

Original Research

ANALYSIS OF THE ACCEPTABILITY AND NUTRITIONAL CONTENT OF CHICKEN NUGGETS WITH THE ADDITION OF TEMPE AND EGGSHELL FLOUR AS AN ALTERNATIVE SNACK FOR SCHOOL CHILDREN.

ANALISIS DAYA TERIMA DAN KANDUNGAN ZAT GIZI NUGGET AYAM DENGAN PENAMBAHAN TEMPE DAN TEPUNG CANGKANG TELUR SEBAGAI ALTERNATIF JAJANAN ANAK SEKOLAH

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Abstract: *Background: School children's snack food needs to be considered because it plays an important role in providing the nutrients needed by school-age children, especially protein and calcium. Tempe is a vegetable product that can increase protein intake and has potential as a functional food. Chicken egg shells are a source of calcium that has not been utilized optimally and can be used as an additive in processed products to increase calcium content. Chicken nuggets with the addition of tempe and eggshell flour can be recommended as an alternative snack for school children which contains good nutrition. Objective: To find out the acceptability and nutritional content of chicken nuggets with the addition of tempe and egg shell flour as an alternative to school children's snacks*

Research methods: This study used an experimental research design consisting of three treatments (F1, F2, F3). The test was carried out in 2 stages, namely the organoleptic test to see the level of preference of the panelists for the nuggets and the test for the nutritional content of the nuggets, namely protein, carbohydrates and calcium. Results: The results showed that the most preferred chicken nugget in terms of color, aroma and taste was the F3 formula. Chicken nuggets in the best treatment had protein (30.61%) carbohydrates (15.21%) and calcium (8mg). These chicken nuggets can be used as an alternative for school children.

Key word: School snacks, Chicken nuggets, Tempe, Eggshell Flour, Protein, Calcium

1. INTRODUCTION

Consumption of street food in school children is a habit that occurs almost all over the world [1]. Children generally choose snacks based on price, prizes, portion size, aroma, and also the freedom to make their own choices, so that school children's snack foods must be a concern. Because this has an important role in the source of nutrient intake for school-age children. In addition to requiring energy intake, school-age children need food intake that is high in protein and calcium.

The recommended protein intake for school-age children is 40 grams [2] Protein has an important role in the nutritional intake needs of children. Children's protein needs include tissue maintenance, changes in body composition, and the formation of new tissues[3] Lack of protein intake is still a problem of malnutrition in school-age children in Indonesia[4]. Balanced nutritional intake is very much needed by school-age children, in addition to protein intake, mineral intake is also very much needed.

Minerals that play an important role in the body's metabolism include calcium and iron. Calcium has an important role for the growth of school-age children. Calcium intake in school-age children is recommended at 1200 mg, the type of food consumed by school-age children affects calcium absorption, while the amount of calcium that can be utilized by the body depends on its biological availability. Calcium absorption ranges from 30% -60% of intake consumed[5].

One effort to increase protein and calcium intake is by adding food ingredients. One vegetable product that is quite popular among the public is tempe. Tempe is considered a functional food. After fermentation, there is an increase in free amino acids of 7.3% to 30%. This is because during fermentation, *Rhizopus* and bacteria will produce protease enzymes, so that proteins are broken down into free amino acids [6]. This fermentation process causes amino acids, fatty acids and total isoflavones in tempe to increase much higher than in soybeans so that it has the potential to be used in the diet as a source of nutritious food[7].

Sources of calcium can be obtained from several types of animal and vegetable food products. In addition, a source of calcium can also be obtained from production residues that are currently not optimally utilized, such as chicken egg shells. Chicken eggshell is one of the by-products derived from chicken breeding activities. Egg shells contain calcium carbonate which has a bioavailability of approximately 40%, and this 40% bioavailability is in the good category[8]

Research by Safitri (2014) states that 100 grams of eggshell flour contains 7.2 grams of calcium[9]. Egg shells that have been made into flour can be used as an additive in processed products to increase the calcium content, which is called substitution. Substitution is the addition of certain nutrients to a food product that is made to resemble or replace the original food product.

One of the processed products that can be made from a flour mixture is nuggets. Nuggets are a popular food that is easy to prepare and liked by children. The main ingredient of nuggets is generally chicken meat, the weakness of chicken nuggets is the lack of fiber and high fat. Tempe is a raw material that has the potential to substitute chicken meat

With the production of chicken nuggets with the addition of tempe and eggshell flour, it can be recommended as snacks for school children. Therefore, researchers are interested in conducting an experiment entitled "Analysis of Acceptability and Nutritional Content of Chicken Nuggets With the Addition of Tempe and Eggshell Flour as Alternative Snacks for School Children"

2. METHODS

Research Location and Time

This research was conducted from January to February 2023, The organoleptic test was carried out at the Food Technology Laboratory of the Pontianak Ministry of Health, Department of Nutrition and tests for protein, carbohydrate and calcium levels were carried out at Sucofindo Jl. Adisucipto

Materials and Tools

The materials used in this study were tempe, eggshell flour, chicken meat, tapioca flour, panir flour, ice water, pepper, salt, sugar, nutmeg, coriander, flavoring. The following stages in making nuggets are the ingredients used as needed. The tools used in making nuggets in this study were scales, knives, spoons, stoves, pans, basins, pans, blenders, basins, filter cloths, stirrers.

Research Design

This type of research is experimental, with 3 treatments P1 (45 Tempe: 5 Eggshell Flour) P2 (40 Tempe: 10 Eggshell Flour) P3 (35 Tempe: 15 Eggshell Flour).. Research that uses trials to determine the level of preference of panelists is somewhat trained in testing taste, color, texture, and aroma. And know the levels of protein, levels of carbohydrates and levels of calcium.

Formulation Nuggets

Table 1 Formulation of Chicken Nuggets with the Addition of Tempe and Eggshell Flour as Alternative Snacks for School Children

| Material | F1 | F2 | F3 |
|-----------------|-----------|-----------|-----------|
| Tempe | 450 gr | 400 gr | 350 gr |
| Egg shell flour | 50 gr | 100 gr | 150 gr |
| Chicken meat | 500 gr | 500 gr | 500 gr |
| Tapioca flour | 90 gr | 90 gr | 90 gr |
| Bread crumb | 200 gr | 200 gr | 200 gr |
| Air it | 100 gr | 100 gr | 100 gr |
| Pepper | 10 gr | 10 gr | 10 gr |
| Salt | 30 gr | 30 gr | 30 gr |
| Sugar | 40 gr | 40 gr | 40 gr |
| Nutmeg | 5 gr | 5 gr | 5 gr |
| Coriander | 5 gr | 5 gr | 5 gr |
| Flavoring | 20 gr | 20 gr | 20 gr |

Research procedure

The procedure for making nuggets is divided into 2 of them:

A. Stages of making eggshell flour (*Processing of Waste and Livestock Products, 2014*)

1. Washing
2. Hot water immersion t:15 minutes
3. Drying temperature T: 80°C and oven t: 45 minutes
4. Grinding and Sieving 80 mesh
5. Eggshell flour

B. Stages of making nuggets (*Pujilestari, 2020 with a modification*)

1. Tools and materials are prepared
2. Tempe nuggets are made by dicing tempe which functions to expand the surface of tempe, then boiling tempe in 1000 ml salt water at temperature T: 70-80°C for t: 15 minutes which aims to inactivate the enzymes in tempe so it doesn't smell rancid. and reduce the unpleasant aroma of tempe.
3. Chicken meat, tapioca flour and tempe are put into a food processor along with complementary spices for making nuggets until a nugget dough is formed
4. Add the eggshell flour and grind again

5. Margarine is smeared onto the baking sheet, the mixture is poured and steamed (T: 70°C, t: 45 minutes), then cool in the refrigerator (t: 3 hours, temperature 0-2 °C), leave it in an open space and cut the nuggets with size 4x2 cm.
6. Nuggets that have been cut are smeared with panir flour, and put in a plastic seal, stored in the freezer and or fried.

Processing and analysis of data

The data obtained were grouped and tabulated, then statistically analyzed using the Friedman test using the application Microsoft Excel 2007

2. RESULTS AND DISCUSSION

Product Description

Nuggets are processed food derived from meat which generally comes from chicken meat and nuggets are ready-to-eat preparations that can be consumed at any time by storing at low temperatures. In this research, chicken-based nuggets were made with the addition of tempe, eggshell flour, tapioca flour and flavorings with different treatments. The resulting nuggets are 4x2 cm in size and weigh 15 grams and in one recipe produces 8 nuggets.

The color of the chicken nugget with the addition of tempe and egg shells in the F3 treatment was more golden yellow than the other treatments. The texture produced by the F3 treatment has a more dominant composition of chicken meat compared to the F1 and F2 treatments and causes a more chewy texture.

Color

Based on the organoleptic test of color on Chicken Nugget with the Addition of Tempe and Eggshell Flour, it can be seen in Figure 1

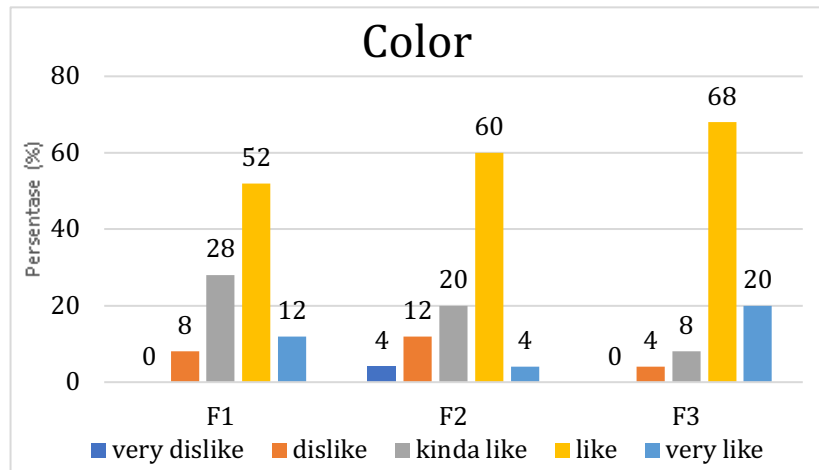


Figure 1 Test Graphic Organoleptic Based on Color

The results of the organoleptic test based on the color of the chicken nuggets with the addition of tempe and eggshell flour showed that the panelists' acceptance of the colors of the three formulations obtained the highest percentage in the F3 formula with the criteria of "very like" which was 20% which was preferred by the panelists. Formula F3 has a more golden yellow color compared to other formulas. Formula F3 is the formula with the most addition of eggshell flour, namely 15. Based on the Friedman test with a 95% confidence level, it shows that there is an effect of adding tempe and eggshell flour to chicken nuggets from organoleptic quality based on color.

The color of the resulting nuggets is brownish, this is influenced by the process of frying the nuggets and the addition of eggshell flour which has a slightly brownish white color.

This color is produced from the characteristic initial color of the outer shell of the egg which is brownish in color and also the baking process changes the color of the eggshell to brown including the inner shell.

Research by Telisa (2022) stated that the mixing of eggshell flour was not significantly different in the organoleptic preference value for aroma [27]. 17 This was due to the use of chicken eggshell powder in the F1, F2 and F3 treatments at most up to 3% of the total dough so that it did not change the original aroma of tekwan, which smelled of snakehead fish. Another study stated that the mixing of eggshell flour was not significantly different on the organoleptic preference value for aroma.

Aroma

Based on the organoleptic test for the aroma of Chicken Nuggets with the Addition of Tempe and Eggshell Flour, it can be seen in Figure 2

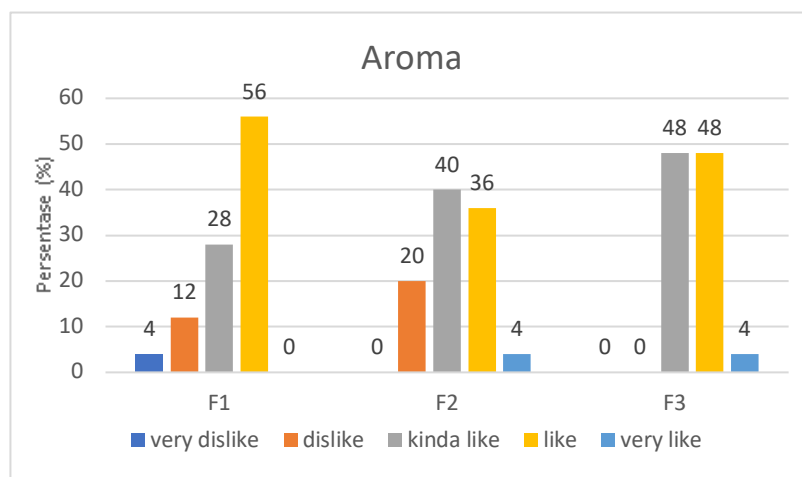


Figure 2 Test Graphic Organoleptic Based on Aroma

Aroma can determine the delicacy of a food product. The taste of food consists of smell, taste and mouth stimulation. The aroma produced from a food product largely determines the delicacy and level of consumer acceptance of a product, because before being eaten the consumer will smell the product first, because a pleasant aroma will attract the attention of consumers (Nurdjanah, 2017).

The results of the organoleptic test based on the aroma of chicken nuggets with the addition of tempe and eggshell flour showed that the panelist's acceptance of the aroma of the three formulations obtained the highest percentage in formulas F2 and F3 with the criteria of "very like" which was 4% which was preferred by the panelists. Based on the Friedman test with a 95% confidence level, it showed that there was no effect of adding tempe and eggshell flour to chicken nuggets on organoleptic quality based on aroma. This is because in the three formulations there are no ingredients that have an aroma that has a significant effect on the aroma of chicken nuggets.

The addition of tempe and eggshell flour in several percentages did not change the aroma of chicken nuggets. This was supported by research by Meikawati & Suyanto (2014) which stated that mixing eggshell flour with mocaf flour did not significantly differ in the organoleptic preference value for aroma. Furthermore, in the study Merta (2020) explained that the addition of purebred chicken egg shell flour had no significant effect on the aroma of chicken nuggets, but there was a tendency to decrease the level of preference of panelists along with an increase in percentage (0%, 5%, 10%, 15% and 20%) chicken eggshell flour which is added to the nuggets. This is because the aroma of chicken meat in the nuggets decreases with the addition of egg shell flour in the mixture. Chicken nuggets on average. The value of the aroma test without the

addition of eggshell flour, the addition of 0.15%, 0.30% and 0.45% decreased, although very little. This is because the added eggshell flour has a smoky aroma.

Fat

Based on the organoleptic test of taste on Chicken Nuggets with the Addition of Tempe and Eggshell Flour, it can be seen in Figure 3

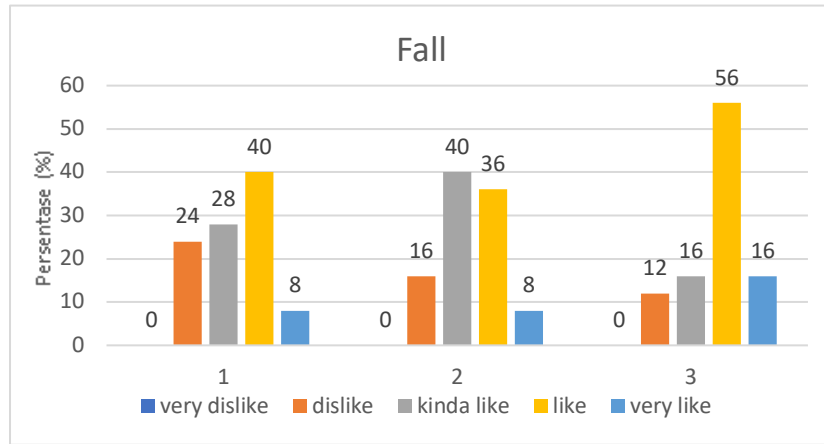


Figure 3 Test Graphic Organoleptic Based on Feel

The results of the organoleptic test based on the taste of the chicken nuggets with the addition of tempe and eggshell flour showed that the panelist's acceptance of the aroma of the three formulations obtained the highest percentage in the F3 formula with the criteria of "very like" which was 16% which was preferred by the panelists. Formula F3 has a more dominant chicken meat taste compared to formulas F1 and F2. Based on the Friedman test with a 95% confidence level, it shows that there is an effect of adding tempe and egg shell flour to chicken nuggets on organoleptic quality based on taste. The resulting taste is influenced by tempe and chicken meat. The reduced taste of tempe caused panelists to prefer more chicken meat formulations, because chicken meat has a taste that can be accepted by all groups of people and all ages. Apart from chicken and tempe, the flavors are also enhanced by supporting spices in the making of nuggets, resulting in a more savory taste to be enjoyed.

Texture

Based on the organoleptic test of the texture of the Chicken Nugget with the Addition of Tempe and Eggshell Flour, it can be seen in Figure 4

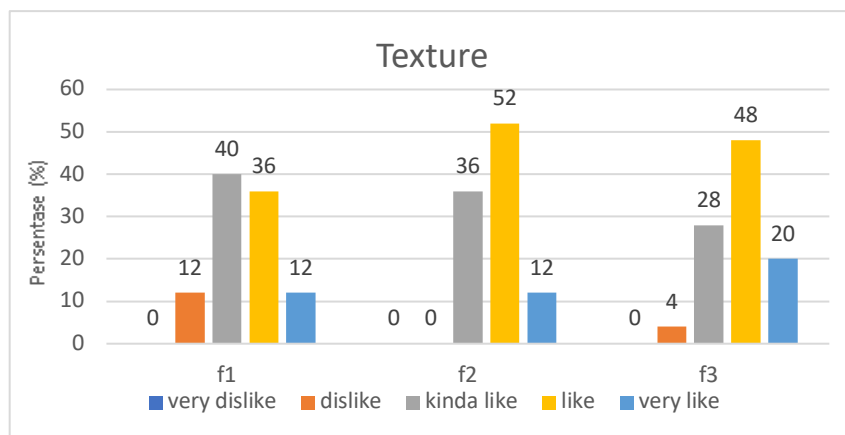


Figure 4 Test Graphic Organoleptic Based on Texture

The results of the organoleptic test based on the texture of the chicken nuggets with the addition of tempe and eggshell flour showed that the panelist's acceptance of the aroma of the three formulations obtained the highest percentage in the F3 formula with the criteria of "very like" which was 20% which was preferred by the panelists. The F3 formula has a more dominant chicken meat composition compared to the F1 and F2 formulas and causes a more chewy texture. Based on the Friedman test with a 95% confidence level, it shows that there is an effect of adding tempe and eggshell flour to chicken nuggets from organoleptic quality based on texture.

The texture produced by chicken nuggets tends to be coarser in texture than formulas 1 and 2, due to the greater addition of eggshell flour to formula 3. This is in line with the research of Ardin (2019) that eggshell flour added to karasi cakes with the composition very much giving a hard, crunchy texture but acceptable to the panelists. Brun (2011) explained that although the particle size of eggshell flour obtained at home, namely processing with a rolling pin and sieve is larger than processing in the laboratory, the flour can be used as a food supplement in several food items. The best dishes to add chicken eggshell powder to are nuggets, bread, pizza and spaghetti where there is a small change in texture without a change in taste.

Overall Responsiveness

The results of acceptability include color, aroma, taste and texture of each treatment which is calculated based on the R value on the Friedman test, the most preferred treatment by the panelists is obtained with the highest value at (F3) of 543, this relates to the formulation of 3 ingredients of tempe and egg shells using a ratio of 35: 15 which in this formulation results in reduced use of tempe which can produce tasty nuggets and the use of eggshell flour which does not cause a rough taste in the mouth on the nuggets so that in formulation 3 this is liked by many panelists and is the chosen and necessary formulation getting attention to MSME products in order to increase the diversity of food products by utilizing eggshell flour

Protein

Test the protein content of chicken nuggets with the addition of tempe and eggshell flour on May 2, 2023 at Sucofindo. The chicken nuggets that were tested for protein content were the selected chicken nuggets, namely formulation 3. The carbohydrate content test was carried out using the method *springl*. In this study, the protein content of chicken nuggets with the addition of tempe and egg shell flour was 30.41%, which met the requirements of SNI NO. 10-6683-2014 which is a minimum of 9%. This is due to the addition of tempe, this is because tempe is a source of vegetable protein

Carbohydrate

Test the carbohydrate content of chicken nuggets with the addition of tempe and eggshell flour on May 2, 2023 at Sucofindo. The chicken nuggets that were tested for carbohydrate content were the selected chicken nuggets, namely formulation 3. The carbohydrate content test was carried out using the method by diferent.. In this study, the protein content of chicken nuggets with the addition of tempe and egg shell flour was 15.21%, which met the requirements of SNI NO. 10-6683-2014 which is a maximum of 25%.

Kalsium

Test for calcium levels in chicken nuggets with the addition of tempe and eggshell flour on May 2, 2023 at Sucofindo. The chicken nuggets that were tested for carbohydrate content were the selected chicken nuggets, namely formulation 3. The calcium content test was carried out using the AOAC method. In this study, the calcium content in chicken nuggets with the addition of tempe and egg shell flour of 8 g met the requirements of SNI NO. 10-6683-2014 which is a maximum of 50%.

Increasing the percentage of addition of eggshell flour resulted in an increase in the level of calcium nuggets produced. This is in accordance with the research by Safitri (2014), which stated that the addition of eggshell flour had a significant effect on the calcium levels of soy milk, where the higher the addition of eggshell flour, the higher the calcium contained in soy milk.

3. CONCLUSION

Based on the results of the study of Acceptance Analysis and Nutritional Content of Chicken Nuggets With the Addition of Tempe and Eggshell Flour as Alternative Snacks for School Children, it can be concluded that:

1. There is an effect of adding tempe and eggshell flour to chicken nuggets in terms of organoleptic quality based on color
2. There was no effect of the addition of tempe and eggshell flour on sari chicken nuggets in terms of organoleptic quality based on aroma.
3. There is an effect of adding tempe and eggshell flour to the sari chicken nuggets in terms of organoleptic quality based on taste.
4. There is an effect of adding tempe and eggshell flour to the sari chicken nuggets in terms of organoleptic quality based on texture

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