

Organoleptic Test of Tempe Sticks with The Addition of Ear Mushroom ((*Auricularia auricular*) for Vegetarian Diet

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ABSTRACT

Background: *Tempeh is a well-known Indonesian food not foreign to the Indonesian people. It is a product often used as a source of vegetable protein. Ear mushrooms are one of the products people are currently looking for to meet their nutritional needs. Ear mushrooms also have several benefits for preventing atherosclerosis and heart attacks. This research aims to determine the level of acceptance of healthy snack innovations for people who consume a vegetarian diet.*

Research Methods: *This research method is an experiment using an organoleptic test where researchers measure the panelists' level of liking. This processed tempeh stick product uses three treatments: P1 (44.9% tempeh: 0 wood ear mushrooms), P2 (33.7% tempeh: 11.2% wood ear mushrooms), P3 (22.4% tempeh: 22 wood ear mushrooms). .4%).*

Research Result: *The highest color acceptability results for this product are P2 (95.69%), the highest aroma acceptability is P1 (96.77%), texture acceptability is P1 and P2 (96.77%), acceptability of the most elevated taste is P1 (95.69). The difference in comparison causes the level of preference for the criteria of color, aroma, taste, and texture. The best treatment that most panelists liked was formulation P1, namely, without the addition of wood ear fungus at all.*

Conclusion: *The highest acceptability results for the color and texture parameters of tempeh sticks are P2. Meanwhile, the acceptability of the aroma parameter P3 has the highest marks. In the acceptability results, taste parameter P1 has the highest assessment results.*

BACKGROUND

Tempe is a famous Indonesian food and is not foreign to Indonesian people. This food is rich in nutrients, especially protein, and besides being affordable compared to animal protein sources, it also tastes delicious. Tempeh is cheap, has lots of nutrients, has health benefits, and can be processed into different foods, so tempeh has become popular in Indonesia (Pinasti et al., 2020). Tempe production in Indonesia is done traditionally. Tempeh is a preparation often used as a source of vegetable protein. Fermenting soybeans into tempeh using the fungus *Rhizopus oligosporus* has the function of increasing and maintaining its nutritional value as well as softening the texture of the ingredient to make it easier to eat. Tempeh has a short shelf life and will spoil quickly during storage. This results in a continuous fermentation process, causing the breakdown of other proteins to form ammonia. The production of ammonia causes an unpleasant odor. Therefore, to extend the shelf life of the time, further processing is necessary. One form of processed tempeh is tempeh flour. (Bastian et al., 2013).

All people can consume the compounds contained in tempeh. The ingredients in tempeh include short peptides, free amino acids, fatty acids, and simple carbohydrates that are easily absorbed by the body.

Tempeh contains 24 times more amino acids than soy milk. In tempeh, there is a fermentation process to increase folic acid and produce vitamin B12, which is not found in food products from other plants. Besides the benefits of high protein and amino acid content, tempeh also has bioactive compounds that benefit the body, including bioactive compounds such as isoflavones fiber. Moreover, steroids have positive effects on health and play a role in preventing various diseases such as heart disease, cancer, and osteoporosis and alleviating menopausal symptoms. Tempeh is generally processed as an addition to ready-made vegetables (Masdarini L, 2011).

One product often found in the community is ear mushrooms, which help meet nutritional needs. It can be seen that every year, the demand for ear mushrooms is increasing. This makes ear fungus increasingly challenging to obtain, and many ear fungus are imported from outside the region. Regarding organoleptics (taste, aroma, texture, color), wood ear mushrooms are better than food. Black ear fungus has a gelatinous texture with a shiny, veined surface and velvety underneath. The antioxidant content in it is flavonoid compounds, which can reduce blood glucose levels (Nurhidayati et al., 2022). However, wood ear fungus is known in the community as a food that can release toxins. Treatment of heart disease and decreased blood viscosity can be overcome by consuming 5-10 grams of ear mushrooms daily. Consuming ear mushrooms is not only popular with local people. People from abroad also like to consume ear mushrooms. This can be seen from the export of ear mushrooms abroad. The nutritional content includes protein, water, carbohydrates, fat, and fiber (Widowati L, 2018). Apart from that, wood ear mushrooms also contain mineral nutrients such as iron, calcium, potassium, phosphorus, magnesium, and sodium, as well as vitamins such as niacin, riboflavin, thiamin, pantothenic acid, vitamin B6, and folate. In general, wood ear fungus grows in damp areas and around fallen trees.

Another benefit of ear fungus is to prevent atherosclerosis, namely stretching the inner walls of blood vessels, preventing blood clots (thrombocytes) and even heart attacks. One of the innovations in food processing is tempeh with food ingredient substitution, which helps increase nutritional value. Snacks are one of the processed foods that are popular with children and adults. The convenience and cheap price make snacks popular with the public. Apart from that, snacks also taste delicious and suit people's tastes. Substituting ear mushrooms and tempeh in making vegetarian snack sticks will make a more nutritious snack.

MATERIAL AND METHODS

This research method uses an experimental method with organoleptic test research in which researchers use a test to measure the level of liking processed tempeh stick products by adding wood ear fungus (*Auricularia auricular*) for a vegan diet.

This research was conducted on March 20, 2023, at the Nutrition Laboratory and Organoleptic Laboratory of IIK Bhakti Wiyata Kediri. I used an organoleptic test questionnaire to determine consumer acceptance of the color, texture, aroma, taste, and preference of tempeh sticks by adding wood ear mushrooms (*Auricularia auricular*) for a vegan diet. Tempe stick testing was carried out by 30 semi-trained panelists using the scoring test method. This test usually provides quantitative values with a pre-agreed scoring (number) ranging from 1 (lowest) to 5 (highest). The level of liking was carried out by panelists totaling 30 level 3 undergraduate nutrition students using the hedonic scale test, namely:

1. Very dislike
2. Do not like
3. Neutral
4. Like
5. Really like

Statistical tests using SPSS20 software with the Friedman test aim to determine whether there are significant differences between groups that are tested repeatedly based on the results of observations on the dependent variable. Suppose the results obtained are significant ($\text{sig} < 0.05$). In that case, the Wilcoxon Test is continued, which aims to test the significance of the comparative hypothesis with two related samples if the data is ordinal.

Manufacturing stages or work procedures

Tools and the ingredients used in making tempeh sticks with the addition of wood ear fungus (*Auricularia auricular*) for a vegan diet are wheat flour, tempeh, wood ear mushrooms, margarine, lime

leaves, baking powder, salt, flavorings, cooking oil. Meanwhile, the tools used are frying pans, pans, choppers, pasta, makers, rollers, cutting boards, bowls, spoons, spatulas, knives, colanders, stoves, and baking pans. Plastic clips measuring 6x10.

Table 1. Composition of Food Ingredients

| Material Name | Treatment | | | | | |
|----------------|-----------|------|----------|------|----------|------|
| | P1 | | P2 | | P3 | |
| | Grams | % | Grams | % | Grams | % |
| Flour | 150 gr | 44.9 | 150 gr | 44.9 | 150 gr | 44.9 |
| Tempeh | 150 gr | 44.9 | 112.5 gr | 33.7 | 75 gr | 22.4 |
| Mushroom | - | - | 37.5 gr | 11.2 | 75 gr | 22.4 |
| Margarine | 12 gr | 3.5 | 12 gr | 3.5 | 12 gr | 3.5 |
| Lime leaves | 5 gr | 1.5 | 5 gr | 1.5 | 5 gr | 1.5 |
| Backing Powder | 0.5 gr | 0.1 | 0.5 gr | 0.1 | 0.5 gr | 0.1 |
| Flavoring | 4 gr | 1,2 | 4 gr | 1,2 | 4 gr | 1,2 |
| Salt | 2 gr | 0.6 | 2 gr | 0.6 | 2 gr | 0.6 |
| Water | 10 gr | 2.9 | 2 gr | 0.6 | 2 gr | 0.6 |
| Total | 333.5 gr | 100 | 333.5 gr | 100 | 333.5 gr | 100 |

The work procedure is as follows

That the research results on making Tempe Sticks can be applied to community service.

1. Choose tempeh that has been properly fermented and is suitable for consumption
2. Steam the tempeh (± 100 Celsius, < 15 minutes)
3. Drain the tempeh and then smooth the texture
4. Mixing ingredients includes wheat flour, tempeh, ear mushrooms, lime leaves (crushed/chopped), water, baking powder, margarine and salt.
5. Knead until smooth and solid
6. Making sheets and printing on tempeh sticks with the addition of ear mushrooms
7. Frying (± 85 Celsius <5 minutes)
8. Tempeh sticks

Ear mushrooms are very easy to cultivate and the production period is faster than oyster mushrooms.

1. Choose ear mushrooms that are still fresh and suitable for consumption
2. Wash ear mushrooms until clean
3. Boil ear mushrooms using the blanching technique (<30 seconds)
4. Drain the wood ear mushrooms and smooth the texture
5. Mixing ingredients includes wheat flour, tempeh, ear mushrooms, lime leaves (crushed/chopped), water, baking powder, margarine and salt.
6. Knead until smooth and solid
7. Making sheets and printing on tempeh sticks with the addition of ear mushrooms
8. Frying (± 85 Celsius <5 minutes)
9. Tempeh sticks with the addition of wood ear mushrooms

RESULTS

Table 2. Percentage of Acceptability of Tempeh Stick Color Parameters

| Color Acceptability Percentage | |
|--------------------------------|--------|
| P1 | 93.54% |
| P2 | 95.69% |
| P3 | 84.94% |

The acceptability of the color of tempeh sticks shows that sample P2 (75% tempeh : 25% wood ear mushroom) has the highest percentage of acceptability value, namely 95.69%. Meanwhile, the tempeh stick sample with the lowest percentage of acceptability value was P3 (50% tempeh : 50% wood ear mushroom) at 84.94%. From table 2 it can be seen that the percentage of all treatments is quite high, but P2 has the best acceptance between P1 and P3.

Table 3. Value of color acceptability of tempe sticks with the addition of wood ear mushrooms

| Replication | Product Treatment | | |
|------------------|-------------------|-------|-------|
| | P1 | P2 | P3 |
| 1 | 3.51 | 3.67 | 3.22 |
| 2 | 3.74 | 3.74 | 3.09 |
| 3 | 3.70 | 3.74 | 3.29 |
| Amount | 10.95 | 11.15 | 9.60 |
| Average | 3.65a | 3.72b | 3.20a |
| Mean rank | 2.15 | 2.23 | 1.62 |
| Mode | 4 | 4 | 3 |

The color acceptability test on tempeh stick samples based on Table 4 shows that P2 (75% tempeh: 25% wood ear mushroom) has the highest level of acceptability between P1 (100% tempeh) and P3 (50% tempeh: 50% wood ear fungus) with average value 3.72. Meanwhile, the sample with the lowest acceptability is P3, which is 3.20. The results of calculating the mode for the three samples show that P3 has the lowest mode, namely 3, which means the panelists have a neutral assessment. In contrast, P1 and P2 have a mode value of 4, which means the panelists have a favorable assessment.

Table 4. Percentage of Acceptability of Tempe Stick Aroma Parameters

| Percentage of Aroma Receptivity | |
|---------------------------------|--------|
| P1 | 96.77% |
| P2 | 91.93% |
| P3 | 95.69% |

The acceptability test for the aroma of tempeh sticks showed that sample P1 (100% tempeh) had the highest percentage acceptability value, namely 96.77%. Meanwhile, the tempeh stick sample with the lowest percentage of acceptability value was P2 (75% tempeh : 25% wood ear mushroom) at 91.93%. From table 4 it can be seen that the percentage of all treatments is quite high, namely above 90%, but P1 has the best acceptance between P2 and P3.

Table 5. Aroma Acceptance Value of Tempeh Sticks with the Addition of Wood Ear Mushrooms

| Replication | Product Treatment | | |
|------------------|-------------------|-------|-------|
| | P1 | P2 | P3 |
| 1 | 3.29 | 3.25 | 3.48 |
| 2 | 3.51 | 3.48 | 3.70 |
| 3 | 3.38 | 3.48 | 3.38 |
| Amount | 10.18 | 10.21 | 10.56 |
| Average | 3.39a | 3.40a | 3.52b |
| Mean rank | 1.94 | 1.94 | 2.12 |
| Mode | 3 | 3 | 3 |

The aroma acceptability test on tempe stick samples based on Table 6 shows that P3 (50% tempeh: 50% wood ear mushroom) has the highest level of acceptability between P1 (100% tempeh) and P2 (75% tempeh: 25% wood ear fungus) with average value 3.52. Meanwhile, the sample with the lowest acceptability is P1, which is 3.39. The results of the mode calculation for the three samples show the same value, namely 3, which means the panelists have a neutral assessment.

Table 6. Percentage of Acceptability of Tempeh Stick Texture Parameters

| Percentage of Texture Acceptability | |
|-------------------------------------|--------|
| P1 | 96.77% |
| P2 | 96.77% |
| P3 | 89.24% |

The acceptability test on the texture of tempeh sticks showed that samples P1 (100% tempeh) and P2 (75% tempeh: 25% wood ear mushrooms) had the same percentage acceptability value, namely 96.77%. Meanwhile, the tempeh stick sample with the lowest percentage of acceptability value was P3 (50% tempeh: 50% wood ear mushroom) at 89.24%.

Table 7. Texture Acceptance Value of Tempeh Sticks with the Addition of Ear Mushrooms

| Replication | Product Treatment | | |
|-------------|-------------------|-------|-------|
| | P1 | P2 | P3 |
| 1 | 3.61 | 3.64 | 3.41 |
| 2 | 3.67 | 3.67 | 3.61 |
| 3 | 3.67 | 3.87 | 3.45 |
| Amount | 10.95 | 11.18 | 10.47 |
| Average | 3.65a | 3.73b | 3.49a |
| Mean rank | 2.01 | 2.13 | 1.86 |
| Mode | 4 | 4 | 4 |

Texture acceptability test on tempe stick samples based on Table 8 shows that P2 (75% tempeh: 25% wood ear mushroom) has the highest level of acceptability between P1 (100% tempeh) and P3 (50% tempeh: 50% wood ear fungus) with the average P2 value is 3.73. Meanwhile, the sample with the lowest acceptability is P3, which is 3.49. The results of the mode calculation for the three samples show the same value, namely 4, which means the panelists have a liking rating.

Table 8. Percentage of Acceptability of Tempeh Stick Flavor Parameters

| Percentage of Taste Receptivity | |
|---------------------------------|--------|
| P1 | 95.69% |
| P2 | 90.32% |
| P3 | 94.62% |

The acceptability test on the taste of tempeh sticks showed that sample P1 (100% tempeh) had the highest percentage of acceptability value, namely 95.69%. Meanwhile, the tempeh stick sample with the lowest percentage of acceptability value was P2 (75% tempeh: 25% wood ear mushroom) at 90.32%. From Table 9, the percentage of all treatments is relatively high, namely above 90%, but P1 has the best acceptance between P2 and P3.

Table 9. Taste Acceptance Value of Tempeh Sticks with the Addition of Wood Ear Mushrooms

| Replication | Product Treatment | | |
|-------------|-------------------|-------|-------|
| | P1 | P2 | P3 |
| 1 | 3.77 | 3.61 | 3.61 |
| 2 | 3.77 | 3.74 | 3.61 |
| 3 | 3.90 | 3.87 | 3.74 |
| Amount | 11.44 | 11.22 | 10.96 |
| Average | 3.81a | 3.74a | 3.65b |
| Mean rank | 2.07 | 2.01 | 1.92 |
| Mode | 4 | 4 | 3 |

The taste acceptability test on tempe stick samples based on Table 10 shows that P1 (100% tempeh) has the highest level of acceptability between P2 (75% tempeh: 25% wood ear mushrooms) and P3 (50% tempeh: 50% wood ear mushrooms) with the average P1 value is 3.81. Meanwhile, the sample with the lowest acceptability is P3, which is 3.65. The results of calculating the mode for the three samples show that P3 has the lowest mode, namely 3, which means the panelists have a neutral assessment. In contrast, P1 and P2 have a mode value of 4, which means the panelists have a favorable assessment.

DISCUSSION

Color

One parameter that can improve food quality is color. Color is an attractant that can attract people visually and tastefully. The first parameter assessed in acceptability is color because color can influence a person's judgment.(Syarif et al., 2017).

The color of the essential ingredients in tempeh stick products can affect acceptability. Adding steamed and mashed tempeh to the tempeh sticks makes the tempeh stick dough brighter and cleaner in color compared to dough that adds chopped wood and mushrooms. This aligns with an opinion(Holinesiti et al., 2022)that tempeh influences the color of stick products. Milliard is forming a brown color due to a non-enzymatic browning reaction. (Rumapar, 2015).

Aroma

The odor emitted by a food product that is received by the sense of smell is aroma. The thing that can influence the attractiveness and acceptability of a food product is aroma. (Anggraini R, 2017). The aroma that comes from this tempeh stick product is influenced by the addition of margarine to the mixture. This is in line with research(Holinesiti et al., 2022)that the aroma of margarine affects the aroma of onion sticks, so the aroma of tempeh flour does not affect the aroma of onion sticks. The aroma of wheat flour during the tempeh fermentation process increases the nutritional value of tempeh due to the breakdown of protein into amino acids due to the activity of the *Rhizopus* mold. (Afriyanti, 2017).

Texture

Moisture, dryness, brittleness, hardness, and elasticity of a food product can be seen from texture parameters(Auliya, 2021). The texture of stick products can be obtained from wheat flour as a binder, balancer, and stiffener for the dough because it contains gluten and gives a crunchy and sturdy texture.(Holinesiti et al., 2022). The use of tempeh in tempeh stick products can affect the crunchy texture and firmness of tempeh stick products because tempeh does not contain gluten. This aligns with research(Holinesiti et al., 2022)that tempeh flour can affect the texture of onion stick products.

Flavor

Protein, fat, carbohydrates, riboflavin, niacin, Ca, K, P, Na, and F are the ingredients found in tempeh. Salty, sour, bitter, sweet, and umami are words that come from Japanese and can be interpreted as delicious (Ikrawan & Pirmansyah, 2019). In making tempeh sticks, margarine, flavorings, sugar, salt, and tempeh are used. The ingredients used in making food can affect the taste of a food product. This aligns with research(Holinesiti et al., 2022)that adding soybean tempeh flour can affect the taste of onion stick products.

CONCLUSIONS

The highest acceptability results for the color and texture parameters of tempeh sticks are P2. Meanwhile, the acceptability of the aroma parameter P3 has the highest results. In the acceptability results, taste parameter P1 has the highest assessment results.

SUGGESTION.

Based on the results of the research that has been carried out, suggestions that can be given to researchers are that further research is needed on the effect of storage on changes in the quality of tempeh sticks. The manufacture of tempeh sticks can be further developed as a healthy snack for the public, especially for those on a vegetarian diet.

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