



Sensory Acceptance and Nutritional Content of Pumpkin (*Cucurbita moschata*) and Chayote (*Sechium edule*) Schotel

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Abstract. The purpose of this study was 1) to determine the sensory acceptance of *Schotel* pumpkin and chayote, 2) to know the nutritional content of the most preferred *Schotel* pumpkin and chayote; and 3) to determine the material composition of the most preferred *Schotel*. The method applied was the experimental method. The formulas used in this study were product 1 (using 25g pumpkin and 175g chayote), product 2 (using 100g pumpkin and 100g chayote), and product 3 (using 175g pumpkin and 25g chayote). The hedonic test involved 25 untrained panellists. Statistical analysis utilized the Kruskal-Wallis nonparametric and Mann-Whitney follow-up tests at the 95% confidence level ($\alpha=0.05$). This study's results indicated that the *Schotel* product using 100g of pumpkin and 100g of chayote was the most preferred and well-accepted product by consumers. *Schotel* products using 100g of pumpkin and 100g of chayote could meet the energy need by 8%, protein by 17%, fat by 17%, and carbohydrates by 3% per serving. The ingredients composition of the best *Schotel* product consisted of ingredients A, B, and C. Ingredients A consisted of 350 ml of liquid milk, 100g pumpkin, 100g chayote, 125g ground beef, 100g carrots, 40g onions, 15g garlic, 3 tbsp flour, 1 tsp salt, ½ tsp ground pepper, ½ tsp ground nutmeg, 2 tbsp cooking oil. Ingredients B consisted of 25g of grated cheese and 3 eggs. Ingredients C consisted of 75g of grated cheese.

Keywords: *Schotel*, pumpkin, chayote, sensory acceptance, nutritional content.

INTRODUCTION

Local food diversification is one of the attempts to increase the added value of a foodstuff. Foodstuffs that have the potential to be diversified are pumpkin (*Cucurbita moshata*) and chayote (*Sechium edule*). These foodstuffs are classified as types of fruits that Indonesians commonly consume.

Pumpkin and chayote contain carbohydrates, protein, fiber, vitamins, and minerals suitable for body health (Rasinta et al., 2015). These foodstuffs are easy to get from traditional and modern markets at affordable prices. The benefits possessed by these two foodstuffs need to be utilized and maximized. One way to utilize pumpkin and chayote so they can last longer is by processing them into new food products.

Food products made from pumpkin that have been developed include pumpkin *lempok* (Nilasari et al., 2017), pumpkin muffins (Rismaya et al., 2018), instant powder drinks (Aliyah, 2019), high-fiber soups (Nurjanah et al., 2020), pumpkin donuts (Halimah & Rahmawati, 2021). Meanwhile, food products made from chayote that have been developed include fish crackers (Asmira & Arza, 2015), sweet pickles (Putri, 2016), chayote *dodol* (Andriani et al., 2018), steamed chayote brownies (Awaludin et al., 2019), chayote biscuits (Setyawan, 2020).

A study on the utilization of pumpkin and chayote together in food products still needs to be done. Therefore, it is necessary to create innovation utilizing pumpkin and chayote to become one of the products known to the public as *Schotel*. Typically, the main ingredient of *Schotel* is macaroni, known as macaroni *Schotel*. Macaroni *Schotel* is a type

of appetizer in continental dishes. This dish consists of macaroni, milk, beef, eggs, and spices (Abdurrahman et al., 2021).

The use of pumpkin and chayote in creating *Schotel* aims to replace the main ingredient, macaroni. The main focus is to use different proportions of pumpkin and chayote in making *Schotel* as a substitute for macaroni. The technique that can be done in this study is by modifying the recipe and the macaroni *Schotel* processing.

Using pumpkin and chayote is expected to add value to these two ingredients. It is also expected that the results of this study will provide information to the public so that they can improve their creativity in processing pumpkin and chayote into *Schotel*. The purpose of this study is 1) to find out the sensory acceptance of pumpkin and chayote *Schotel*; 2) to identify the nutritional content of the most preferred pumpkin and chayote *Schotel*; and 3) to specify the materials composition of the most preferred *Schotel*.

METHODS

The study was conducted in July 2022. The research location of the experiments on pumpkin and chayote *Schotel* products was in the Culinary Arts Study Program laboratory located on Jl. Sultan Agung, No. 77, Gajah Mungkur, Gajahmungkur, Semarang. This study consisted of 3 stages. The first stage included the preparation of materials and equipment as well as the formulation of the pumpkin and chayote *Schotel* products. The second stage was the process of making pumpkin and chayote *Schotel* products. The third stage was the execution of hedonic tests and ranking tests to determine sensory acceptance of pumpkin and chayote *Schotel* products (Penjumras et al., 2021).

The first stage was preparing the materials and equipment being used. The ingredients used were liquid milk, pumpkin, chayote, ground beef, carrots, onions, garlic, flour, salt, ground pepper, ground nutmeg, cooking oil, cheese, and chicken eggs. The equipment included digital scales, measuring cups, spoons, mixing bowls, cutting boards, knives, fry pans, spatulas, stoves, electric ovens, and 7x7 cm aluminum foil cups. The formula used in this study consisted of product 1 with a composition of 25g pumpkin and 175g chayote, product 2 with a composition of 100g pumpkin and 100g chayote, and product 3 with a composition of 175g pumpkin and 25g chayote. The proportion of materials used can be seen in **TABLE 1**.

The second stage was the making of pumpkin and chayote *Schotel* products. The process of making pumpkin and chayote *Schotel* products used a flowchart seen in **FIGURE 1**.

The third stage was the execution of the hedonic test and ranking test to observe the sensory acceptance of the pumpkin and chayote *Schotel* products. The acceptance attributes used were color, texture, aroma, flavor, and the overall quality of the pumpkin and chayote *Schotel* (Selvakumaran et al., 2019) using a test scale of 1-5, precisely scale of 1 (extremely dislike) to scale 5 (extremely like) (Suryono et al., 2018). The number of panelists involved in the hedonic test was 25 untrained panelists (Widodo & Priyanti, 2020).

Statistical analysis of the hedonic test results employed the nonparametric Kruskal-Wallis test and the Mann-Whitney follow-up test at a confidence level of 95% ($\alpha=0.05$). The software used is SPSS 28.0 for MacOs. Meanwhile, obtaining data on nutritional content was done by calculating the nutritional content of pumpkin and chayote *Schotel* using the <https://valuegizi.com> search engine. The data from the nutrient content calculation was then compared with the Nutrition Facts Label (*Acuan Label Gizi/ALG*) to determine the percentage of the Nutrient Adequacy Ratio (*Angka Kecukupan Gizi/AKG*) (Handayani & Priyanti, 2021).

TABLE 1. Ingredients formula and proportion of pumpkin and chayote *Schotel*

Ingredients	Allocations		
	Product 1	Product 2	Product 3
Ingredient A:			
Liquid milk (ml)	350	350	350
Pumpkin (g)	25	100	175
Chayote (g)	175	100	25
Ground Beef (g)	125	125	125
Carrot (g)	100	100	100
Onion (g)	40	40	40
Garlic (g)	15	15	15
Flour (tbsp)	3	3	3
Salt (tsp)	1	1	1
Ground pepper (tsp)	½	½	½

Ingredients	Allocations		
	Product 1	Product 2	Product 3
Ground nutmeg (tsp)	½	½	½
Cooking oil for stir-frying (tbsp)	2	2	2
Ingredient B:			
Grated cheese (g)	25	25	25
Chicken egg	3	3	3
Ingredient C:			
Grated cheese (g)	75	75	75

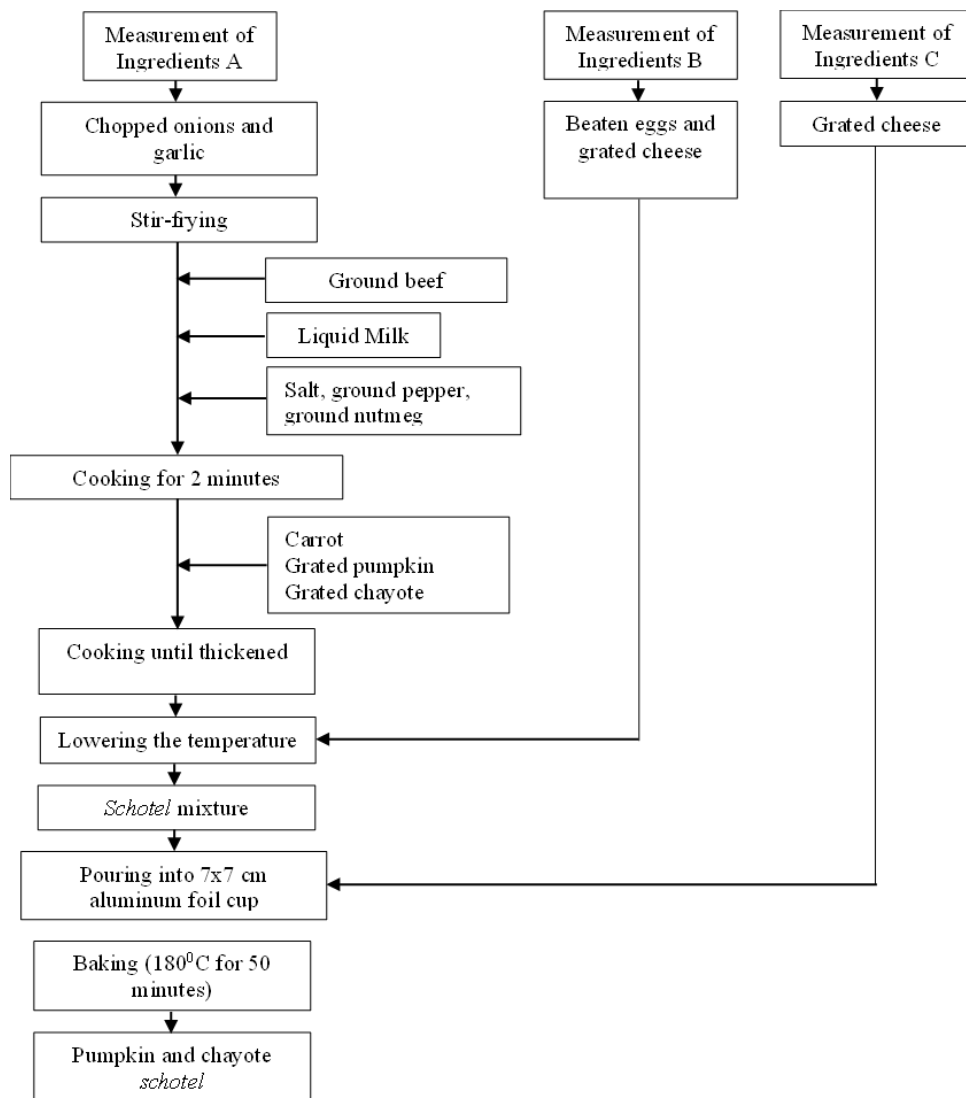


FIGURE 1. Process flowchart in the making of pumpkin and chayote *Schotel* samples

RESULTS AND DISCUSSION

Sensory Acceptance of Pumpkin and Chayote *Schotel* Products

The statistical analysis results on the hedonic test of the pumpkin and chayote *Schotel* products can be seen in **TABLE 2**. Meanwhile, the images of the pumpkin and chayote *Schotel* products produced from this study can be seen in **FIGURE 2**.

TABLE 2. Statistical analysis results on hedonic test of pumpkin and chayote *Schotel* products

Sensory Attributes	Mean Value			P
	Product 1	Product 2	Product 3	
Color	4.08 ± 0.70a	4.24 ± 0.60a	4.16 ± 0.55a	0.742
Aroma	4.24 ± 0.72a	4.32 ± 0.56a	4.28 ± 0.61a	0.978
Texture	3.76 ± 0.88a	4.24 ± 0.52b	4.32 ± 0.75b	0.031
Flavor	3.24 ± 0.83a	4.44 ± 0.51b	4.28 ± 0.79b	0.000
Overall	3.80 ± 0.71a	4.48 ± 0.51b	4.48 ± 0.59b	0.001

Note: The same notation in the same column indicates no significant difference at $\alpha = 5\%$

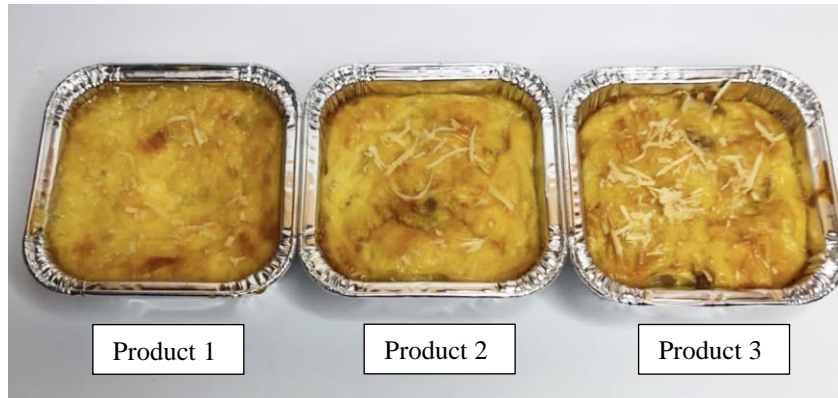


FIGURE 2. Pumpkin and chayote *Schotel* products

Color

The hedonic test mean value of the color attribute indicated that product 2 (using 100g pumpkin and 100g chayote) had the highest value, which was 4.24 ± 0.60 . According to the Kruskal Wallis test, statistically, it signified that the mean value of color acceptance of the three *Schotel* products was not significantly different ($P=0.742$), or in other words, the use of pumpkin and chayote did not affect the color of *Schotel*. Thus there was unnecessary to carry out the Mann-Whitney follow-up test.

The colors generated by the three products were very similar and uniform, specifically a yellow color on the inside and a brownish-yellow color on the outside/top of the product. This was influenced by several factors, such as the raw ingredients being used. Some of the raw ingredients that were very likely to give a yellow color were chicken eggs and cheese, while the addition of pumpkin did not significantly affect *Schotel* products. The other factor was the Maillard reaction during the *Schotel* baking process. The Maillard reaction was a non-enzymatic browning reaction caused by carbohydrates and protein in the processed ingredients resulting in a brownish-yellow color when baked (Asmira & Arza, 2015).

Aroma

The results of the hedonic test on the aroma of the three *Schotel* products made from pumpkin and chayote showed that product 2 (using 100g pumpkin and 100g chayote) had the highest mean value, which was 4.32 ± 0.56 . The results of the Kruskal Wallis test indicated no significant difference in the aroma ($P=0.978$) of the three *Schotel* products with the addition of pumpkin and chayote. Thus, using pumpkin and chayote did not affect the aroma of *Schotel*, so the Mann-Whitney follow-up test was unnecessary.

The aroma produced by the three products came from the substituent ingredients used (Kristianingsih, 2010). The product had a dominant aroma, specifically milk, cheese, and beef. Meanwhile, the aroma of pumpkin and chayote could have been more pronounced even though the amount used differed. This condition made the three products have the same aroma.

Texture

The sequence of products with the most preferred texture by the panelists was product 3 (using 175g pumpkin and 25g chayote), then product 2 (using 100g pumpkin and 100g chayote), and lastly, product 1 (using 25g pumpkin and 175g chayote). The mean value of the hedonic test results of product 3 was 4.32 ± 0.75 . Based on the Kruskal Wallis test, it was observed that there were significant differences in texture ($P=0.000$) of the three *Schotel* products. The Mann-Whitney test was conducted to determine which products had different textures.

The results of the Mann-Whitney test revealed that the texture of product 1 (using 25g pumpkin and 175g chayote) was significantly different from product 2 (using 100g pumpkin and 100g chayote) and product 3 (using 175g pumpkin and 25g chayote). Meanwhile, the texture of product 2 (using 100g pumpkin and 100g chayote) and product 3 (using 175g pumpkin and 25g chayote) was similar and, in other words, had the same texture.

Adding pumpkin resulted in a denser *Schotel* texture resembling *Schotel*, which uses macaroni as the main ingredient. This is in line with a study by Kristianingsih (2010) which stated that adding pumpkin to food products could produce a moist, dense product with small pores.

Flavor

Based on the results of the hedonic test, the highest mean value of the flavor attribute was in product 2 (using 100g pumpkin and 100g chayote) of 4.44 ± 0.51 . The results of the Kruskal Wallis test specified a significant difference in flavor ($P=0.000$) among the three products. Subsequently, after conducting Mann-Whitney follow-up tests, the results obtained described that the flavor of product 1 (using 25g pumpkin and 175g chayote) was significantly different from product 2 (using 100g pumpkin and 100g chayote) and product 3 (using 175g pumpkin and 25g chayote). Meanwhile, the flavor of product 2 (using 100g pumpkin and 100g chayote) and product 3 (using 175g pumpkin and 25g chayote) was not significantly different or, in other words, had the same flavor.

The flavor attributes of the three products came from the substituent ingredients used, including pumpkin, chayote, milk, beef, cheese, and spices. The flavor of Product 1 was very different from the flavor of Product 2 and Product 3, so the panelists' acceptance of the flavor of Product 1 was low, as can be seen from the mean value in **TABLE 2**.

Overall Product

The overall attribute displayed the panelist's overall acceptance of aspects of the *Schotel* product. Based on the hedonic test, product 2 and product 3 had the highest mean values, with the same mean value. However, based on the Kruskal-Wallis test, there was a significant difference in overall attributes ($P=0.001$) among the three products.

The results of the Mann-Whitney follow-up test on the overall attributes of the *Schotel* products indicated that product 1 (using 25g pumpkin and 175g chayote) was significantly different from product 2 (using 100g pumpkin and 100g chayote) and product 3 (using 175g pumpkin and 25g chayote). Meanwhile, product 2 (using 100g pumpkin and 100g chayote) and product 3 (using 175g pumpkin and 25g chayote) were similar and, in other words, accepted the same overall attribute assessment.

In determining the best product, a ranking test was carried out. Based on the ranking test, it was observed that 18 panelists (72%) chose product 2 (using 100g pumpkin and 100g chayote) to be in first place. Thus, the *Schotel* product using 100g pumpkin and 100g chayote was the most preferred and was well accepted by the panelists.

Nutritional Content of Pumpkin and Chayote *Schotel* Products

The *Schotel* product using 100g pumpkin and 100g chayote was the most preferred and was well accepted by the panelists. The nutritional content of the *Schotel* products was calculated using the <https://valuegizi.com> search engine. The results of the nutritional value calculation of the product per serving (115g) can be seen in **TABLE 3**.

TABLE 3. Nutritional content and AKG percentage per serving of the best *Schotel* product

Nutrition	Nutritional Value	% AKG per Serving
Energy (kcal)	178.3	8%
Protein (g)	9.9	3%
Fat (g)	11.3	17%
Carbohydrate (g)	9.5	17%

The ALG value used as a reference was the general group ALG. The general group ALG values were 2150 kcal energy, 60g protein, 67g fat, and 325g carbohydrates (Badan Pengawas Obat dan Makanan Republik Indonesia, 2016). Based on the ALG value, consuming 115g of *Schotel* product using 100g pumpkin and 100g chayote can meet the energy requirement of 8% per serving, protein requirement of 17% per serving, fat requirement of 17% per serving, and carbohydrate requirement of 3 % per serving.

CONCLUSION

Based on the results of this study, using pumpkin and chayote can affect the texture, flavor, and overall acceptance of *Schotel* products. Using pumpkin and chayote did not affect the color and aroma acceptance of *Schotel* products. The *Schotel* product using 100g pumpkin and 100g chayote was the most preferred and was well accepted by the panelists. *Schotel* products using 100g pumpkin and 100g chayote could meet energy requirements of 8% per serving, protein requirements of 17% per serving, fat requirements of 17% per serving, and carbohydrate requirements of 3% per serving. The composition of the best *Schotel* product consisted of ingredient A, B, and C. Ingredient A consisted of 350 ml liquid milk, 100g pumpkin, 100g chayote, 125g ground beef, 100g carrots, 40g onions, 15g garlic, 3 tbsp flour, 1 tsp salt, ½ tsp ground pepper, ½ tsp ground nutmeg, and 2 tbsp cooking oil. Ingredient B consisted of 25g of grated cheese and 3 eggs. Ingredient C consisted of 75g of grated cheese.

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