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# The effects of adding amaranth spinach (*Amaranthus spp*) on nugget tofu nuggets' nutritions and organoleptics

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## Abstract

The use of amaranth spinach to increase the nutritional values in a food is considered beneficial for health. To date, tofu dregs are considered waste and underestimated because they are only used as manure. An alternative to process tofu dregs is making tofu dreg nuggets. This study aimed to determine the effects of adding 100 g, 200 g, and 300 g amaranth spinach on the organoleptic and chemical properties of tofu nuggets. This study used an experimental design. The organoleptic test was conducted at the Unggul Lampeunerut Elementary School, and the test was conducted at the Laboratory of Nutrition Science and Food Technology, Universitas Syiah Kuala, Banda Aceh. The analysis of variance found that the tofu dreg nuggets' color earned the highest average value of 3.65. Meanwhile, the highest average values of the aroma, taste, and texture were 3.74, 3.70, and 3.82, respectively. The highest average values of protein, crude fiber, and water were 5.99, 4.71, and 52.80, respectively. Moreover, this study revealed that adding different amounts of amaranth spinach to nuggets significantly affected the organoleptic values of colors, aromas, tastes, and textures. However, this addition did not significantly affect the chemical content of tofu nuggets, such as protein, crude fiber, and water. Further research should investigate the addition of other material compositions to tofu dreg nuggets because the chemical characteristics of tofu dregs nuggets in this study are still below the SNI standard.
**Keywords**: amaranth, nugget, tofu dregs, organoleptic

## Introduction

Nuggets are one of the semi-finished processed food products made from ground beef with a mixture of spices and refer to as an emulsion product (Astawan in Mushollaeni, 2007). Nuggets can be made from beef, chicken, or fish (Anonymous, 2002). They are very popular, especially for children. There are many nuggets from different brands are sold in the market. Nuggets are made from meat, fish, or non-meat (vegetarian) ingredients, such as vegetables. Nuggets made from vegetables (vegetarian) aim to increase the consumers' interests, especially children who do not like vegetables, to eat them. This processed product is also a choice for vegetarian consumers, who do not consume meat and fish. The vegetable nuggets are highly nutritious because vegetables contain many nutrients, such as vitamins and minerals (Alamsyah, 2007). To date, nuggets are commonly made from meat. As a result, the price is relatively high, not all levels of society can afford them, and nuggets do not contain all food nutrients. To create a balanced vegetarian-and-animal, there are several new food innovations using raw materials from waste; one of which is tofu dregs, a food with high-vegetable proteins. Nuggets made from tofu dregs as the basic ingredient provide high nutrition and fiber.

Tofu dregs are a by-product of the process of making tofu. The main ingredient in making tofu is soybeans (Suprapti, 2005). The series of tofu manufacturing processes include

soaking, peeling, milling, screening, cooking, clumping, and printing soybeans, and finally cutting tofu. Tofu pulp still contains relatively high proteins because not all parts of the protein can be extracted in the process of making tofu, especially when using a simple and traditional milling process (Leoni, 2011). People think that tofu dregs have no nutritional value so that they are not optimally utilized (Fransiska, 2017; Rahayu, 2016). The people only use tofu dregs as manure and some of them are used as the basic material for making tempe gembus. Moreover, some people throw away waste or tofu dregs, polluting the surrounding environment (Rahayu, 2016). Various research results show that tofu dregs contain quite high nutritional content. For example, 100 g tofu dregs still contain 5.00 g protein and 8.10 g carbohydrates (Directorate of Nutrition of the Ministry of Health, 1990). In addition, the crude fiber content in tofu waste is very high at 23.58% (Sutardi, Sigit, and Tahormat 1983 in Yuliani, 2013). Proteins are a part of all living cells, constitute the largest part of the body after water, and have a distinctive function that cannot be replaced by other nutrients because they build and maintain the body cells and tissues (Almatsier, 2001). Meanwhile, crude fiber is classified as a functional food and can prevent degenerative diseases. Functional food is a food that contains active components and provides health benefits, (Yuliani, 2013).

Vegetables are a major source of fiber and natural antioxidants and contain lots of vitamins and minerals as regulatory substances. Nurhadi (2011) states that colorful vegetables are better than colorless vegetables because colors in food provide functional effects on the body, have specific properties, and depend on the pigments that make up the color. Amaranth spinach (*Amaranthus spp*) is a vegetable plant that contains chlorophyll significantly helping the digestive tract in toddlers and adults, smoothening the channel bladder, and eliminating toxins in the body. Moreover, Amaranth spinach is good for eye health as well as prevents cancer and iron deficiency or anemia. Moreover, amaranth spinach can inhibit the angiotensin-converting enzyme and lower blood pressure. The content of calcium in amaranth spinach can also prevent the calcification of bones (Dwiari, 2008: 1). Amaranth spinach contains vitamins and minerals, calcium, vitamin A, vitamin E, vitamin C, iron, fiber, and beta-carotene (Dwiari, 2008: 1 in Andaruni, 2014).

## Methods

This research was an experimental study to examine the effects of adding amaranth spinach (*Amaranthus spp*) on the nutritional and organoleptic values of tofu nuggets. This experimental study employed a non-factorial completely randomized design (CRD) with three treatments and three repetitions. This research was carried out from December 19 to January 11, 2020. The nuggets were made at home the organoleptic test was carried out at Unggul Lampeunerut Elementary School, and the chemical test was carried out at the Laboratory of Nutrition Science and Animal Food Technology, Faculty of Agriculture, Universitas Syiah Kuala, Banda Aceh. This study involved 90 students of grade 6. The raw materials used in this research were tofu dregs, amaranth spinach, cornstarch, eggs, onions, garlic, pepper, salt, nutmeg powder, breadcrumbs, and cooking oil. Meanwhile, the materials for the chemical test were nine samples of tofu dregs nuggets, 100 ml aqua dest, 15 ml of 4% K2S solution, 50 ml HCI (0.1 N), 5 drops of methyl red indicator, NaOH standard (0.1), 50 ml H2SO4, 100 ml of NaOH 3, 25%, 50 ml of hot water, and 30 ml of 90% ethanol. The tools used in this study were stoves, scales, basins, plates, spoons, cutting boards, knives, corkscrews, baking sheets, blenders, freezers, beakers, kjeldahl flasks, water baths, 50-ml measurement pipettes, dropper pipettes, burettes, stative rods, analytical balance, ovens, Erlenmeyer, back cooler, beaker glasses, filter papers, closed weighing bottles, test tubes, 1-ml pipettes, water bath, small plates, aqua glasses, and questionnaires. The data were

processed and analyzed using ANSIRA (analysis of diversity analysis) and SPSS 18. If the P-value (sig) had been less than 0.05 (P<0.05), the significant effect of 5% level treatment was revealed. Meanwhile, if the test results had showed a significant difference in the treatments, the step was continued to Duncan's test.

## Results

The formulation of tofu nuggets in this study consisted of three treatments: the addition of 100 g, 200 g, and 300 g of amaranth spinach. The acceptability of tofu dreg nuggets was assessed using an organoleptic test and a hedonic scale to determine the panelists' preference for tofu dreg nuggets.

### Colors

The addition of 100 g amaranth spinach produced (Formula A)golden yellow tofu dregs. Meanwhile, the addition of 200 g amaranth spinach (Formula B) produced slightly greenish-golden-yellow tofu dregs. Finally, the treatment with the addition of 300 g amaranth spinach (Formula C) produced dominantly greenish tofu dregs.

Table 1. Organoleptic results of the tofu nuggets' colors

| Formulas | Color Scores |
|---|---|
| A (100 g) | 3.65[a] |
| B (200 g) | 3.59[a] |
| C (300 g) | 2.78[b] |

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

The analysis of variance (ANOVA) showed that the addition of amaranth spinach had a significant effect on the tofu dreg nuggets' color because the F-value was 32.398 with a significant level (P-value) of 0.00 < from 0.05. This finding concluded that the addition of amaranth spinach significantly affected the tofu nuggets' colors. Thus, Duncan's test was proceeded subsequently to explore the most different treatment.

### Aromas

The aroma of tofu dreg nuggets added with different amounts of amaranth spinach is not much different. The three treatments produced a typical aroma of nuggets and tended to smell unpleasant from amaranth spinach. Therefore, the panelists preferred this aroma.

Table 2. Organoleptic results of the tofu nuggets' aromas

| Formulas | Aroma Scores |
|---|---|
| A (100 g) | 3.74[a] |
| B (200 g) | 3.50[b] |
| C (300 g) | 3.15[c] |

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

The analysis of variance (ANOVA) showed that the addition of amaranth spinach had a significant effect on the aroma of tofu dreg nuggets because the F-value was 13.865 and a significant level (P-value) was 0.00 < from 0.05. These findings concluded that the addition of amaranth spinach had a very significant effect on the aroma of tofu dregs nuggets.

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**Tastes**

This study discovered that each treatment produced different tastes of tofu dregs nuggets. The results of the organoleptic test of the ANOVA test are presented in Table 3.

Table 3. Organoleptic results of the tofu nuggets' tastes

| Formulas | Taste Scores |
|---|---|
| A (100 g) | 3.70[a] |
| B (200 g) | 3.38[b] |
| C (300 g) | 3.23[b] |

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

The analysis of variance (ANOVA) showed that the addition of amaranth spinach significantly affect the taste of the tofu dreg nuggets because the F-value was 8.423 and a significant level (P-value) of 0.00 < from 0.05. This finding enabled the next test, Duncan's test, to be proceeded to explore the most different treatment.

**Textures**

The results of the analysis of variance (ANOVA) showed that the addition of amaranth spinach had a significant effect on the aroma of tofu dreg nuggets because the F-value was 7.317 and a significant level (P-value) was 0.00 < from 0.05. Thus, Duncan's test was proceeded afterward to examine the most different treatment.

Table 4. Organoleptic results of the tofu nuggets' tastes

| Formulas | Taste Scores |
|---|---|
| A (100 g) | 3.70[a] |
| B (200 g) | 3.38[b] |
| C (300 g) | 3.23[b] |

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

**Chemical characteristics**

Chemical characteristics of tofu nuggets were analyzed to examine proteins, crude fiber, and water. The chemical characteristics of each formula are summarized in Table 5.

Table 5. Chemical characteristics of tofu nuggets

| Chemical characteristics | Formula A | Formula B | Formula C |
|---|---|---|---|
| Protein (%) | 5.62 [a] | 5.99 [a] | 5,68 [a] |
| Crude fiber (%) | 2.85 [a] | 4.14 [a] | 4.71 [a] |
| Water content (%) | 50.03 [a] | 52.80 [a] | 49.21 [a] |

The analysis of variance (ANOVA) discovered that the addition of amaranth spinach had no significant effect on protein, crude fiber, and water content of tofu nuggets because their F-values were 0.808, 0.928, and 0.586, respectively while a significant level (P-value) was > 0.05. Therefore, Duncan's test was not necessarily conducted.

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## Discussion

The findings of this research are almost identical to those of Sofyan (2019), stating that the higher the percentage of amaranth spinach, the darker-green the product will be. Indraswari et al. (2017) assert that the acceptability of food products is influenced by the amount of amaranth spinach concentration added to food; the higher the amaranth spinach concentration, the lower the color acceptability will be.

Increasing the addition of amaranth spinach produced a distinctive aroma of amaranth spinach. To conclude, adding a high percentage of amaranth spinach produced nuggets with amaranth spinach aroma; thus, the typical aroma of nuggets was not revealed.

The findings of this research are almost the same as those of Indraswari (2017), deploying that the more the proportion of amaranth spinach added in food, the less favorable the food for the panelists. This condition occurs due to the distinctive taste of amaranth spinach. In other words, the more amaranth spinach was added to the nuggets, the more unpleasant the nuggets would be. Moreover, the more amaranth spinach was added, the less favorable the texture for the panelists.

## Conclusion

This study concluded that the different amounts of amaranth spinach added to nuggets significantly affected the organoleptic values of colors, aromas, tastes, and textures of the nuggets. However, the addition did not significantly affect the chemical content of tofu nuggets, such as protein, crude fiber, and water content. This research suggests that further research should analyze the addition of other material compositions to tofu because the chemical characteristics of tofu dreg nuggets in this study were still below the SNI standard.

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