Properties of organoleptic nuggets with basic materials chicken intestine and breadfruit flour

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Abstract. The study evaluated the organoleptic properties from chicken intestines nugget with substitution 50% of breadfruit flour and tapioca flour. The treatments in this study consisted of without breadfruit flour (R1), the substitution of breadfruit flour 15% (R2), 25% (R3), 35% (R4), 50% (R5), 65% (R6), 75% (R7), 85% (R8), 100% (R9). A completely randomized design with 5 replications was used in this study. The substitute of breadfruit flour as a substitute treatment for tapioca flour. Parameters consist of texture, colour, and taste. The results of this study were panellists’ preference for nugget colour with the substitution of breadfruit flour 35% (R4) to 100% (R9) was significantly different (P<0.05) with R1. The aroma of nuggets with breadfruit flour 35% (R4), 50% (R5), 65% (R6), 85% (R8), and 100% (R9) were significantly different (P<0.05) with R1. The taste of chicken intestine nuggets with breadfruit flour substitution 25% (R3) to 100% (R9) was significantly different (P<0.05) than the control. The conclusion in this study substituting tapioca flour to replace breadfruit flour in 50% chicken intestine nuggets has different organoleptic characteristics in aroma, texture, colour, and taste. Substitution of breadfruit flour 50% can be applied to make nuggets made from chicken intestines.

1. Introduction
One of the by-products that have the potential to replace meat ingredients in the manufacture of livestock products is chicken intestines. Chicken intestines are a by-product of slaughtered chickens. The chicken intestine has a low marketable value but has complex nutrition. Chicken intestine crude protein content reached 39.97% [1], and 58.6–67.6% [2]. Chicken intestine is often used for fish feed and raw material for making intestinal chips, especially in Java. In Southeast Sulawesi, food made from chicken intestines is not yet popular. Most of the chicken intestines are disposed of as livestock waste. From the perspective of its existence, the nutritional content of chicken intestines Potential to be used as animal food products. Nugget is a preserved food that is very popular and practical. According to [3], nuggets are a processed product from milled meat that is seasoned, then mixed using a filling flour, adding bread flour to the surface, then frozen to maintain the quality during storage. The basic ingredients for making nuggets
come from chicken, beef, goat, and fish [4]. Research on nuggets with fish as a basic ingredient has been carried out [5].

Other ingredients used in making nuggets are fillers and spices such as garlic, nutmeg, pepper, salt, and sugar. The filler material comes from the type of flour. The ingredients of the filler added to the nugget product are aimed at forming a compact and compact nugget texture. The texture of the nuggets is formed by the gelatinization process of starch during nugget processing [6]. The addition of fillers will also increase the density and weight of the processed product by adding similar ingredients such as chicken intestine to reduce the portion of meat ingredients to save material costs [7]. The nutrient content of tapioca flour per 100 g of sample is 0.59% protein, 3.39% fat, 12.9% air, and carbohydrates 6.99% [8]. Other types of flour with high starch content can replace tapioca flour in making nuggets. Several researchers have reported the benefits of replacing tapioca flour with various other types of flour. According to [9] wheat flour, maize flour, jackfruit seed flour, and tapioca flour can be used as fillers for beef nuggets, the use of various types of flour does not show a significant influence on organoleptic quality on colour score and aroma but affects the flavour of the product. One type of flour that can be used as a filler (filler) is breadfruit flour.

Breadfruit (*Artocarpus communis*) is a source of carbohydrate food that grows in tropical regions such as Southeast Sulawesi. According to [10] breadfruit flour contains 84% carbohydrates, 9.9% water, 2.8% ash, 3.6% protein and 0.4% fat. Research related to the use of breadfruit flour in food has been carried out. Such as breadfruit flour as a filler for horse sausage [10], breadfruit flour in the production of cookies [11], and the use of breadfruit flour in making various kinds of other snacks [12]. In addition to its good nutritional content, the utilization of breadfruit flour in foodstuffs has a positive influence on organoleptic quality. This research is a continuation of the first phase study which successfully obtained 50% meat base combination and 50% chicken intestine [13].

Therefore, it is necessary to experiment with making chicken nuggets which are substituted by chicken intestine by adding tapioca flour and breadfruit flour as fillers with different percentages. This study aims to assess consumer palatability (organoleptic quality) of nugget products. The purpose of this study was to utilize intestinal slaughterhouse waste to become a nutritious food source. Likewise, it can utilize the potential of local plants to diversify food because, during the season, breadfruit is often found in Southeast Sulawesi at relatively cheap prices.

### 2. Materials and methods

| Table 1. List of nuggets raw material composition |
|-----------------------------------------------|
| Ingredient (%) | R1 | R2 | R3 | R4 | R5 | R6 | R7 | R8 | R9 |
| Chicken meat  | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Chicken intestine | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Tapioca | 100 | 85 | 75 | 65 | 50 | 35 | 25 | 15 | 0 |
| Breadfruit flour | 0 | 15 | 25 | 35 | 50 | 65 | 75 | 85 | 100 |
| Garlic | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| Ground pepper | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Salt | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 |
| Nutmeg powder | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| Flavouring | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Sugar | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Skim milk powder | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |

The materials used in this study consisted of meat and broiler intestines. The supporting composition of the nuggets includes tapioca, breadfruit flour, garlic, powdered pepper, salt, nutmeg powder, skim
milk, panir flour, and eggs. [14]. The process of making nuggets refers to [15] and [9], prescription adjustments. Chicken meat and chicken intestines 300 grams mashed using a blender. Then add ingredients such as ice, salt, sugar, pepper, garlic, skim milk, tapioca flour, and breadfruit flour according to the treatment. All ingredients are stirred homogeneously. After the mixing process is complete, the dough is moulded and then steamed. The steaming process uses temperatures between 60-70 °C in 30 minutes. After the steaming process, the nuggets are cooled to room temperature. Then the nuggets are stored in the refrigerator.

This half-cooked dough is then sliced 4 x 4 cm in size and 1 cm thick. After that, dip the nuggets in the egg and then coat the breadcrumbs. Nuggets that have been coated with panir flour can use palm oil for 30 seconds and a temperature of 200°C. A completely randomized design was used in this research. There were nine treatments with five replications.

| Table 2. Organoleptic scores of chicken intestine nuggets using breadfruit flour substitution |
|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| Parameter | Hedonic score | Criteria | R1 | R2 | R3 | R4 | R5 | R6 | R7 | R8 | R9 |
|----------|---------------|----------|----|----|----|----|----|----|----|----|----|
| Colour   | 1             | Dark brown |    |    |    |    |    |    |    |    |    |
|          | 2             | Brown    |    |    |    |    |    |    |    |    |    |
|          | 3             | Yellowish-brown |    |    |    |    |    |    |    |    |    |
|          | 4             | Yellowish gold |    |    |    |    |    |    |    |    |    |
|          | 5             | Yellow   |    |    |    |    |    |    |    |    |    |
|          | 1             | Very dislike |    |    |    |    |    |    |    |    |    |
|          | 2             | Dislike  |    |    |    |    |    |    |    |    |    |
| Aroma    | 3             | Enough to like |    |    |    |    |    |    |    |    |    |
|          | 4             | Like     |    |    |    |    |    |    |    |    |    |
|          | 5             | Very like |    |    |    |    |    |    |    |    |    |
|          | 1             | So rough |    |    |    |    |    |    |    |    |    |
|          | 2             | Rough    |    |    |    |    |    |    |    |    |    |
| Texture  | 3             | Medium   |    |    |    |    |    |    |    |    |    |
|          | 4             | Soft     |    |    |    |    |    |    |    |    |    |
|          | 5             | Very soft |    |    |    |    |    |    |    |    |    |
|          | 1             | Very dislike |    |    |    |    |    |    |    |    |    |
|          | 2             | Dislike  |    |    |    |    |    |    |    |    |    |
| Flavour  | 3             | Enough to like |    |    |    |    |    |    |    |    |    |
|          | 4             | Like     |    |    |    |    |    |    |    |    |    |
|          | 5             | Very like |    |    |    |    |    |    |    |    |    |

Source: [16], [3]

The treatments consisted of control without breadfruit flour (R1), followed by the addition of breadfruit flour 15% (R2), 25% (R3), 35% (R4), 50% (R5), 65% (R6), 75% (R7), 85% (R8), and 100% (R9). Data analysis was analysed using analysis of variance, while further testing was done with the Honest Significant Difference Test [17]. Organoleptic characteristics such as colour, aroma, texture, and taste were measured by a hedonic score using trained panellists (Table 2).

3. Results and discussion
The organoleptic quality variables of the nuggets studied in this study consisted of colour, texture, and taste, aroma of the nuggets. Table 3 describes the results of research on organoleptic of chicken nuggets made from 50% intestinal with breadfruit flour substitution
Based on the results of the study, the texture of chicken intestine nuggets was not significantly different for all treatments (R2-R9) and control (R0). The use of breadfruit flour substituted with tapioca flour...
did not affect the texture of chicken intestine nuggets. The average texture score is around 3.53-3.72, meaning that the texture of the nugget tends to be quite preferred. The texture is not affected by the addition of fillers. [15] stated that the addition of nugget fillers was relatively small (maximum 2.5%) so it did not give much effect on the colour, hardness, smell, and taste of nuggets.

The texture of processed products such as meat is greatly influenced by the water holding capacity of meat proteins. According to [21] added that meat fat also affected processed meat texture. The results of this study are following the research conducted by [22]. Smooth chicken nugget texture will determine consumer acceptance. According to [23] This means that the appearance of the product affects consumers in viewing quality and significantly influences the purchase of a product.

3.4 Flavour
The results of this study indicate that nuggets with breadfruit and tapioca flour substitutions at 15% (R2) were not significantly effect (P> 0.05) to R1. The substitution of breadfruit flour with a percentage of 25% (R3) to 100% (R9) was significantly effect (P <0.05) lower than without breadfruit flour (R1). The average score of flavour nuggets in Table 3 ranges from 2.23 - 3.11 based on the preferred level to the one that is quite liked by the panellists. The conclusion is that the substitution of breadfruit flour can improve the taste although there is a tendency for the taste score to decrease inversely with an increase in the substitution of breadfruit flour. Taste is generally influenced by the main raw materials, namely meat and chicken intestines, as well as additional ingredients in the form of spices and filling ingredients, besides the taste of nuggets, is also influenced by the temperature, method, and cooking time.

The added flavour plays a role in flavour formation which is strengthened by the presence of cooking [24-26]. The cooking method affects the taste and aroma of processed meat. Where the cooking method determines how many releases heterocyclic compounds are often found in cooked meat [27].

4. Conclusions
The conclusion in this study is that the substitution of breadfruit flour of nuggets with 50% chicken intestine has a significant effect (p <0.05) on the organoleptic properties (colour, aroma, texture, and taste) of the nuggets produced. The nugget product with breadfruit flour substitution at 50% (R5) as a whole show’s higher consumer acceptance.

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