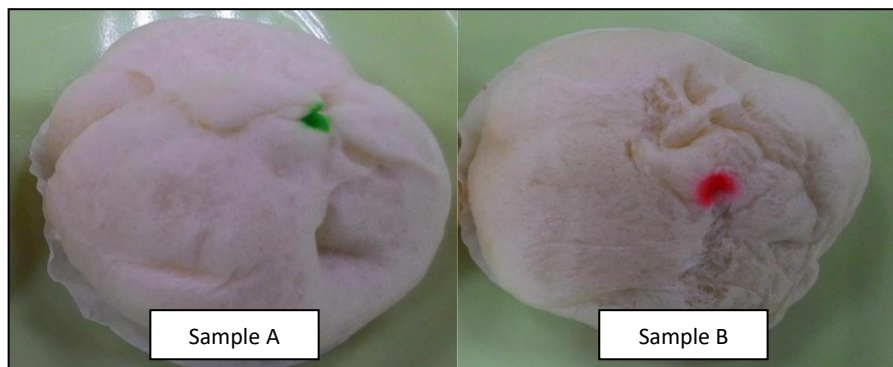


Figure-3. The texture of pau (sample A and sample B)**Figure-4.** The appearance of pau (sample A and B) after four hours in the steamer

5. Discussion and Conclusion

According to [Singh-Ackbarali and Maharaj \(2014\)](#), the hedonic characteristics is an important tool used to determine the level of acceptance of the respondents towards the product and to determine the standard formulation of new product development. The findings of [Muresan et al. \(2012\)](#) also support the findings by [Singh-Ackbarali and Maharaj \(2014\)](#) in which the quality of the hedonic characteristics play an important role in choosing or receiving the food product. Normally, the hedonic test is used to determine the attitude of the respondents to foods by measuring the level of acceptance of the respondents to the development of new products. The level of acceptance of the respondents on the usage of water roux in the production of pau dough was obtained in this research. Based on the findings, it can be seen that from the construct of respondents' acceptance, the majority of respondents prefer sample A than sample B with a total of 156 respondents. Water roux quantity used for sample A was 80g per 1 kg of flour. Another ingredient such as flour steamed bun, dried yeast, baking powder, castor sugar, vegetable fat, and water is at a constant quantity.

It can be concluded that the hedonic characteristics based on color dimension has affected the acceptance respondents. The results obtained showed that the color of pau influenced the respondents' intention of buying which showed the highest mean value compared to the other hedonic characteristics. According to [Downham and dan \(1999\)](#), in order to awaken the appetite of a person, the color of a food plays an important role for consumers. For example, the color of sample A is whiter compared to sample B. According to, the addition of a substance in food can affect the color of food. So, we can conclude that adding water roux in the preparation of water dough to some extent will affect the color of the pau. This study also supported research by [Pertuzatti et al. \(2015\)](#) which found that the color of food reaches the highest level of acceptance with a percentage of 88.88%, followed by texture (83.05%) and flavor (80%), in their study also support that color can affect the product if there are other ingredients that are added to a batter.

Moreover, this finding is also supported by studies conducted by in which found that the color of pau will change if there are additional ingredients other than the main ingredient in the dough steamed bun. The findings by [Hsu \(2011\)](#) also found that respondents can evaluate the color of a food product. The change of the product colors boost respondents' interest and affect the level of acceptance of the survey respondents. It can be concluded that respondents preferred Sample A the instead of Sample B as indicated for the quality of color. In addition, according to a study by color plays an important role on the sense of taste because respondents will see first before they find food and thus affect the level of acceptance of a person on the product. Without these senses, the tongue may be wrong in giving an assessment of the food product.

In addition, the value added pau product, which the ingredient have been modified one of the original material, softeners, have been exchanged with water roux to produce pau that were soft and fluffy. This study is aimed at developing a standard formulation quantity of water roux in the preparation of pau dough and to see the level of acceptance of 290 students of FTV, UPSI to pau that has been value added. There are two main issues that are discussed in this study, namely, what is the standard formulation quantity of water roux in the preparation of dough steamed bun, whether the level of acceptance of the survey respondents to use water roux in making pau dough and steamed buns have been added to help enhance the value. Survey respondents also accepted sample A versus sample B based on the mean value of the hedonic characteristics that showed highest hedonic characteristics followed by the color, taste and texture dimensions. The researchers hope that all the information related to the findings and

recommendations in this study could add knowledge for various parties towards the production and innovation of food products in Malaysia.

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