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The Effect Of Gembili Flour Substitution (*Dioscorea Esculenta L.*) In Making Chicken Filled Dumpling Skins Regarding Physical Properties And Sensory Quality

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Abstract

This study aims to analyze the effect of gembili flour substitution in the production of chicken-filled wonton wrappers on the physical properties and Sensory quality tests. The research was conducted at the Food Processing Laboratory, Department of Culinary Education, Universitas Negeri Jakarta. The study period was from May 2024 to September 2025. The research method used was an experimental method. The samples in this study were chicken-filled wonton wrappers substituted with gembili flour at levels of 5%, 10%, and 15%. Based on the results of statistical hypothesis testing using ANOVA for the physical properties test, it was found that the substitution of gembili flour had no significant effect on cooking loss. Furthermore, the results of statistical hypothesis testing using the Kruskal-Wallis test showed that there was no significant effect of gembili flour substitution on all sensory quality aspects evaluated, including the aroma of the gembili flour in the wrapper, the aroma of the chicken filling, the color of the wrapper, the taste of the wrapper, the taste of the filling, the taste of the gembili flour in the wrapper, texture (crispiness), and oil absorption. The conclusion of this study recommends the 15% gembili flour substitution in chicken-filled wonton wrappers to be further developed as a product with commercial potential and as an effort to promote the utilization of gembili flour as a local food ingredient.

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1. INTRODUCTION

In the early Three Kingdoms period (circa 220–280 BC), dumplings were introduced to China, already resembling their modern form, and served as a dish. Then, during the Qing Dynasty (1644–1911), dumplings' popularity increased rapidly, spreading throughout various regions, making them one of the fastest-growing culinary traditions of the period.(Haryudyanti, 2020)During the Qing Dynasty, an entrepreneur started a dumpling restaurant, which was then managed by his entire family for generations. The family also traveled to various provinces, integrating Chinese culinary principles and traditions into their dishes. Meanwhile, during the Ming Dynasty, dumplings, known as*jiao'er*first made by a physician.

The culinary world is growing rapidly, and food consumption is also increasing. Wonton skins are very popular among the public. Wontons are made from wheat flour mixed with water, eggs, salt, and fat or oil, and formed into thin, elastic sheets. (Cordoba, 2015). The next step in serving dumplings is frying, steaming, or boiling them. Most dumplings are eaten with chicken noodles,

either fried or boiled. The process used in this dumpling research is frying. The process of making dumpling skins with chicken filling uses the following method: deep frying(fry in plenty of oil). Chicken-filled wonton skins can be served as a snack or with meatballs, noodles, and chicken noodles.

Gembili tubers are white and traditionally steamed or boiled in Indonesia. These tubers have the potential to be developed as a raw material for flour.(Teti Estiasih, Widya Dwi Rukmi Putri, 2017)Indonesia still imports wheat flour from other countries to meet its wheat flour needs. To reduce wheat flour imports, it's necessary to diversify food products based on tubers, such as yams beans. Yam bean flour has the potential to be used in making wonton skins. (Dwi Prameswari and Estiasih, 2013).

According to Prabowo, Estiasih, and Purwantiningrum (2014), Gembili (Dioscorea esculenta L.). It is a tuber from the family Dioscoreacea, which has the advantage of a relatively high starch content and the bioactive compound inulin. Processing local tubers into flour products can be an alternative source of local food ingredients that can support food security with continual availability.

Several studies have been conducted on the use of gembili flour, namely in making bread, noodles, cakes, and cookies. Gembili flour can replace or substitute wheat flour. Several studies have been conducted on gembili flour, specifically substituting gembili starch for cheese sago.(Yuni Mulyana, 2023), Substitution of gembili flour in making white bread(Adiansah et al., 2023), substitution of gembili flour in brownie roast (Qolbiah, Kiranawati, and Larasati, 2021), substitution of gembili flour in making cookies (Dwi Amalia, 2024). In addition to these products, gembili flour will be applied to food products, one of which is dumpling skin.

Based on the descriptions above, to optimize the basic ingredients for making chicken-filled dumpling skins, researchers will innovate by replacing some of the wheat flour with gembili flour. This research is expected to increase product variety and reduce wheat flour use.

2. MATERIALS AND METHODS

2.1 Research methods

The research method used in this study is an experimental method to determine the effect of substitution of gembili flour on the physical properties and sensory quality of chicken-filled dumpling skins. The population in this study is chicken-filled dumpling skins substituted with gembili flour with samples consisting of chicken-filled dumpling skins substituted with gembili flour with percentages of 5%, 10%, and 15%. The sampling technique is random *sampli*ng, where each sample is given a random three-digit code known only to the researcher.

2.2 Data Collection and Analysis Techniques

Data collection in this study was carried out in stages, starting with product validation by 5 (five) expert panelists, namely lecturers from the Culinary Arts Education Study Program, Jakarta State University. Next, the samples were tested on 45 somewhat trained panelists, namely students from the Culinary Arts Study Program, Jakarta State University, to assess the sensory quality in terms of the aroma of the wonton skin gembili flour, the aroma of the chicken filling, the color of the wonton skin, the taste of the wonton skin, the taste of the chicken filling, the taste of the wonton skin gembili flour, the texture (crispyness), and the oil absorption capacity, using a scale *liked*. Then the samples were tested for their physical properties using a digital scale for the physical aspects of *cooking loss*.

Sensory quality test data analysis was conducted using the Kruskal-Wallis test followed by Tukey's test. Physical property tests were conducted on the following aspects: *cooking loss*. Data obtained from the analysis of physical property tests was carried out with the ANOVA test to determine the effect of each treatment. If there is an effect, it will be continued with the Duncan test.

2.3 Making Gembili Flour

The process of making gembili flour begins with clean equipment and high-quality ingredients, such as tubers that are undamaged, not too old, and smell fresh. Next, the gembili tubers are weighed and washed to remove any dirt, then peeled and washed again until clean. After washing, the gembili is thinly sliced. The soaked and drained gembili are then arranged on a baking sheet and dried in the sun for 1-3 days. The dried gembili are then ground and sieved using a 200-mesh sieve to obtain a fine flour. The sifted gembili flour is then stored in an airtight container.

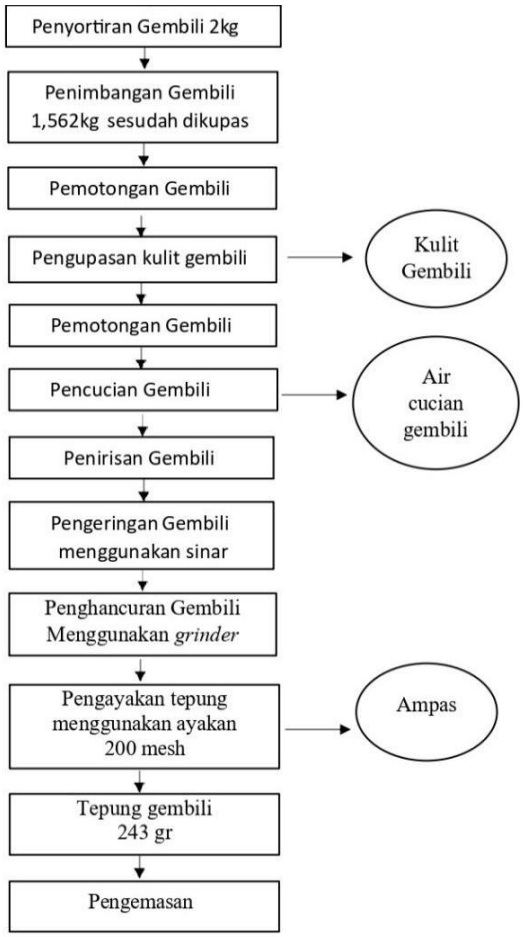

Figure 1: Flowchart of Gembili Flour Production

2.4 Making Chicken-Filled Dumpling Skins

Table 1. Formula for Chicken-Filled Dumpling Skin with Gembili Flour Substitution

Material	**Unit**					
	Gram	**5%**	**Gram**	**10%**	**Gram**	**15%**
Flour	**237,5**	**95**	**225**	**90**	**212,5**	**85**
Gembili Flour	**12,5**	**5**	**25**	**10**	**37,5**	**15**
Warm water	100	40	100	40	100	40
Margarine	50	20	50	20	50	20
Egg yolk	24	9,6	24	9,6	24	9,6
Salt	2	0,8	2	0,8	2	0,8
Flavoring	2	0,8	2	0,8	2	0,8

Chicken Filling

Material	**Gram**	**%**
Chicken	125	100
Garlic	6	4
Salt	1	0,8
Flavoring	1	0,8
Oyster sauce	1	0,8

Chicken Glue

Material	Amount	
	Gram	%
Cornstarch	2	100

Making dumpling skins filled with chicken begins with preparing equipment and ingredients such as chicken, garlic, salt, pepper and flavoring, the chicken that has been washed clean is then ground with...*chopper*, then sauté the crushed garlic until fragrant, then add the chicken and sauté until slightly dry, then remove and *chopper*. Return and store in a bowl, after that the sautéed chicken is left for a moment so that it is not hot then add cornstarch and weigh it as much as 2 grams then round it. After the chicken filling has been made then make the dumpling skin dough. Prepare ingredients such as wheat flour, eggs, margarine, water, margarine, salt, and flavoring. All ingredients are weighed, then the wheat flour, eggs, margarine, water, margarine, salt, and flavoring are mixed using a spatula. The dough has been mixed evenly and rested for 30 minutes. After resting, the dough is thinned using a pasta *maker* until it becomes a fairly thin sheet number 2 measuring 1 mm, then cut the dumpling skin sheet with a ring. *The* D9 dumplings are then filled and shaped like coins. The shaped dough is then fried in oil at 160°C for 2-4 minutes. After draining, the chicken-filled dumpling skins are then packaged in a sealed container to maintain their crispy texture.

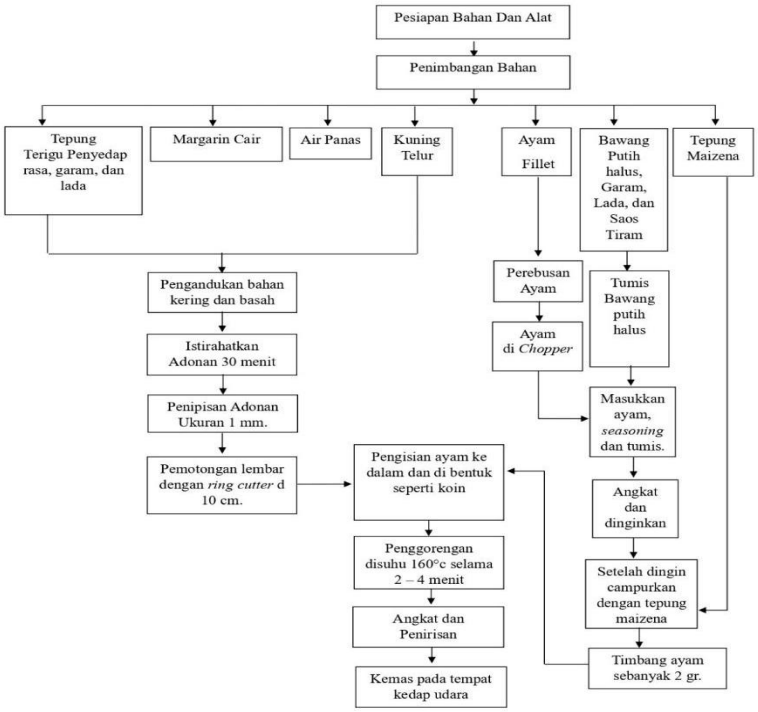

Figure 2: Flowchart for making chicken-filled dumpling skins.

3. RESULTS & DISCUSSION

3.1 Physical Properties

a. *Cooking Loss*

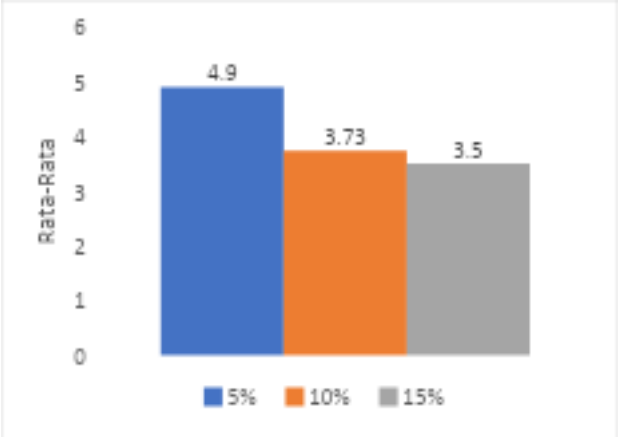

Figure 3 Average Graph of *Cooking Loss*

The results show that the calculated F is 0.60 with α = 0.05, the degree of freedom of treatment (dbp) is 2, and the degree of freedom of error (dbg) is 6, the F-table is 5.14. These results indicate that the calculated F < Ftable, which means H_0accepted and H_1rejected, then

there is no influence on cooking. *Chicken-filled* dumpling skins are substituted with 5%, 10%, and 15% gembili flour. This is because gembili flour also has a fairly high starch content, particularly amylopectin, which functions to absorb water content in food ingredients so that all water content is absorbed during the mixing process. (Richana and Sunarti, 2004).

3.2 Sensory Quality

Table 2 Average Results of Sensory Quality Test

Testing Criteria	Treatment		
	5%	10%	15%
Aroma of Gembili Flour	3,6[a]	4,2[a]	4,4[a]
Aroma of Chicken Stuffing	4,4[a]	4,5[a]	4,2[a]
Dumpling Skin Color	4[a]	4,3[a]	4,2[a]
Dumpling Skin Flavor	4,3[a]	4,3[a]	4,4[a]
Chicken Stuffing Flavor	4,2[a]	4,4[a]	4,3[a]
Gembili Flour Flavor	4[a]	4,2[a]	4,2[a]
Texture (Crispiness)	3,5[a]	4,1[a]	4,0[a]
Oil Absorption Capacity	2,4[a]	2,7[a]	2,4[a]

Note: The same notation on the same line has no significantly different meaning.

Aroma of Gembili Flour

Based on the Kruskal-Wallis test assessment data, it was shown that the substitution of gembili flour did not affect the aroma aspect of gembili flour. This is demonstrated in x^2count = 4.343, which is smaller than x^2table = 5,991.

Aroma is the smell of food products. Aromatic compounds are volatile, so they can easily reach the olfactory system at the top of the nose. (Monikha, Umbara, and Azizah, 2020).The higher the amount of gembili flour used, the more dominant the distinctive gembili aroma. However, the distinctive aroma of the chicken-filled dumpling skin is influenced by several ingredients, including margarine, eggs, and flour.

Aroma of Chicken Stuffing

Based on the Kruskal-Wallis test data, it was shown that the substitution of gembili flour did not affect the aroma of the chicken filling. This is demonstrated in Fig. x^2count = 1.175, which is less than x^2table = 5,991.

The dominant aroma in fried dumpling products generally comes from the Maillard reaction and fat oxidation that occurs ot the surface of the skin during the frying process, not from the chicken filling inside. (Kumar, 2021), The frying process produces volatile compounds such as aldehydes, ketones, and pyrazines, which give fried foods their distinctive aroma. These compounds form primarily in the skin due to direct contact with high temperatures and oil.

Dumpling Skin Color

Based on the Kruskal-Wallis test assessment data, it was shown that the substitution of gembili flour did not affect the color of the dumpling skin. This is demonstrated in x^2count = 2.449, which is smaller than x^2table = 5,991.

The usual color change will be brownish-yellow. When frying, it can cause a Maillard reaction.(Afifah, 2020). Color is also related to panelist acceptance, so selecting the right substitute ingredients is crucial to producing a product with optimal visual appeal. Furthermore, color characteristics are influenced not only by the type of flour used but also by processing methods such as frying.

Dumpling Skin Flavor

Based on the Kruskal-Wallis test assessment data, it was shown that the substitution of gembili flour did not affect the taste of the dumpling skin. This is demonstrated in x^2count = 0.148, which is smaller than x^2table = 5,991.

Taste is one of the main factors determining the level of acceptance of a food product. Scientifically, the assessment of taste is subjective because each individual has different perceptions and preferences regarding the taste of a food. According to D Setyaningsih (2010) the human sense of taste is capable of recognizing four basic tastes: sweet, sour, salty, and bitter, as well as additional flavors such as spicy and savory (umami). These can overlap or enhance each other depending on the composition of the food's ingredients. In this case, the carbohydrate and fiber content of gembili flour do not contribute dominant flavors and therefore do not alter the flavor profile of the final product.

Chicken Stuffing Flavor

Based on the Kruskal-Wallis test assessment data, it was shown that the substitution of gembili flour did not affect the flavor of the chicken filling. This is demonstrated in x^2count = 0.492, which is smaller than x^2table = 5,991.

This indicates that the addition of gembili flour to the dumpling skin formulation does not provide a real change in the overall taste of the product. The absence of this effect is thought to be because the dominant taste of the dumpling product is more influenced by the chicken filling and spices used, not by the composition of the flour in the skin.

Gembili Flour Flavor

Based on the Kruskal-Wallis test assessment data, it was shown that the substitution of gembili flour did not affect the taste of gembili flour. This is demonstrated in x^2count = 0.537, which is smaller than x^2table = 5,991.

The use of margarine serves to reduce the taste of gembili flour, which is not very tasty, according to Monika (2020). The high proportion of gembili flour causes a strong gembili aroma in the bagelen dry bread.

Texture (crispiness**)**

Based on the Kruskal-Wallis test assessment data, it was shown that the substitution of gembili flour did not affect the texture (crispiness). This is shown in x^2count = 4.8, which is smaller than x^2table = 5,991.

According to Jamaluddin (2018), frying at a temperature range of 160-190°C will result in a fast frying process and produce food products with a crispy texture, golden color, and good aroma with an oil absorption rate of around 8-25%. Research results(Arum Anugrahati, 2017) show that the texture of snacks such as dumpling skins is greatly influenced by the raw materials and processing process, especially ingredients containing starch such as tapioca flour, rice, and sticky rice. The amylopectin content in starch contributes to the characteristics of a crispier texture because it forms a strong structure during heating.

Oil Absorption Capacity

Based on the Kruskal-Wallis test assessment data, it was shown that the substitution of gembili flour did not affect oil absorption. This is demonstrated in x^2count = 1.044, which is smaller than x^2table = 5,991.

This indicates that during the frying process, the amount of oil absorbed is more influenced by the characteristics of the dumpling skin and frying conditions, rather than by the composition of the chicken filling inside. Farkas (1996) states that the oil absorption process in fried foods is mainly determined by physical and chemical changes in the surface layer, which occur due to water evaporation and pore formation during frying.

4. CONCLUSION

In the physical properties test of dumpling skin filled with chicken substituted with gembili flour at percentages of 5%, 10%, and 15%, in the aspect*cooking los*sstated that there was no effect of substituting gembili flour in making pangdit skin filled with chicken.

There was no effect of substitution of gembili flour in chicken-filled dumpling skins on the sensory quality aspects of gembili flour aroma, chicken filling aroma, color, dumpling skin taste, chicken filling taste, gembili flour taste, texture, and oil absorption of chicken filling. Therefore, chicken-filled dumpling skins with 15% gembili flour substitute treatment are recommended as an effort to utilize gembili tubers and alternative local food ingredients.

5. ACKNOWLEDGEMENT

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