

Evaluating The Acceptance and Utilization of Spinach Gyoza as An Iron-Rich Snack to Prevent Anemia Among Young Women

Mochammad Wildzan Yuda Pratama¹, Juliana Christyaningsih^{*2}, Annas Buanasita³,
Nurul Hindaryani⁴, Fahmi Hafid⁵, Siti Zaharah Rosli⁶

^{1,2,3,4,5}Department of Nutrition, Politeknik Kesehatan Kemenkes Surabaya, Surabaya, Indonesia

⁶Department of Healthcare Professional, Faculty of Health and Life Sciences, Management & Science University, Shah Alam, Selangor, Malaysia

Email: juliana.christy123@gmail.com

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ABSTRACT

Anemia is when blood hemoglobin levels are lower than normal in certain age and gender groups. The blood pigment known as hemoglobin is responsible for transporting oxygen and carbon dioxide throughout the body. This experimental research aims to examine the impact of one variable on other variables or to determine whether a relationship exists between these two variables. To validate the findings of this research on the acceptability and iron level of Gyo Yam, or spinach dumplings, as a substitute snack to prevent anemia in young ladies, a laboratory test was performed in this investigation to assess the formulation's iron content utilizing a specific technique, ICP-OES (Inductively Coupled Plasma-Omission Spectroscopy). As a result, each dumpling weighs 50 grams and has 2.2 milligrams of iron. In conclusion, Formula 3 of Gyoyam (Spinach Gyoza) can serve as a viable snack option for young women to help prevent anemia.

INTRODUCTION

Anemia is a significant global public health issue, with a particularly high prevalence in developing countries^{1–7}. Anemia is a condition of blood hemoglobin levels below normal in certain groups of people, depending on gender and age^{8–12}. The main cause of anemia is iron deficiency. About two-thirds of the body's iron is contained in hemoglobin in red blood cells¹³. Iron deficiency can cause somatic and brain cell changes and growth retardation¹⁴. Treatment of anemia in adolescent girls is focused on iron supplementation¹⁵. In addition, other approaches can be taken such as local food system management, diet optimization, food fortification, probiotic administration, and nutrition education¹⁶.

Spinach is one of the food ingredients that are easily available in cities and villages^{17,18}. Spinach is one of the vegetables that is high in iron, and many processed products use spinach, such as spinach chips, fried spinach, and gyoza dumplings with spinach.

Gyoza itself is a Japanese snack and one of the traditional Chinese foods originally called dumplings. According to historical sources, Kaku means "horn" because it looks like a horn¹⁹.

The World Health Organization (WHO) reports that the prevalence of anemia is the highest in children (42.6%) and the lowest in nonpregnant women (29.0%). From the results of the Indonesian

National Health Survey in 2013, the prevalence of anemia in children aged 1-4, 5-14 and 15-24 was 28.1%, 26.4% and 18.4%²⁰. Compared to the last survey in 2007, prevalence increased to 27.7%, 9.4% and 6.9% in children aged 1-4, 5-14 and 15-24 years. Data from the 2013 Basic Health Research showed that adolescent girls increased to 37.1% compared to 48.9% in the results of the 2018 Basic Health Research with anemia rates in the age groups of 15-24 and 25-34 years there^{21,22}.

From the background above, the author is interested in carrying out research on "Acceptability and Iron Levels of Gyoyam (Spinach Gyoza) as an Alternative Snack to Prevent Anemia in Young Women". This study aims to determine the results of the acceptance test and iron levels of Gyoyam (Gyoza Bayam) as an alternative snack to prevent anemia in adolescent girls.

MATERIALS AND METHODS

This type of research is experimental research. This research was carried out from October 2022 to March 2023 at the Department of Nutrition, Poltekkes, Ministry of Health, Surabaya. The population in this study was 25 female students of the Department of Nutrition Poltekkes Kemenkes Surabaya Level 2.

To determine the iron content in Gyoyam (Gyoza Spinach) using the ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry) method, the analysis of the iron content of the sample was carried out with the ICP-OES spectrophotometer test with 1 control and 2 treatments, by adding spinach leaves with different doses, namely 0 grams, 40 grams, 60 grams with 2 repetitions and if there is a difference, further tests are carried out. conducted at Saraswanti Indo Genetech Laboratory, AMG Tower, 19-20th Floor Jl Dukuh Menanggal 1-A, Surabaya, East Java.

Results from the acceptability test covering taste, aroma, color and texture were tested by the Kruskal-Wallis test method to see which product the test taker liked the most with a baseline margin of error of 0.05 ($\alpha = 0.05$). The difference requires a post-hoc test with the Mann-Whitney test to see if the hypothesis accepts $p < 0.05$.

RESULTS

Table 1. Characteristic Gyoyam Formulation (Spinach Gyoza)

Indicator	Formulation		
	F1	F2	F3
Texture	Not too dense	Dense	Dense
Color	White slightly pale	Light green	Dark green
Aroma	Typical gyoza aroma	Typical gyoza aroma	Typical gyoza aroma
Taste	Like gyoza in general	Like gyoza in general	Like gyoza in general

Source: Primary Data, 2023

Table 1. Average Distribution of Gyoyam (Spinach Gyoza) Formulation Assessment

No	Indicator	Gyoyam Formulation (Spinach Gyoza)		
		F1	F2	F3
1.	Texture	3.20	3.52	4.08
2.	Color	4.12	3.24	3.40
3.	Aroma	3.36	3.60	4.00
4.	Taste	2.92	4.16	4.04
	Average	3.4	3.63	3.88

Source: Primary Data, 2023

Based on the table above with the three formulations of Gyoyam (Gyoza Bayam) with a total acceptability test using a hedonic scale, overall favorability results can be obtained based on texture, color, aroma, and taste on Gyoyam (Gyoza Bayam) with a formulation of 3 F3 codes much liked by panelists, the average score of 3.88 means that it is included in the likes category.

Table 2. Kruskal Wallis Test Results

No	Indicator	Kruskal Wallis Test Values
1.	Color	0.001
2.	Taste	0.048
3.	Aroma	0.000
4.	Texture	0.004

Source: Primary Data, 2023

Based on the table above, it can be concluded that color, taste, aroma, and texture have significant differences because the results of the 4 indicators above $p < 0.05$.

Table 4. Mann Whitney Test Results

No.	Indicator	Gyoyam (Gyoza Bayam)	Mann Whitney Value
1.	Color	F1 with F2	0.001
		F1 with F3	0.002
		F2 with F3	0.526
2.	Aroma	F1 with F2	0.403
		F1 with F3	0.019
		F2 with F3	0.098
3.	Taste	F1 with F2	0.000
		F1 with F3	0.000
		F2 with F3	0.526
4.	Texture	F1 with F2	0.323
		F1 with F3	0.001
		F2 with F3	0.038

Source: Primary Data, 2023

From the man whitney test table on the color indicator the difference is in the formula F1 with F2, and F1 with F3, while in F2 with F3 there is no difference. In the mann whitney test on the aroma indicator the difference is found in the formula F1 with F3, while F1 with F3, and F2 with F3 there is no difference. In the mann whitney test on the taste indicator the difference is in the formula F1 with F2, and F1 with F3, while in F2 with F3 there is no difference. In the mann whitney test on the texturee

indicator in the formula F1 with F2 there is no difference, while F1 with F3, and F2 with F3 there is a difference.

Table.5 Iron Levels in Gyoyam (Gyoza Bayam) 100 g

No.	Code	Simple Iron Levels (mg/100 g)	Duplo Iron Content (mg/100g)	Average (mg/100 g)
1.	F1	1.26	1.26	1.26
2.	F2	3.29	3.32	3.30
3.	F3	4.31	4.32	4.31

Source: Primary Data, 2023

Based on the table above, the results of iron levels in Gyoyam (Gyoza Spinach) are the highest iron levels in the F3 formula of 4.31mg / 100 g.

DISCUSSION

Gyoyam Acceptability Test Characteristics (Gyoza Bayam)

Gyoyam (Spinach Gyoza) is made from garlic, ginger, oyster sauce, soy sauce, sesame oil, salt, sugar, flavoring, chicken, shrimp, cabbage, mushrooms, ginger and dumpling skin²³. The difference in spinach Gyoyam (Spinach Gyoza) formula is the ratio of adding spinach vegetables. The ratio of spinach vegetables in formulation 1 or control (F1 code) is 0, in formulation 2 (F2 code) is 40, and in formulation 3 (F3 code) is 60. The sample indicators for the hedonic test are the aroma, color, texture, and taste of each Gyoyam (Spinach Gyoza) formulation in general. In the results of this study, it was obtained that products with the code F3 were the products most liked by panelists.

A. Color

In determining the quality of a product, color is one of the important indicators first seen by panelists²⁴. Color assessment of Gyoyam (Gyoza Spinach) is a subjective assessment based on the panelists' sense of sight²³. Of the three formulations Gyoyam (Gyoza Spinach) has a different color, namely the F1 code has a slightly pale white color, the F2 code has a light green color, and the F3 code has a dark green color. Based on the acceptability test, the highest average value on the color indicator shows the highest result with the F1 code with a value of 4.12, while the F3 code has a value of 3.40, and the lowest value is found in the F2 code with a value of 3.24.

B. Aroma

In the aroma acceptability test is one of the important ones because it can provide results whether the product is accepted by the panelists or not. From the average results of the acceptability test assessment on the aroma indicator based on subjective assessment, the highest result in the F3 code has a value of 4.00. While the lowest value is found in the F1 code with a value of 3.36. The F3 code has a high value due to the aroma of spinach that is not too sharp.

C. Texture

The texture of gyoza is known for its water content, and the type of carbohydrates. Too high-water content can produce a mushy texture. thus, affecting the texture of the gyoza. Texture is an important indicator that can be directly assessed by the author with his sense of touch²⁵. Based on the acceptability test, the texture indicator shows the highest result in the F3 code with a value of 4.08, while the F2 code has a value of 3.52, and the lowest value is in the F1 code with a value of 3.20. Of the three formulations, it has a texture that is not much different, which is not too dense. This can happen because the influence of the cooking process, binder and cooking time affect the quality of Gyoyam (Spinach Gyoza).

D. Taste

Taste is the most important indicator in ascertaining whether a product is acceptable or not to the panelists. Taste can be assessed by the sense of taste which is one of the supports of taste in determining the quality of a product. Based on the acceptability test, the highest average value on the taste indicator showed the highest result in the F2 code with a value of 4.16, while the F3 code had a value of 4.04, and the lowest value was in the F1 code with a value of 2.92. Panelists' level of preference for products with the F2 code was possible because of the comparison of adding chicken meat with spinach vegetables that suit the panelists' tastes. This indicates that the addition of spinach leaves does not affect the taste of the product (more spinach added does not mean higher or lower)²⁶.

Iron Levels in Gyoyam (Gyoza Bayam)

Gyoyam iron content (Spinach Gyoza) is formula F1 with 0 grams of spinach vegetables the iron content is 1.26 mg / 100 g, formula F2 with 40 grams of spinach vegetables has an iron content of 3.30 mg / 100 g, formula F3 with 60 grams of vegetables compared to spinach has an iron content of 4.31 mg / 100 g. The increase in iron content of Gyoyam formulations (Gyoza Spinach) F2 and F3 is due to the addition of spinach. Therefore, the value of iron levels increases if spinach is added¹⁹.

CONCLUSION

Based on research and experiments conducted, the highest Gyoyam iron content (Gyoza Bayam) was obtained in the F3 formulation of 4.31 mg / 100 g. For organoleptic test results in terms of taste, aroma, color and texture the highest value in F3. F1 and F2 are still acceptable to the panelists because the score results are in the neutral category. In the color formula indicators F1 with F2 and F1 with F3 there is a noticeable difference ($p < 0.05$). On the aroma indicators of the formula F1 with F3 there is a noticeable difference ($p < 0.05$). On the taste formula indicators F1 with F2 and

F1 with F3 there is a noticeable difference ($p < 0.05$). In the texture formula indicators F1 with F3 and F2 with F3 there is a noticeable difference ($p < 0.05$).

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