

## ACCEPTANCE TEST OF COOKIES MOERHI AS SUPPLEMENTARY FOOD FOR UNDERNUTRITION ADOLESCENT GIRLS

Dian Septiana<sup>1\*</sup>, Adi Magna Patriadi Nuhriawangsa<sup>2</sup>, Setyo Sri Rahardjo<sup>3</sup>

<sup>1</sup>Nutrition Sciences Study Program, Postgraduate School, Universitas Sebelas Maret, Surakarta, Indonesia

<sup>2</sup>Departement of Animal Science, Faculty of Agriculture, Universitas Sebelas Maret, Surakarta, Indonesia

<sup>3</sup>Departement of Medical Science, Faculty of Medicine, Universitas Sebelas Maret, Surakarta, Indonesia

*\*Corresponding author: dian.septiana@student.uns.ac.id*

### ABSTRACT

**Background:** Due to rapid physical growth and development, adolescents are nutritionally vulnerable. One nutritional problem that occurs in adolescents is undernutrition. Undernutrition is handled by nutrition education and the provision of supplementary food. Sweet potato can be used as an ingredient for making supplementary food because it contains carbohydrates, and tempeh flour can be used as a source of protein. Cookies Moerhi are made using white sweet potato flour and tempeh flour. This study aims to determine the best formulation, acceptability, and nutritional content of Cookies Moerhi.

**Methods:** This study used a completely randomized design (CRD) with three formulation of white sweet potato flour and tempeh flour: F1 (15%: 15%), F2 (20%: 10%), and F3 (10%: 20%). The panelists were 25 semi-trained panelists. Test parameters include color, taste, aroma, texture, aftertaste, and overall testing using 9 hedonic scales.

**Results:** The hedonic test showed that F2 was the best formulation favored by panelists on all parameters (color, taste, aroma, texture, aftertaste, and overall). The nutritional content test of treatment F2: energy 516,61 kcal, protein 18.87 g, fat 28.93 g, and carbohydrates 45.19 g.

**Conclusion** Based on all parameters (color, taste, aroma, texture, aftertaste, and overall), the best formulation for Cookies Moerhi is treatment F2 (20% white sweet potato flour, 10% tempeh flour). Cookies Moerhi can be an alternative supplementary food for adolescent girls with undernutrition because its nutritional content meets 15% of the RDA for adolescents aged 13-15 years.

**Keywords:** adolescents, undernutrition, sweet potato, tempeh, cookies

### INTRODUCTION

Adolescence is a transitional period in the human life cycle because it is a period of physiological, psychological, and social development that marks the transition from childhood to adulthood (Thalib et al., 2021). Due to rapid physical growth and development, adolescents are nutritionally vulnerable. One nutritional problem that occurs in adolescents is undernutrition.

Based on the 2023 Indonesian Health Survey (IHS), the prevalence of undernutrition (thinness) among adolescents aged 13-15 in West Nusa Tenggara Province

was 7.6%, higher than the national prevalence of 5.7% (Ministry of Health, 2023).

Adolescents require more nutrients than children, but adolescents tend to adopt poor consumption patterns (Widnatusifa et al., 2021). Poor nutritional behavior is the cause of nutritional problems in adolescents, such as the imbalance between the intake of nutrients consumed and the nutrients needed (Hafiza et al., 2021). Lack of carbohydrates causes a decrease in energy produced by glucagon, so when this happens, fat reserves will be used to produce energy (Reynolds et al., 2019). Body fat reserves that continue to decrease can lead to underweight (Rarastiti, 2023).

Decreased body mass and problems with absorption of fat-soluble vitamins may also occur due to insufficient fat intake (Rohmah et al., 2023).

One way to overcome undernutrition is by providing supplementary food. In general, supplementary food is given in the form of biscuits. Cookies are a type of biscuit made from soft, crunchy dough. When broken, they have a less dense cross-section (BSN, 2011). Cookies Moerhi are made using white sweet potato flour and tempeh flour.

A literature review conducted in 2022 showed that sweet potatoes can be used as a primary ingredient for making supplementary food for adolescents (Setyawati et al., 2022). White sweet potato made into flour contains 84.83% carbohydrates (Santosa et al., 2019), which can be a source of energy. In addition, a source of protein, which functions as a building substance, is also needed. Tempeh flour is made into flour and contains 45.69% protein (Seveline et al., 2019). Previous research on providing soybean tempeh yellow sweet potato biscuits showed an average increase in the body weight of children who experienced wasting (Farihani et al., 2022).

Before being given to teenagers, a hedonic test must be conducted to determine the formulation of Cookies Moerhi that can be accepted by panelists. In hedonic tests, panelists use the five senses to assess the level of liking of a product. The objective of this study is to determine the formulation, acceptability, and nutritional value of Cookies Moerhi as an alternative supplementary food for undernutrition adolescent girls.

## METHODS

This study used a Completely Randomized Design (CRD) with 3 different formulation of white sweet potato flour and tempeh flour, namely F1 (15%: 15%), F2 (20%: 10%), and F3 (10%: 20%) which can be seen in Table 1.

**Table 1.** Formulation of Cookies Moerhi

Material	F1	F2	F3
White sweet potato flour (g)	15	20	10
Tempeh flour (g)	15	10	20
Wheat flour (g)	5	5	5
Egg yolk (g)	15	15	15
Skim milk (g)	5	5	5
Margarine (g)	25	25	25
Sugar (g)	20	20	20
Total	100	100	100

The Hedonic test, or liking level test, was conducted in March 2024; the parameters tested included color, taste, aroma, texture, aftertaste, and overall. The hedonic test was conducted at the Taste Test Laboratory of the Poltekkes Kemenkes Mataram by 25 semi-trained panelists who were 6th Semester Nutrition Department students. The requirements for determining semi-trained panelists are Nutrition Students of the Poltekkes Kemenkes Mataram, have received lecture material on organoleptic tests, and have become panelists in organoleptic tests. The scale used in the test is a scale of 1-9 with details: 1) dislike extremely, 2) dislike very much, 3) dislike moderately, 4) dislike slightly, 5) neither like nor dislike, 6) like slightly, 7) like moderately, 8) like very much, and 9) like extremely.

The nutrient content test on Cookies Moerhi was conducted at the Chemistry and Biochemistry Laboratory of the Faculty of Food Technology and Agroindustry, Mataram University, in April 2024. Determination of carbohydrate content using the By Difference method, protein content using the Kjeldahl method, and fat content using the Soxhlet method.

Before the statistical test, a normality test was carried out to determine whether the data was normally distributed. Then, the Kruskal-Wallis Test was carried out because the data was not normally distributed.

## RESULTS AND DISCUSSION

### 1. Descriptive Statistics

Table 3. displays the color parameter's lowest value of 2, maximum value of 9, average value of 6.16, and a standard

deviation of 1.763. The taste parameter has a minimum value of 2, a maximum value of 9, an average value of 6.07, and a standard deviation of 1.898. The aroma parameter has a minimum value of 3, a maximum value of 9, an average value of 6.39, and a standard deviation of 1.541. The texture parameter has a minimum value of 1, a maximum value of 9, an average value of 5.57, and a standard deviation of 2.001. The aftertaste parameter has a minimum value of 2, a maximum value of 9, an average value of 5.71, and a standard deviation of 1.761. Moreover, overall has the minimum value is 2, the maximum value is 9, the average value is 6.08, and the standard deviation is 1.730.

**Table 3.** Descriptive Statistics

	N	Min	Max	Mean	Std. Deviation
Color	75	2	9	6.16	1.763
Taste	75	2	9	6.07	1.898
Aroma	75	3	9	6.39	1.541
Texture	75	1	9	5.57	2.001
Aftertaste	75	2	9	5.71	1.761
Overall	75	2	9	6.08	1.730
Valid N (listwise)	75				

## 2. Normality Test

The results of the normality test in Table 4. indicate that the p-values for all parameters (color, taste, aroma, texture, aftertaste, and overall) are  $< 0.05$ , indicating that the data is not normally distributed. Subsequently, further tests were conducted with the Kruskal-Wallis test.

**Table 4.** Tests of Normality

	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
Color	.203	75	.000	.914	75	.000
Taste	.126	75	.005	.948	75	.004
Aroma	.188	75	.000	.932	75	.001
Texture	.149	75	.000	.954	75	.009
Aftertaste	.115	75	.015	.952	75	.006
Overall	.196	75	.000	.930	75	.000

a. Lilliefors Significance Correction

## 3. Kruskal Wallis Test

The Kruskal-Wallis test was conducted to see the difference between treatments.

### a. The Color difference in each treatment

The data shown in Table 5. indicates that Treatment F2 has the greatest color rating of 52.70, whilst Treatment F3 has the lowest rating of 29.14.

Furthermore, the Kruskal-Wallis test was carried out in Table 6. The results showed an asymp significance value of 0.000, smaller than 0.05, meaning there is a significant color difference between the F1, F2, and F3 treatments.

The most preferred color of Cookies Moerhi by panelists is formulation F2 with 20% white sweet potato flour and 10% tempeh flour treatment with a scale of 7.36 (like moderately). F1 treatment uses 15% white sweet potato flour and 15% tempeh flour with a hedonic scale of 5.72 (neither like nor dislike). Treatment F3 used 10% white sweet potato flour and 20% tempeh flour with a hedonic scale of 5.4 (neither like nor dislike).

Color plays an important role in determining the acceptance quality of an ingredient because it is the first thing that individuals will judge (Aprita, 2022). The color of the flour used influences the color of cookies. White sweet potato flour is pure white, while tempeh flour is not completely bright white but yellowish-white, so the more tempeh flour is used, the browner the color of the cookies becomes. This aligns with research by Kristanti et al. (2020), which shows that the more temperature flour is added to mocap cookies, the more color changes (brown).

**Table 5.** Average color in treatments

	Ranks		
	Treatment	N	Mean Rank
Color	F1	25	32.16
	F2	25	52.70
	F3	25	29.14
	Total	75	

**Table 6.** Kruskal-Wallis Test on Color Difference

Test Statistics <sup>a,b</sup>	
Color	
Kruskal-Wallis H	18.114
Df	2
Asymp. Sig.	.000

a. Kruskal Wallis Test

b. Grouping Variable: Treatment

### b. Taste differences in each treatment

Table 7. shows that Treatment F2 had the highest average flavor rating, at 50.40, while F3 had the lowest rating, at 31.20.

**Table 7.** The average flavor of each treatment

	Ranks		
	Treatment	N	Mean Rank
Taste	F1	25	32.40
	F2	25	50.40
	F3	25	31.20
	Total	75	

Furthermore, the Kruskal-Wallis test was carried out in Table 8. with results showing an asymp significance value of 0.002, smaller than 0.05, meaning that there is a significant difference in taste between the three treatments F1, F2, and F3.

**Table 8.** Kruskal-Wallis Test of Taste Differences

Test Statistics <sup>a,b</sup>	
	Taste
Kruskal-Wallis H	12.471
Df	2
Asymp. Sig.	.002

a. Kruskal Wallis Test

b. Grouping Variable: Treatment

The most preferred taste of Cookies Moerhi by panelists is formulation F2 with 20% white sweet potato flour and 10% tempeh flour treatment with a scale of 7.16 (like moderately). F1 treatment uses 15% white sweet potato flour and 15% tempeh flour with a hedonic scale of 5.56 (neither like nor dislike). Treatment F3 used 10% white sweet potato flour and 20% tempeh flour with a hedonic scale of 5.48 (neither like nor dislike).

Cookies Moerhi with more tempeh flour produced a slightly more bitter taste. This aligns with research by Kiswati and Prijatni (2023), which shows that adding tempeh flour makes cookies taste bitter and is not liked by panelists. Formulation F2 is most preferred due to the use of more white sweet potato flour than tempeh flour. Research conducted by Kurniawati (2021) showed that the total sugar content in cookies made with white sweet potato flour was higher than that of other tuber flours, so this caused the taste of the cookies to be preferred because the taste of tempeh flour could be covered.

#### c. Differences in aroma in each treatment

Table 9. shows that Treatment F2 has the highest average aroma rating, at 45.58, while F3 has the lowest rating, at 29.58.

**Table 9.** The average aroma in treatments

	Ranks		
	Treatment	N	Mean Rank
Aroma	F1	25	38.84
	F2	25	45.58
	F3	25	29.58
	Total	75	

Furthermore, the Kruskal-Wallis test was carried out in Table 10. with results showing an asymp significance value of 0.029, smaller than 0.05. This means there is a significant difference in aroma between the three treatments, F1, F2, and F3.

**Table 10.** Kruskal Test for Difference in Aroma

Test Statistics <sup>a,b</sup>	
	Aroma
Kruskal-Wallis H	7.060
Df	2
Asymp. Sig.	.029

a. Kruskal Wallis Test

b. Grouping Variable: Treatment

The aroma of Cookies Moerhi most favored by panelists is formulation F2 with 20% white sweet potato flour and 10% tempeh flour treatment with a scale of 6.96 (like slightly). F1 treatment uses 15% white sweet potato flour and 15% tempeh flour with a hedonic scale of 6.48 (like slightly). Treatment F3 used 10% white sweet potato flour and 20% tempeh flour with a hedonic scale of 5.72 (neither like nor dislike).

The aroma of cookies is influenced by the margarine used in making cookies, which is 25%, so the aroma of sweet potato flour and tempeh flour does not affect the aroma of cookies. Fat is important in making cookies because it functions as an aroma addition that can eliminate the aroma of sweet potato flour (Oktaviana et al., 2017).

#### d. Texture differences in each treatment

Table 11. shows that Treatment F2 has the highest average texture rating, at 50.88, while F3 has the lowest rating, at 27.66.

**Table 11.** Mean texture in treatments

	Ranks		
	Treatment	N	Mean Rank
Texture	F1	25	35.46
	F2	25	50.88
	F3	25	27.66
	Total	75	

Furthermore, the Kruskal-Wallis test was carried out in Table 12. The results showed an asymp significance value of 0.001, smaller

than 0.05, meaning there is a significant difference in texture between the three treatments, F1, F2, and F3.

**Table 12.** Kruskal-Wallis Test of Texture Differences

Test Statistics <sup>a,b</sup>	
Texture	
Kruskal-Wallis H	15.023
Df	2
Asymp. Sig.	.001

a. Kruskal Wallis Test

b. Grouping Variable: Treatment

The most preferred texture of Cookies Moerhi by panelists is formulation F2 with 20% white sweet potato flour and 10% tempeh flour treatment with a scale of 6.76 (like slightly). F1 treatment uses 15% white sweet potato flour and 15% tempeh flour with a hedonic scale of 5.36 (neither like nor dislike). Treatment F3 used 10% white sweet potato flour and 20% tempeh flour with a hedonic scale of 4.6 (dislike slightly).

An increase in the percentage of tempeh flour used decreases the level of crispness, making it the least preferred cookie by panelists. This study's results align with Kristanti et al.'s (2020) research, which suggests that cookies' texture becomes hard due to denaturation during the baking process. This is because tempeh flour contains high protein, 45.69% (Seveline et al., 2020).

e. Aftertaste differences in each treatment

Table 13. shows that treatment F2 has the highest average aftertaste rating, 49.12, while treatment F3 has the lowest rating, 31.40.

**Table 13.** Mean aftertaste in treatments

Ranks			
		Treatment	Mean Rank
After taste	F1	25	33.48
	F2	25	49.12
	F3	25	31.40
	Total	75	

**Table 14.** Kruskal-Wallis Test for Difference in Aftertaste

Test Statistics <sup>a,b</sup>	
Aftertaste	
Kruskal-Wallis H	10.152
Df	2
Asymp. Sig.	.006

a. Kruskal Wallis Test

b. Grouping Variable: Treatment

Furthermore, the Kruskal-Wallis test was carried out in Table 14. with results showing an asymp significance value of 0.006, smaller

than 0.05. This means there is a significant difference in aftertaste between the three treatments, F1, F2, and F3.

Treatment F2 has the most favorable aftertaste by panelists, with a scale of 6.6 (like slightly). Treatment F1 has an aftertaste with a hedonic scale of 5.32 (neither like nor dislike), and the F3 treatment with a hedonic scale of 5.2 (neither like nor dislike). The aftertaste refers to the lingering sensation in the mouth that persists even after the stimulus has been removed (Dinata et al., 2022). The preferred aftertaste is F2 due to the use of sweet potato flour more than tempeh flour, which has a bitter taste when tempeh flour is more widely used in making cookies.

f. The overall difference in each treatment

Table 15. shows that Treatment F2 has the highest average overall rating, at 48.74, while F3 has the lowest rating, at 29.28.

**Table 15.** Mean overall in the treatment

Ranks			
		Treatment	Mean Rank
Taste	F1	25	35.98
	F2	25	48.74
	F3	25	29.28
	Total	75	

Furthermore, the Kruskal-Wallis test was carried out in Table 16. with results showing an asymp significance value of 0.005, smaller than 0.05, meaning there is a significant difference in overall parameters between the three treatments, F1, F2, and F3.

**Table 16.** Kruskal Test of Overall Difference

Test Statistics <sup>a,b</sup>	
Overall	
Kruskal-Wallis H	10.666
Df	2
Asymp. Sig.	.005

a. Kruskal Wallis Test

b. Grouping Variable: Treatment

The overall assessment is a test of previous parameters such as color, taste, aroma, texture, and aftertaste. (Dinata et al., 2022). Panelists favored treatment F2, with a scale of 6.92 (like slightly), followed by treatment F1, with a hedonic scale of 5.92 (neither like nor dislike), and treatment F3, with a hedonic scale of 5.4 (neither like nor dislike).

#### 4. Nutrition Content Test

Macronutrients are the main components of various tissues and constitute the total calorie intake. The body's main source of energy is carbohydrates, which can be divided into carbohydrates, proteins, and fats (Savarino et al., 2021). Based on the results of the hedonic test, the most preferred Cookies Moerhi by panelists is F2. The following are the results of the proximate test of Cookies Moerhi with the most favorable acGizmodoce of panelists, namely F2, which is compared with the Recommended Dietary Allowance (RDA) for adolescent girls aged 13-15 years (Table 17).

**Table 17.** Comparison of Nutritional Content of Moerhi Cookies and AKG

Nutritional content	F2	AKG
Energy (kcal)	516,61	2050
Protein (g)	18,87	65
Fat (g)	28,93	70
Carbohydrate (g)	45,19	300

##### a. Energy

The caloric value was determined by adding up the calories provided by protein, carbs, and fat using conversion factors of 4 kcal/g, 4 kcal/g, and 9 kcal/g, respectively (Infante et al., 2017). The energy content of Cookies Moerhi F2 treatment can meet the nutritional needs of 25% of the Recommended Dietary Allowance (RDA) for adolescent girls aged 13-15 years.

##### b. Protein

Based on proximate tests, the protein content in Cookies Moerhi F2 treatment is 18.87%, which can meet the nutritional needs of 29% of the RDA for adolescent girls aged 13 - 15. Protein from food provides essential amino acids that play a role in tissue protein synthesis (Damayanti, 2016).

##### c. Fat

Based on the proximate test, the fat content in the three formulation of Cookies Moerhi F2 treatment is 28.93%, which can meet the nutritional needs of 41% of the RDA for adolescent girls aged 13-15.

##### d. Carbohydrates

Based on the proximate test, the nutritional content of the three Cookies Moerhi F2 treatments is 45,19%, which can meet the nutritional needs of 15% of the RDA for adolescent girls aged 13-15.

## CONCLUSION

Based on all parameters (color, taste, aroma, texture, aftertaste, and overall), the best formulation for Cookies Moerhi is treatment F2 (20% white sweet potato flour, 10% tempeh flour). Cookies Moerhi can be an alternative supplementary food for adolescents with undernutrition because its nutritional content meets 15% of the RDA for adolescents aged 13-15 years.

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## CONFLICT OF INTEREST

All writers stated that there were no conflicts of interest.

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