

## **The effects of yellow pumpkin (*Cucurbita moschata*) substitution on stick acceptance**

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### **Abstract**

Sticks refer to snacks or cakes made of wheat flour, tapioca or sago flour, fat, eggs, and water. Sticks have a long flat shape processed with fried techniques, a savory taste, and a crisp texture. Sticks are made of raw materials and additional ingredients. The raw material is flour and is sometimes substituted by pumpkin flour. Pumpkin stick is alternative food to increase the production of pumpkin flour. This study aimed to determine the effects of using 10%, 20%, and 30% pumpkin flour on organoleptic properties (colors, smells, tastes, and textures) of sticks. This study employed an experimental design with a non-factorial completely randomized design (RAL) with three treatments and three repetitions. Moreover, 15 untrained panelists from Dayah Panjoe Village, Kuta Blang District, Bireuen Regency were involved to test the treatments. This study found that the highest nutritional value of the stick color was 3.64 (moderately liked by the panelists). The highest value of stick smell was 3.62 (moderately liked by the panelists). Meanwhile, the highest value of stick taste was 4.13 (liked by the panelists). Finally, the highest value of stick texture was 3.40 (moderately liked by the panelists). This research concluded that the substitution of 10%, 20%, and 30% pumpkin flour significantly affected organoleptic properties, such as color, smell, taste, and texture. This research suggests that further research measures the temperature of the frying pan and preferably greases the pumpkin flour with mashing.

**Keywords:** yellow pumpkins, pumpkin flour, stick cake

### **Introduction**

Sticks refer to snacks or types of pastries whose basic ingredients are wheat flour, tapioca or sago flour, fat, eggs, and water. The sticks have a long flat shape, a savory taste, and a crunchy texture. Their finishing method is fried. The criteria of a good stick are a golden yellow color, a cake-like smell, a dry and crunchy texture, and a savory taste. Sticks are often consumed as a daily snack by children and adults when spending their leisure time suddenly feeling hungry before the main meal (Habeahan, YM, 2018). Sticks are made of raw materials and additives. The raw material includes wheat flour, but pumpkin flour was substituted for wheat flour.

Wheat flour is the main ingredient of sticks, but wheat flour (wheat) is not produced in Indonesia. Consequently, the main ingredient of sticks still depends on wheat flour. To reduce the dependence on wheat flour, it is necessary to discover other ingredients with a fairly high nutritional value, wide availability, and simple procedures. However, this discovery is still nonoptimal to increase the nutritional values of sticks. Therefore, this experiment created sticks by reducing the use of wheat flour but increasing the nutritional content of sticks, especially protein. The protein must be increased because it is an important nutrient for the body's growth process and antibody formation. Wheat flour can be reduced

by ingredients with high nutritional values and low selling values, such as pumpkin flour (Fitriana P, 2013).

A pumpkin is a food commodity that is rarely utilized because people are not aware of its potential and nutritional contents. Moreover, it is quite evenly distributed in Indonesia and found in almost all islands of Indonesia (Gardjito M, 2006). The bright yellow color of pumpkin flesh indicates that it contains carotenoid pigments that will be converted into vitamin A, are beneficial for human growth, reproduction, and fetal development, maintain body tissues and vision, and reduce the risk of diseases, such as cancer, and liver (Keller, 2001 in Fitriani, 2018). Pumpkins are rich in fiber, vitamins, and carbohydrates. High carbohydrates in pumpkins are potentially processed into pumpkin flour. The pumpkin flour contains several enzymes, such as amylase, protease, lipase, and oxidase (Sufi, 1999). In addition, 100 g of pumpkins contain 29.00 calories, 1.10 g of protein, 0.30 g of fat, 25.00 mg of calcium, 64.00 mg of phosphorus, 1.40 mg of iron, 180 mg of vitamin A, 00 SI, 0.06 mg of vitamin B1, and 91.20 mg of water. (Muchtadi TR, Ayustaningwarno F, and Sugiyono, 2010)

To date, pumpkins are rarely used in Aceh. People usually use pumpkins to make vegetables in their daily life or snacks, such as *timpan* or *compote*. Unfortunately, pumpkins in Aceh have not been extensively processed because society still has inadequate knowledge. Therefore, the food diversification of pumpkins must be increased and used as a source of nutritional food products. One of the efforts to make functional sticks is by adding pumpkin flour which positively affects body health (Dewi FK, 2017). Given that pumpkins provide several advantages, they can be used as a substitute material. For this purpose, pumpkins are processed into a durable product, such as flour. Pumpkin flour is more efficiently used to process various food products. Based on the above background, the researchers investigated the effects of substituting pumpkin flour (*Cucurbita moschata*) for wheat flour on organoleptic acceptance.

## Methods

This research was conducted in June 2020. The organoleptic test was carried out in Daya Panjoe Village, Kuta Blang District, Bireuen Regency. The raw materials used in this study were pumpkin flour, wheat flour, eggs, margarine, salt, coconut milk, onions, garlic, and celery. The tools used in this study were scales, amphibians, pans, spoons, basins, stoves, wire filters, sockets, and plates. This research was an experimental study and employed a non-factorial completely randomized design (CRD) with three treatments and three repetitions. An organoleptic test was conducted by 15 consumer panelists who examined the colors, tastes, smells, and textures of the sticks. The results of the organoleptic and chemical tests were then analyzed by the ANOVA test using a computerized program. When the test results showed a significant difference in the treatments, the results were then analyzed using Duncan's test.

## Results

The preliminary research obtained three best stick formulations: formula A with 10% pumpkin flour substitution, formula B with 20% pumpkin flour substitution, and formula C with 30% pumpkin flour substitution. The acceptability of pumpkin sticks was assessed using an organoleptic test with a hedonic scale to determine the panelists' preference for pumpkin sticks, including colors, smells, tastes, and textures.

**Color**

The color assessment showed that formula A had the highest average score of 3.64 (liked moderately by the panelists). Meanwhile, formula B had an average value of 2.42 (disliked by the panelists), and formula C earned the average value of 2.37 (disliked by the panelists). To conclude, the highest average value was earned by the treatment added with 10% pumpkin flour while the lowest value was earned by the treatment added with 30% pumpkin flour. The results of the analysis of variance (ANOVA) showed that the substitution of pumpkin flour had a significant effect on the colors of the stick because the F value was 14.978 with a significant level (P-value) of  $0.00 < 0.05$ . These findings concluded that the alternative hypothesis ( $H_a$ ), postulating that the substitution of pumpkin flour significantly influenced the stick, was accepted.

Table 1. Organoleptic results of the colors of pumpkin sticks

Formulas	Color Scores
A (10%)	3.64 <sup>b</sup>
B (20%)	2.42 <sup>a</sup>
C (30%)	3.37 <sup>a</sup>

*Numbers followed by the same letters indicate no significant difference at the 0.05 level assessed by Duncan's test.*

The results of Duncan's test showed that formula A had different color from formula B. However, formula B had a similar color to formula C. The most different formulation was found in formula C, and this formulation was disliked by the respondents because adding too much pumpkin flour resulted in a brown color. This study concluded that the stick with 10% substitution produced the most preferable stick color (3.64) because it had an attractive yellow color.

**Smells**

An aroma is one of the factors in determining quality. Winarno (2004) explains that the smells received by the nose and brain are mostly produced by various ingredients or a mixture of four main smells: fragrance, sourness, rancidness, and charredness. The aroma of food determines its delicacy. In this case, smell has more to do with the senses of smell. A distinctive and attractive aroma of food triggers consumers to prefer it. Therefore, colors must be considered in the processing of food ingredients.

Table 2. Organoleptic results of the smells of pumpkin sticks

Formulas	Smell Scores
A (10%)	3.57 <sup>b</sup>
B (20%)	3.62 <sup>b</sup>
C (30%)	2.66 <sup>a</sup>

*Numbers followed by the same letters indicate no significant difference at the 0.05 level assessed by Duncan's test.*

The results of the organoleptic test showed that of the three treatments, formula A with 10% pumpkin flour substitution had an average score of 3.57 (liked moderately by the panelists). Meanwhile, formula B with 20% the substitution earned an average score of 3.62 (liked moderately by the panelists). Finally, formula C with 30% the substitution showed an average score of 2.66 (disliked by the panelists). The highest average value was found in formula B with the 20% pumpkin flour substitution, and the lowest value was found in formula C with 30% pumpkin flour substitution.

The results of the analysis of variance (ANOVA) showed that the addition of pumpkin flour significantly affected the aroma of pumpkin sticks because the F-value was 8,931 with a significant level (P-value) of  $0.00 < \text{from } 0.05$ . These findings concluded that the alternative hypothesis ( $H_a$ ), substitution, was accepted.

### Taste

The results of the hedonic test of the taste of pumpkin sticks revealed that formula A with 10% substitution had an average value of 4.13 (liked by the panelists). In contrast, formula B with 20% substitution earned an average score of 2.88 (disliked by the panelists), and formula C with 30% substitution earned 2.13 (disliked by the panelists).

Table 3. Organoleptic results of the tastes of pumpkin sticks

Formulas	Taste Scores
A (10%)	4.13 <sup>c</sup>
B (20%)	2.88 <sup>b</sup>
C (30%)	2.13 <sup>a</sup>

*Numbers followed by the same letters indicate no significant difference at the 0.05 level assessed by Duncan's test.*

The results of the analysis of variance (ANOVA) showed that pumpkin flour substitution significantly affected the taste of pumpkin sticks because the F-value was 5.6401 with a significant level (P-value) of  $0.00 < \text{from } 0.05$ . These findings concluded that the alternative hypothesis ( $H_a$ ), stating that the substitution of pumpkin flour significantly affected the taste of pumpkin sticks, was accepted. Meanwhile, the results of Duncan's test revealed that the panelists' preference level for formula A was not the same as formula B and formula C. The panelists liked and somewhat liked the three formulas. This study concluded that the substitution of 10% stick taste was the most preferable stick taste because earned the highest score (4.13).

### Textures

The organoleptic test of the stick texture discovered that the 10% substitution earned 3.40, which means that the panelists gave a somewhat favorable response to the crunchy texture. The average value of the 20% substitution was 2.95, indicating that the panelists disliked a slightly crunchy texture. Finally, the 30% substitution had an average score of 2.75. This score denotes that the panelists disliked a slightly crunchy texture.

The results of the analysis of variance (ANOVA) showed that the addition of pumpkin flour significantly affected the aroma of pumpkin sticks because the F-value was 2,517 with a significant level (P-value) of  $0.00 < \text{from } 0.05$ . These findings concluded that the alternative

hypothesis ( $H_a$ ), stating that adding pumpkin flour significantly affected the texture of the pumpkin stick, was accepted.

**Table 4. Organoleptic results on the textures of pumpkin sticks**

Formulas	Texture Scores
A (10%)	3.40 <sup>b</sup>
B (20%)	2.95 <sup>a</sup>
C (30%)	2.66 <sup>a</sup>

*Numbers followed by the same letters indicate no significant difference at the 0.05 level assessed by Duncan's test.*

Pumpkin flour with different amounts of substitution affected the resulted texture. The panelists assessed the formula with the criteria of likes and dislikes. The increasing addition of pumpkin flour made the texture less crunchy. In other words, adding too much pumpkin flour can make the texture not crispy.

## Discussion

The effect of different amounts of pumpkin flour substitution in each treatment affected the stick colors. The colors of the stick ranged from yellowish to yellow colors. The 10% pumpkin flour substitution had a faded yellow color resembling the color of the sticks in general. Meanwhile, the 20% pumpkin flour substitution produced a darker stick color. In fact, the normal color of the stick ranges from yellowish to yellow colors. Finally, a high level of pumpkin flour substitution by 30% produced a very different color from that of the stick in general. This difference occurred because adding more pumpkin flour decreased the acceptance of the color.

Pumpkin flour had a very significant effect on the aroma of pumpkin sticks. This result is almost similar to that of Rahmi et al. (2011) who investigated the use of pumpkin as a source of antioxidants and natural dyes in wet noodle products. Rahmi et al. (2011) discovered that pumpkin flour had a unique aroma, namely summer squash, and this aroma was different from that of wheat flour this results in a distinctive aroma. The more pumpkin flour used, the more distinctive the pumpkin aroma will be.

Pumpkin sticks made of various treatments produced a savory taste and a distinctive smell of pumpkin flour. Each treatment produced a different taste of pumpkin sticks. The 10% pumpkin flour substitution produced a taste similar to that of a stick in general. Taste is an indicator to determine the level of public acceptance of the resulted product. The 20% pumpkin substitution produced a savory taste with a slightly crunchy taste of pumpkin flour. Meanwhile, the addition of 30% pumpkin produced a more dominant taste of pumpkin flour.

According to Widyastuti (2015), the different flour content in each treatment determines the moisture content of the sticks, which affects the texture because the water content affects the appearance, texture, and taste of food. This statement is supported by Winarno (2002) who asserts that water is the most important component in food ingredients because it affects the appearance, texture, and taste of food. Pumpkin flour is hygroscopic or easily absorbs water because pumpkins contain pectin and fiber, which can bind water more significantly than wheat flour (Lestario et al., 2012).

## Conclusion

The stick acceptability analysis showed that the pumpkin flour substitution significantly affected colors, smells, texture, and taste of the sticks ( $0.00 < 0.05$ ). Formula A with 20% pumpkin flour substitution had the best hedonic test results for color, taste, and texture variables. Meanwhile, formula B had the most preferable smell. Research on the effects of pumpkin flour substitution on sticks should be continued by measuring the temperature in the frying pan and preferably on smoothing pumpkin flour by mashing it.

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