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The Effect of Added Moringa Leaves (*Moringa oleifera* L.) and Quail Eggs (Coturnix-coturnix japonica) on Wingko as A Snack for Anemia

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***Abstract* — This study aims to (1) determine the effect of adding moringa leaves and quail eggs to the preference level for wingko, which includes color, aroma, texture, and taste as snacks for anemia patients; (2) determine the nutritional value of the best product through wingko organoleptic test by examining the influence of adding moringa leaves and quail eggs. The research employed a pure experimental design using a 3x2 factorial design with 6 treatments. In this study, the K factor was used as the addition of moringa leaves with level 3, and the P factor was the addition of quail eggs with 2 levels. The results showed that: (1) wingko with the addition of 20% moringa leaves and 20% quail eggs was favored by the panelists based on the De Garmo test, with a productivity value of 0.88. By employing the Kruskal-Wallis test and Mann-Whitney test, this study has confirmed that the proportion of added moringa leaves and quail eggs affects the aroma, color, and taste of wingko; (2) the nutritional value of the best wingko contains 7.63% protein based on Kjeldah test, 43.97% carbohydrates based on Luff Schriool test, 12.45% fat based on direct extraction test, and 4.37 mg iron(Fe) as identified in atomic absorption spectrometer test; (3) the addition of 20% moringa leaf wingko and 20% quail eggs in 100 grams could meet the requirement of protein, carbohydrates, fat, and iron.**

Keywords—Wingko, Moringa Leaves, Quail Eggs, Anemia

I. INTRODUCTION

Anemia is a condition in which the level of hemoglobin in the blood is lower than the normal level. Normal hemoglobin levels in adolescent women are 12-16 g/dl and 13-17g/dl in male adolescents [26]. The prevalence of anemia in Indonesia is still quite high at 48.9% [6], with the proportion of anemia among the 15-24 and 25-34 years of age groups [14].

Risk factors for iron deficiency in anemia are commonly identified during pregnancy, breastfeeding, growth, and iron absorption. Anemia is a result of the lack of copper (Cu), vitamin A, vitamin B9, vitamin B12, vitamin B2, and vitamin C, as well as the presence of chronic infections and acute diseases such as tuberculosis, HIV, cancer, and malaria [19][28].

One way to prevent anemia is to consume foods containing iron and a variety of foods so that the nutrients obtained by the body complement each other. The consumption of food with vitamin C can help the absorption of iron. In contrast, foods that contain phytates, phosphates, and tannins can inhibit iron absorption. Iron can be obtained from animal food sources (heme iron) and non-animal sources (non-heme iron) [13].

Indonesia has many food sources high in iron, both heme and non-heme. Heme iron can be obtained from fish, meat, and eggs, especially quail eggs, while non-heme iron can be obtained from cereals, nuts, fruits, and green vegetables, especially moringa leaves. Moringa has many benefits for the world, which is why it is generally known as *The Miracle Tree.* Almost each of its parts, ranging from leaves, fruit, seeds, flowers, bark, and stems, to roots, have essential benefits. Moringa leaves contain fiber, fat, protein, and minerals, such as Ca, Mg, P, K, Cu, Fe, and S. Some of the vitamins contained in Moringa leaves include vitamin A (β-carotene), choline, thiamine, riboflavin, niacin, and ascorbic acid. Moringa leaves also contain a profile of phytochemicals, such as tannins, sterols, saponins, terpenoids, phenolics, alkaloids, and flavonoids such as quercetin, isoquercetin, kaemfericitin, isothiocyanates, and glycosides [8][27].

Iron content in 100 g of fresh moringa leaves is 7 mg [13]. In addition, the iron content in each gram of Moringa leaf flour is 28.2 mg/100. Moringa can therefore be a resource to prevent anemia. Food sources high in iron other than moringa leaves are quail eggs. Quail eggs are a source of food with a fairly complete nutritional value, including carbohydrates, protein, amino acids, and iron that are useful for the body. The nutritional value of 100 g quail eggs includes 13.05 g protein, 3.65 g iron, and 11.03 g cholesterol. In contrast, 100 g chicken eggs contain 12.8 g protein, 27 mg iron, and 423 mg cholesterol [5]. Quail eggs have a high iron content so they can increase hemoglobin levels and prevent anemia. These properties have attracted measures to include quail eggs as essential ingredients for foods, including wingko.

Wingko is a semi-wet food from Indonesia made from grated glutinous rice flour, coconut, sugar, and other additives that form a distinctive aroma and taste [12]. Research conducted by [13] on "The Study of Making Cookies with Addition of Moringa Leaf Flour and Sesame Seeds to Prevent Anemia" has concluded that a higher amount of moringa leaf flour leads to a higher amount of iron content. In the same vein, research conducted by [23] on the effect of the consumption of quail eggs on hemoglobin and cholesterol levels in adolescents aged 13-15 years has concluded that there is a significant difference between the consumption of quail eggs on hemoglobin and cholesterol levels. Also, another research conducted by [17] on the physicochemical and organoleptic properties of sweet potatoes showed that wingko from white sweet potato flour was preferred by panelists because it had good taste.

The iron content found in moringa leaves and quail eggs and the popularity of wingko as a traditional snack has the potential to help prevent anemia in Indonesia. The present study stems from the prevailing issues of anemia and the potential of moringa leaves and quail eggs as essential ingredients in wingko as snacks.

II. MATERIALS AND METHOD

A. Materials

The materials used in this study were moringa leaves from Prunggahan Kulon village of Tuban district in Indonesia, quail eggs, glutinous rice flour, coconut, vanilla, sugar, margarine, butter, and coconut milk.

B. Equipment

The study included the following equipment: blender, basin, mold, spatula, digital scales, bowl, measuring cup, whisk, baking sheet, pan, and spoon.

C. Research Design

This study used an experimental design with a 3x2 factorial design. The added proportions of 3 levels of Moringa leaves and 2 levels of quail eggs resulted in a combination of 6 treatments, namely K1P1 (20% moringa leaves, 15% quail eggs), K2P1 (25% moringa leaves, 15% quail eggs), K3P1 (30% moringa leaves, 15% quail eggs), K1P2 (20% moringa leaves, 20% quail eggs), K2P2 (25% moringa leaves, 20% quail eggs), and K3P2 (30% moringa leaves, 20% quail eggs. The data were processed using Kruskal-Wallis. A follow-up test through Mann Whitney was carried out when $p<0.05$ was confirmed to determine the effect of each treatment. This study used the De Garmo test to determine the best treatment for the physicochemical and sensory properties of wingko.

D. Procedure

Production of wingko

Wingko was made by preparing and weighing ingredients including the proportion of moringa leaves according to treatment (20%, 25%, and 30%), the proportion of quail eggs according to treatment (15% and 20%), glutinous rice flour (150 g), grated coconut (200 g), vanilla (500 mg), granulated sugar (145 g), margarine (10 g), butter (10 g), and coconut milk (35 ml). Then moringa leaves with coconut milk were mixed using a blender. Next, grated coconut, sugar, glutinous rice flour, vanilla, margarine, and butter were added. The resultant mixture was used to form the dough by kneading until smooth. The last process was roasting the wingko mold at 160ºC for time 20 minutes until the dough turned brown.

E. Analysis Method

Data was collected using a hedonic test according to the panelists' preference level in the form of aroma, color, taste, and texture using a test scale of strongly dislike (1), dislike (2), somewhat dislike (3), somewhat like (4), like (5), like very much. Data were processed using the Kruskal-Wallis test. When a significant difference was found, the Mann-Whitney test would be performed. The best product was determined based on its nutritional value using the De Garmo test. The nutritional values were identified through a series of tests, involving carbohydrate content through the Luff schoorl method [7], protein content through the Kjeldahl method [2], fat content through soxhlet [2], and iron content through the spectrophotometer calculation method [3]. This research has been approved by the Health Research Ethics Commission, Faculty of Dentistry, Airlangga University with ethics reference number 581/HRECC.FODM/XI/2021.

III. RESULTS AND DISCUSSION

A. Preference Level for Wingko with Moringa Leaves and Quail Eggs

1. Aroma

Aroma is a category that affects panelists' acceptance of food product based on whether it is delicious [1]. The panelists' preference level for aroma can be seen in the following table.

TABLE I. MEAN OF WINGKO AROMA

Treatment	N	Mean
20%, 15 %	60	202,04
25%,15%	60	192,79
30%,15%	60	167,24
20%,20%	60	208,34
25%,20%	60	173,75
30%,20%	60	138,83
Total	360	

Table I presents the analysis results of the aroma test of wingko obtained on means ranging from 138.83 to 208.34 (somewhat like to likes). The panelists' preference level from the aroma category was the highest on the 20%:20% formula, while the lowest was on the 30%:20% formula.

The Kruskal-Wallis test found a significant difference (p 0.001) in each of the formulae based on wingko aroma, so a follow-up analysis was performed using the Mann-Whitney test. Further test results showed different preference levels between 20%:15% and 30%:15% (p 0.034), 20%:15% and 30%:20% (p 0.000), 25%:15% and 30%:20% (p 0.002) , 30%:15% and 20%:20% (p 0.030), 20%:20% and 30%:20% (p 0.001), and 25%:20% and 30%:20% (p 0.043). These data demonstrated

that aroma was influenced by the amount of added moringa leaves and quail egg.

Wingko with the addition of 20% moringa leaves and 20% quail eggs was preferred by panelists for its pleasant aroma. The greater proportion of moringa leaves generated a stronger scent of moringa leaves [4]. The saponin compounds contained in moringa leaves caused wingko to have an unpleasant aroma. Saponins are steroids or triterpenoid glucosides stored in carbohydrates [18].

The findings above acknowledge the research conducted by [9] reporting that the addition of moringa leaves affects wingko aroma. More addition of moringa leaves was reported to reduce panelists' preference level.

2. Color

Color is a very important category because it can affect the appearance of a food product and therefore panelists' preference level (Amir, 2018). The panelists' preference level for color is shown in the following table.

TABLE II. MEAN SCORES OF WINGKO COLOR

Treatment	N	Mean
20%, 15 %	60	191,35
25%,15%	60	190,22
30%,15%	60	141,54
20%,20%	60	218,03
25%,20%	60	191,12
30%,20%	60	150,75
Total	360	

Table II describes the analysis results of the color test with reported means ranging from 141.54 to 218.03 (slightly like to likes). The panelists' preference level from the color category was the highest on the 20%:20% formula, while the lowest was on the 30%:15% formula.

Kruskal-Wallis test found a significant difference (p 0.000) in each of the color formulae, so a follow-up test was performed using the Mann-Whitney test. The results marked some differences in the preference level between the following formulae: 20%:15% and 30%:15% (p 0.005), 20%:15% and 30%:20% (p 0.021), 25%:15% and 30%:15% (p 0.004), 25%:15% and 30%:15% (p 0.004), 25%:15% and 30%:20% (p 0.019), 30%:15% and 20%:20% (p 0.000), 30%:15% and 25%:20% (p 0.004) and 20%:20% and 30%:20% (p 0.000). These data demonstrated that color was influenced by the amount of added moringa leaves and quail eggs.

Wingko with the addition of 20% moringa leaves and 20% quail eggs was the most preferred by panelists because it had a light green color, while the formula with the addition of 30% moringa leaves and 15% quail eggs received the lowest preference due to its black-green color. The additions of moringa leave affected the green color of wingko. Moringa leaves contain high concentrations of chlorophyll as a green dye. Leaves are often called green matter [15].

The findings are in line with the research conducted by [24] showing that the higher proportion of moringa leaves produced darker color. The more moringa leaves added to the wingko can decrease panelists' preference.

3. Taste

Taste is the result of a combination of food ingredients that can be felt by the sense of taste. Taste is the most important factor in determining panelists' preference for a product (Amir, 2018). The panelists' preference levels for wingko taste are presented in the following table.

TABLE III. MEAN SCORES OF WINGKO TASTE

Treatment	N	Mean
20%, 15 %	60	180,77
25%,15%	60	186,68
30%,15%	60	147,10
20%,20%	60	207,24
25%,20%	60	195,98
30%,20%	60	165,23
Total	360	

Table III shows the analysis results of wingko taste based on mean scores from 147.10 to 207.24 (slightly like to likes). The panelists' preference level from the color category was the highest on the 20%:20% formula, while the lowest was on the 30%:15% formula.

Kruskal-Wallis test found a significant difference (p 0.014) in each of the taste formulae. As such, a follow-up test was performed using the Mann-Whitney test. Further test results showed that there were differences in the preference level between 25%:15% and 30%:15% (p 0.002), 30%:15% and 20%:20% (p 0.002), 30%:15% and 25%:20% (p 0.004), 20%:20% and 30%:20% (p 0.033). These findings have proven that moringa leaves and quail egg affect wingko taste.

Wingko with the addition of 20% moringa leaves and 20% quail eggs was the most preferred by the panelists. The addition of 20% of moringa leaves reduced the bitter and acrid taste. The addition of moringa leaves tended to generate a bitter sensation which was affected by the tannin content. Tannin is astringent compound from the polyphenol group and it tastes dry and astringent [11].

These findings confirm the research of [24] which states that panelists' preference tends to fall due to the increased addition of moringa leaves.

4. Texture

The findings in wingko texture analysis are presented in the following table.

TABLE IV. TABLE MEAN OF WINGKO TEXTURE

Treatment	N	Mean
20%, 15 %	60	165,87
25%,15%	60	188,48
30%,15%	60	164,66
20%,20%	60	182,13
25%,20%	60	202,04
30%,20%	60	179,82
Total	360	

Table IV documents the analysis results of wingko texture as indicated by mean scores from 164.66 to 202.04 (slightly like

to likes). The panelists' preference level from the texture category was the highest on the 25%:20% formula, while the lowest was on the 30%:15% formula

The results of the Kruskal-Wallis test for texture parameters showed p 0.297 (p>0.05). This means that the addition of moringa leaves and quail eggs improves the wingko taste. As a result, no Mann-Whitney test was performed.

Wingko texture is influenced by white glutinous rice flour. This ingredient contains amylose and amylopectin so that it can produce a chewy texture on wingko [24]. The difference in each treatment is insignificant, resulting in a nearly similar wingko texture, which is chewy and dense. In addition, the amount of liquid that is the basic ingredient can also affect the wingko texture [25]. In this study, the amount of fluid was kept constant across treatments. Therefore, it would be possible to reach a similar texture despite different thicknesses and shapes of wingko dough, while also maintaining constant baking time.

These findings are in line with the research of [24] which states that the addition of moringa leaves does not have a significant effect on wingko texture.

5. Identifying the Best Products

The best product was identified using De Garmo test. The initial stage of the test was determining the panelists' scores [21]. This was done by assigning a score of 0-1 on each parameter of all treatments as indicated by panelists' preference. The next stage was to calculate the effectiveness of the product by using the values or scores assigned to wingko with different treatments. The last stage was to calculate productivity value by multiplying effectiveness value with weighted value. The best product is characterized by the highest productivity value as a result of a specific amount of added moringa leaves and quail eggs. De Garmo test results can be seen in the following table.

TABLE V. THE RESULTS OF DE GARMO TEST

Treatment	Productivity Value
20%, 15 %	0.53
25%,15%	0.65
30%,15%	0.09
20%,20%	0.88
25%,20%	0.73
30%,20%	0.2

De Garmo test calculation involving such parameters as aroma, color, taste, and texture has proven that the best product is wingko with the addition of 20% moringa leaves and 20% quail eggs.

TABLE VI. THE SELECTED FORMULA OF WINGKO RECIPE (K1P2 TREATMENT)

Ingredient	20%, 20% Formula
Moringa leaves (g)	30
Quail egg(g)	30
glutinous rice flour (g)	150
grated coconut (g)	200
Vanilla (mg)	500
Sugar (g)	145
Margarine (g)	10
Butter (g)	10
Coconut milk (ml)	35

B. The nutritional content of wingko moringa leaves and quail eggs

1. Nutritional content

The nutritional content of wingko resulting from different amounts of added moringa leaves and quail eggs included protein, carbohydrates, fat, and iron. Involving the data from Indonesia Food Composition Data (IFCD) The test results in this regard are shown in the following table.

TABLE VII. THE NUTRITIONAL CONTENT OF WINGKO WITH DIFFERENT ADDITIONS OF MORINGA LEAVES AND QUAIL EGGS IN EVERY 100-GRAM INGREDIENT

Nutritional content	IFCD 2019	laboratory test results
Protein (%)	3.20	7.63
Carbohydrate (%)	51.40	43.97
Fat (%)	15.10	12.45
Iron (Fe) (mg/kg)	1.10	4.37

Table VII has shown that the nutritional value of wingko with 20% moringa leaves and 20% quail eggs in every 100 g can increase the amount of protein and iron while lowering carbohydrates and fats. Following [22], wingko nutritional content was compared with 10% recommended dietary allowances (RDA).

2. Protein Content

Protein plays a role in forming hemoglobin. Lack of protein in the long term will result in disturbances in the formation of red blood cells and thence can cause symptoms of anemia [16].

TABLE VIII. THE PROTEIN CONTRIBUTION IN WINGKO WITH MORINGA LEAVES AND QUAIL EGGS

Category	Age (year)	Snack needs to meet 10% RDA (g)	Protein contribution in wingko with moringa leaves and quail eggs in 100 g (%)
Children	7-9	4	190.75
Male	10-12	5	152.6
Adults	13-15	7	109
	16-18	7.5	102
	19-64	6.5	117
Female	10-12	5.5	138.7
Adults	13-18	6.5	117
	19-64	6	127

Data in Table VIII shows that wingko with the addition of 20% moringa leaves and 20% quail eggs per 100 grams can meet protein needs to foster the production of blood hemoglobin.

3. Carbohydrate Content

Carbohydrates are the main source of energy for the body. Carbohydrates will be broken down in the form of glucose. Excess glucose in the form of glycogen will be stored in the liver and muscle tissue [10].

TABLE IX. THE CARBOHYDRATE CONTRIBUTION IN WINGKO WITH MORINGA LEAVES AND QUAIL EGGS IN REFERENCE TO RDA

Category	Age (years)	Snack needs to meet 10% RDA (g)	Carbohydrate contribution in wingko with moringa leaves and quail eggs in 100 g (%)
Child	7-9	25	175.9
Man	10-12	30	146.6
	13-15	35	125.6
	16-18	40	109.9
	19-29	43	106
	30-49	41.5	129.3
	50-64	34	157
Woman	10-12	28	157
	13-18	30	146.6
	19-29	36	122.1
	30-49	34	129.3
	50-64	28	157

Data in Table IX demonstrates that wingko with the addition of 20% moringa leaves and 20% quail eggs per 100 grams can meet carbohydrate needs.

4. Fat Content

Fat is an energy source that produces several more basic calories than carbohydrates and protein. Fat is needed by humans in certain amounts. The excess fat is stored by the body and this excess will be used when needed. Fat intake that is too low can result in insufficient energy consumption because one gram of fat provides nine calories. The insufficient intake of animal fats can lead to low iron.

TABLE X. THE FAT CONTRIBUTION IN WINGKO WITH MORINGA LEAVES AND QUAIL EGGS IN REFERENCE TO RDA

Category	Age (years)	Snack needs to meet 10% RDA (g)	Fat contribution in wingko with moringa leaves and quail eggs in 100 g (%)
Child	7-9	5.5	226.4
Man	10-12	6.5	191.5
	13-15	8	155.6
	16-18	8.5	146.5
	19-29	7.5	166
	30-49	7	177.9
	50-64	6	207.5
Woman	10-12	6.5	191.5
	13-18	7	177.9
	19-29	6.5	191.5
	30-49	6	207.5
	50-64	5	249

The table above documents that wingko with the addition of 20% moringa leaves and 20% quail eggs per 100 grams can meet the fat requirement according to RDA.

5. Iron Content

Iron is an essential microelement for the body. Iron has a function for the formation of hemoglobin, minerals, and the formation of enzymes. Iron deficiency can cause iron reserves in the liver to decrease so that the formation of red blood cells is disrupted which will result in the formation of low hemoglobin levels or below normal blood hemoglobin levels [20].

TABLE XI. IRON CONTRIBUTION IN WINGKO WITH MORINGA LEAVES AND QUAIL EGGS IN REFERENCE TO RDA

Category	Age (years)	Snack needs to meet 10% RDA (g)	Iron contribution in wingko with moringa leaves and quail eggs in 100 g (%)
Child	7-9	1	437
Man	10-12	0.8	546.3
	13-18	1.1	397.3
	19-64	0.9	485.6
Woman	10-12	0.8	546.3
	13-18	1.5	291.3
	19-49	1.8	242.8
	50-64	0.8	546.3

As observed in Table XI, wingko with the addition of 20% moringa leaves and 20% quail eggs can meet iron needs. This confirms that the wingko can offer more iron to meet the iron needs of patients with anemia.

IV. Conclusion

1. Wingko with the addition of 20% moringa leaves and 20% quail eggs has been to be the most preferred by the panelists and possesses the highest productivity value. The added proportion of moringa leaves and quail eggs has varied effects on the aroma, color, and taste of wingko, but not on its texture.
2. The best wingko product is found to have 7.63% protein content, 43.97% carbohydrate, 12.45% fat, and 4.37 mg iron.
3. Wingko with the addition of 20% moringa leaves and 20% quail eggs per 100 grams can meet the needs for protein, carbohydrates, fat, and iron.

References

[1] Amir, Y., Sirajuddin, S. and Syam, A., 2018. Daya Terima Susu Bekatul Sebagai Pangan Fungsional. Hasanuddin Journal of Public Health. Vol. 1(1): hal. 16-25.

[2] AOAC (Association of Official Agricultural Chemist). (1990) Official Methods of Analysis of The Association of Official Agriculture Chemist (15 th edition). Virginia: Association of Analytical Chemist Inc

[3] AOAC, 1994. Official Methods of Analysis. Association of Official Analytical Chemists. 1111 North 19 Street, th Suite 20, 16 Edi. Arlington, Virginia, USA. 22209.

[4] Armila, F., Rahmatu, R., & Hutomo, G. S. (2019). Karakteristik Mutu Fisikokimia dan Organoleptik Greenies. Agrotekbis: E-Jurnal Ilmu Pertanian, 7(4), 424-432.

[5] Bakhtra, D. D. A., Rusdi, R., & Mardiah, A. (2017). Penetapan Kadar Protein Dalam Telur Unggas Melalui Analisis Nitrogen Menggunakan Metode Kjeldahl. Jurnal Farmasi Higea, 8(2), 143-150.

[6] Balitbangkes RI. Laporan Hasil Riset Kesehatan Dasar Tahun 2018. Jakarta: Balitbangkes, 2018.

[7] BSN [Badan Standarisasi Nasional]. (1992). Standar Nasional Indonesia: Cara uji makanan dan minuman (SNI 01-2891-1992)

[8] Gopalakrishnan, Lakshmipriya, et al . 2016 . Moringa Oleifera: A Review On Nutritive Importance And Its Medicinal Application. Food Science And Human Wellness 5.2 : 49-56.

[9] Handayani, I., & Priyanti, E. (2021). Analisis Penerimaan dan Kandungan Gizi Wingko dengan Substitusi Tepung Daun Kelor (Moringa Oleifera). TEKNOBUGA: Jurnal Teknologi Busana dan Boga, 9(2), 79-84.

[10] Haswita dan Reni Sulistyowati. (2017). Kebutuhan Dasar Manusia Untuk Mahasiswa Keperawatan dan Kebidanan. Jakarta : CV. Trans Info Medika

[11] Ismarani. 2012. Potensi Senyawa Tanin dalam Menunjang Produksi Ramah Lingkungan. CEFARS. Vol. 3(2): hal. 46-55.

[12] Jariyah, J., Wicaksono, L. A., & Septi, N. D. (2020). Corn Wingko Processing Optimization Using Response Surface Methodology. International Journal on Food, Agriculture and Natural Resources, 1(2), 28-33.

[13] Karani, Renna Arini Reddina. 2021. Kajian Pembuatan Cookies Dengan Penambahan Tepung Daun Kelor Dan Biji Wijen Sebagai Makanan Selingan Sumber Zat Besi Untuk Mencegah Anemia. Doctoral dissertation, Politeknik Negeri Jember.

[14] Kementrian Kesehatan RI. 2018. Riset Kesehatan Dasar 2018. Badan Penelitian dan Pengembangan

[15] Krisnadi. (2015). Edisi revisi maret 2015. Kelor Super Nutrisi, 1–164

[16] Masthalina, H. (2015). Pola Konsumsi (faktor inhibitor dan enhancer fe) terhadap Status Anemia Remaja Putri. KEMAS: Jurnal Kesehatan Masyarakat, 11(1), 80-86.

[17] Mawaddah, R. (2018). Pengaruh Proporsi Tepung Ubi Jalar (Ipomoea Batatas L.) Dan Tepung Ketanterhadap Sifat Fisiko-Kimia Dan Sifat Organoleptik Wingko (Doctoral Dissertation, University Of Muhammadiyah Malang).

[18] Mazidah, Y. F., Kusumaningrum, I., & Safitri, D. E. 2018. Penggunaan Tepung Daun Kelor pada Pembuatan Crackers Sumber Kalsium. ARGIPA (Arsip Gizi dan Pangan). Vol. 3(2): hal. 67-79.

[19] Milman, Nils. 2011. Anemia—Still A Major Health Problem In Many Parts Of The World. Annals Of Hematology 90, No. 4 (2011): 369-377.

[20] Novitasari, S. (2014). Hubungan Tingkat Asupan Protein, Zat Besi, Vitamin C dan Seng dengan Kadar Hemoglobin pada Remaja Putri di SMA Batik 1 Surakarta (Doctoral dissertation, Universitas Muhammadiyah Surakarta).

[21] Rifkowaty, E. E. (2020). Pengaruh Konsentrasi Sukrosa Dan Gliserin Terhadap Sabun Transparan Daun Ketepeng (Cassia Alata). Jurnal Patani: Pengembangan Teknologi Pertanian dan Informatika, 4(2), 26-33.

[22] Rohayati, & Zainafree, I. 2014. Faktor yang Berhubungan dengan Penyelenggaraan Program Makan Siang di SD Al Muslim Tambun. Unnes Journal of Public Health. Semarang: Fakultas Ilmu Keolahragaan Universitas Negeri Semarang.

[23] Sari, Ika Purnama, et al .2020. Pengaruh Konsumsi Telur Puyuh Terhadap Kadar Hemoglobin Dan Kolesterol Pada Remaja Umur 13-15 Tahun. Jurnal Vokasi Kesehatan 6.1 : 35-41.

[24] Setiawan, F. A., & Priyanti, E. (2020). Substitusi Tepung Daun Kelor dalam Pembuatan Cup Cake. Garina,20(1).

[25] Singgih, W. D., & Harijono. (2015). Pengaruh Substitusi Proporsi Tepung Beras Ketan dengan Kentang pada Pembuatan Wingko Kentang. Jurnal Pangan Dan Agroindustri, 3(4), 1573–1583.

[26] Yohana Dewi Andriani, P. (2017). Hubungan Anemia Dalam Kehamilan Dan Paritas Dengan Perdarahan Post Partum Di Puskesmas Nambo Tahun 2015-2016 (Doctoral Dissertation, Poltekkes Kemenkes Kendari).

[27] Rusdianto, A., S., Nizhomia, F., Giyarto, G., and Wiyono, A., E. 2022. The Characteristics of Liquid Soap With Varied Additions of Moringa Leaf Extract (*Moringa Oleifera* L.). International Journal of Food, Agriculture, and Natural Resources. Vol 3 (1):33-39.

[28] Lina lasminingrum, Bambang Purwanto, Melati Sudiro, Anggie Mutmainnah. 2021. The association of iron deficiency anemia on chronic suppurative otitis media in children: A case-control study. *Annals of Medicine and Surgery*. Vol 72. 103105. ISSN 2049-0801.