ORGANOLEPTIC ACCEPTANCE TEST OF FLAWLESS BREAD WITH SORGHUM FLOUR SUBSTITUTION

Dian Ayu Ainun Nafies[1]*, Lilia Faridatul Fauziah[1], Ahmad David Royyifi[1], Kartika Dewi Sukmawati[1]
[1]Institute of Health Sciences Nahdlatul Ulama, Tuban
*Corresponding Author, E-mail : diannafies19@gmail.com

ABSTRACT

Iron-deficiency anemia is a hematological disease that is often found in pregnant women. This situation can certainly hinder the growth and development of the fetus in pregnant women. It can be said to be anemia if the number of red blood cells or hemoglobin is below the normal limit if the hemoglobin level is <14 g/dL in men and <12 g/dL in women. Therefore, food that contains iron is needed to meet daily iron needs. Sorghum planting is often found in East Java and surrounding areas. This plant contains high levels of iron compared to other cereals, such as rice. This research aims to determine the effect of sorghum flour substitution on the organoleptic acceptability of sorghum white bread. The analysis used in this research consists of static analysis and organoleptic analysis. The results of this study showed that there was a significant effect on the color, smell, flavor, and texture of white bread substituted for sorghum kurskal wallis flour (p > 0.005). This research concludes that white bread substituted for sorghum flour influences organoleptic quality.

Keywords: White Bread; Sorghum Flour; Sorghum; Organoleptic; Substitutes.

1. INTRODUCTION

Iron deficiency anemia (IDA) is a hematological disease that is often found in pregnant women. This situation can certainly hinder the growth and development of the fetus, and if anemia occurs in pregnant women for a long period, it will result in stunting in the baby they are carrying in the future. Considering the large negative impact of iron deficiency anemia, it needs to receive sufficient attention (Susiloningtyas, 2023). Iron (Fe) deficiency can cause iron deficiency anemia; this is caused by a lack of iron availability in the body, resulting in insufficient iron needed for erythropoiesis. This is characterized by a picture of hypochromic microcytic erythrocytes, a decrease in serum iron levels, transferrin, and iron reserves, accompanied by an increase in total iron binding capacity (Fitriany & Saputri, 2018). The prevalence of anemia in pregnant women in Indonesia has increased since 2018. The incidence of anemia increased

significantly from 2013 (37.1%) to 2018 (48.9%)(Kemenkes RI, 2018). The highest prevalence of anemia in Indonesia occurs in pregnant women, at 50.5%. Meanwhile, the average prevalence of anemia in pregnant women in East Java Province is 5.8%; this result is still below the national target of 28% (Kemenkes RI, 2018).

The cause of iron deficiency Anemia in pregnant women is caused by a lack of iron intake in the body. This is caused by not consuming enough foods rich in iron. If a pregnant woman has hemoglobin levels in the first and second trimesters of <11 gr/dl or Hb, 10.5 gr/dl in the second trimester, it can be said that the pregnant woman has anemia. The impact of anemia on the fetus can result in the fetus not developing well, LBW (low birth weight), and the baby being born prematurely, while the impact of anemia on pregnant women can result in decreased appetite, nausea, weakness, fatigue, and lethargy (Susiloningtyas, 2023)

Efforts to overcome anemia in pregnant women are made by providing adequate nutrition that is high in iron. In this regard, it is necessary to intervene in foods high in iron for pregnant women, one of which is white bread. Bread is a type of processed food made from wheat flour and then baked using an oven. Bread has various types and shapes, depending on the formulation of the ingredients used. used and how to make it (Syahputri & Wardani, 2015).

White bread is a processed food product made from wheat flour mixed with ingredients such as butter, yeast, and milk (Sitepu, 2019). The definition of bread is a product obtained from wheat flour dough leavened with bread yeast. White bread has now become an alternative food to replace rice, so it is quite popular among the public. The nutritional content of white bread is superior compared to rice and noodles; 100 grams of white bread provide 248 kcal of energy, with a composition of 50 grams of carbohydrates, 8 grams of protein, and 0.67 mg of iron (Nugroho, 2016). The iron content in white bread is very low; therefore, it is necessary to modify white bread recipes to increase the nutritional value, especially iron, to overcome the problem of iron deficiency in pregnant women, one of

which is by adding sorghum, which is a cereal high in iron, so that it is suitable as a substitute ingredient for white bread.

Sorghum (*Sorghum bicolor L. Moench*) is a cereal with the highest iron content. The iron content of sorghum is 5.4 mg/100 gr, higher than the iron in broken rice, 1.8 mg/100 gr, and wheat, 3.5 mg/100 gr (Susila, 2005). Research conducted by Suarni (2017) found that the content of sorghum flour per 100 grams contained 11.3 grams of protein, 6.3% fiber, and 4.4 mg of iron, which was higher than wheat flour.

The addition of sorghum flour can increase the nutritional value of white bread. The nutritional value of sorghum per 100 grams, according to Kementerian Kesehatan et al (2017), contains 366 kcal, 11.0 grams of protein, 3.3 grams of fat, 73.0 grams of carbohydrates, and 4.4 mg of iron. The iron content in sorghum is higher than in other types of cereals. The iron content in food can be used as an alternative to prevent anemia, and iron can also be used for the body's defense system (Kementrian Kesehatan Republik Indonesia, 2015). So far, the use of sorghum in the Tuban area has not been properly utilized; usually, sorghum is only used as animal feed, even though sorghum has a high nutritional content.

Research conducted by Syafitri et al (2019) shows that the higher the addition of sorghum flour, the higher the iron content (Fe). Teenage female respondents consuming these biscuits can contribute to the body's iron intake by 40% of the total daily requirement.

Based on this explanation, choosing the type of food to increase daily iron (Fe) requirements is very important for pregnant women to prevent anemia. The addition of sorghum flour to white bread can be used as an alternative food with a high iron content, which is expected to increase the daily iron (Fe) intake requirements.

2. METHOD AND ANALYSIS

The analysis used in this research consists of statistical analysis and acceptability or organoleptic analysis. The acceptability test was carried out on untrained panelists who were first given instructions to take the

acceptability test with a total of 30 panelists. The panelists used for the acceptability test were 15 students from the Faculty of Nursing, Nursing Study Program, Nahdlatul Ulama Institute of Health Sciences, Tuban, and 15 students from the Faculty of Health, Nutrition Study Program, Nahdlatul Ulama Institute of Health Sciences, Tuban. Acceptability analysis was carried out using a liking test (Hedonic) on color, smell, flavor, and texture parameters. Data analysis used in this research used a computer program. Data from the favorability test results on acceptability were processed using Microsoft Excel.

Then statistically using SPSS, the data from the liking test results on acceptability were analyzed for data normality first, then if the data distribution showed that it was not normal ($p<0.05$) continued with Kruskall Wallis analysis. The *Kruskal-Wallis* method is a ranking-based method aimed at determining whether there are statistically significant differences between 2 or more groups of variables. If the results of the Kruskall-Wallis analysis show a difference, the *Mann-Whitney* test is continued with each treatment. The score data in the selected formulator research was processed using Microsoft Excel, where the average results of each parameter of color, smell, flavor, and texture were sorted from the ranking obtained from the highest and lowest values in the level of liking.

3. RESULT AND DISCUSSION

Organoleptic quality was carried out by 30 panelists regarding date cookies substituted for rice bran flour and kepok banana flour. Organoleptic testing has characteristics and is given a score according to preference. Characteristics that are not liked are given a value of 1, normal or neutral are given a value of 2, likes are given a value of 3, and likes are given a value of 4 which includes color, flavor, smell, and texture.

Flavor Acceptance Test

Based on the results of the liking level assessment with 30 untrained panelists, the following results were obtained. The white bread that was most liked by panelists was

white bread in treatment P0 by 20 panelists (67%) because the flavor in P0 was more familiar to panelists, then the white bread that was most disliked was white bread in treatment P3 by 23 panelists (76 %) the flavor in P3 tends to be disliked because the flavor of sorghum in this treatment is very strong. Panelists didn't like it because the more sorghum the flavor of the bread becomes unpleasant, P1 most of the panelists 21 people (70%) liked the flavor of plain bread, and 22 people Panelists in treatment P2 said normal/neutral to the flavor of white bread. The level of panelists' preference for the flavor of white bread will be presented in Figure.1 below.

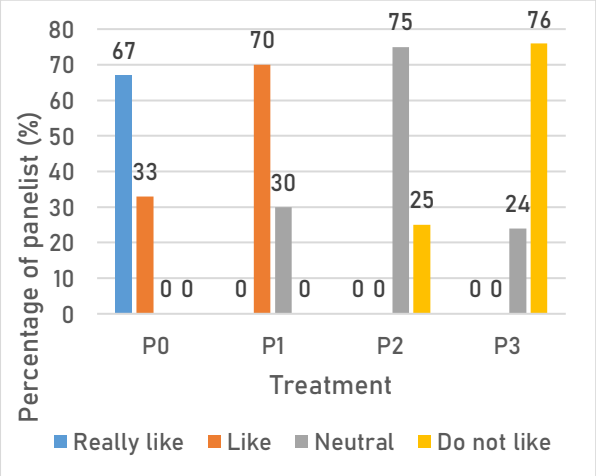

Figure. 1 Percentage of panelists' liking for the flavor of white bread substituted for sorghum flour 2023

The results of the *Kruskal Wallis* test for the level of preference for the flavor of white bread substituted for sorghum flour showed that the difference in preference for flavor between treatments was significant ($p<0.05$).

Table 1. *Mann Whitney* Flavor Test Results

Parameter	Treatment	N	*Mann-Whitney*	Asymp.Sig
Flavor	P0 P1	30	105,000	0,000
	P0 P2	30	0,000	0,000
	P0 P3	30	0,000	0,000
	P1 P2	30	99,000	0,000
	P1 P3	30	31,500	0,000
	P2 P3	30	225,000	0,000

The results of further tests using *Mann-Whitney* in the flavor category showed that there were real differences in all treatments with significant values indicated by *p-value*.

Color Acceptability Test

Color is a characteristic that determines consumer acceptance or rejection of a product. Based on the results of assessing the level of color preference with 30 untrained panelists, the following results were obtained. The level of preference for the color of white bread with the most

preferred being in treatment P2 was 17 people (56%) the color in P2 was liked a lot because it was unique and different from the color of bread in general, while the level of preference for white bread that was least liked by the panelists was treatment P1: 3 people (10%) in treatment P1 panelists did not like the color because the color in treatment P1 was familiar to the panelists, then in treatments P1 and P2 most of the panelists said they liked the color of white bread.

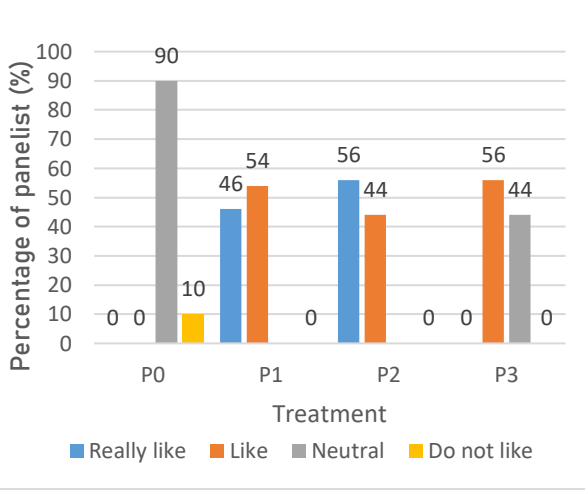

Figure. 2 Percentage of panelists' liking for color in white bread substituted for sorghum flour 2023

The results of the *Kruskal Wallis* test for the level of preference for the color of white bread substituted for sorghum flour showed that the difference in preference for color between treatments was significant ($p<0.05$).

Table 2 *Mann Whitney* Color Test Results

Parameter	Treatment	N	*Mann-Whitney*	Asym p.Sig
Color	P0 P1	30	24,000	0,000
	P0 P2	30	19,500	0,000
	P0 P3	30	240,000	0,000
	P1 P2	30	405,000	0,442
	P1 P3	30	136,000	0,000
	P2 P3	30	110,500	0,000

(Source: Primary Data, 2023)

A follow-up test using *Mann-Whitney* in the color category showed that there were real differences in treatments P0-P1, P0-P2, P0-P3, P1-P3, and P2-P3 with significant values indicated by a P value of 0.05.

Smell Acceptability Test

One way to test food preferences can be done by smell testing. Based on the results of assessing the level of liking for smells with 30 untrained panelists, the following results were obtained. The level of preference for the smell of white bread that was most liked by the panelists was treatment P0 with a total of 15 people (50%) the smell in P1

was preferred by the panelists because the smell of the bread was a typical bread smell in general, then the level of preference for the smell of white bread was the least The panelists liked the P3 treatment by 17 people (30%) because there were more substitutes for sorghum flour with the smell of bread like wood so the panelists didn't like the smell in the P3 treatment, in the P1 treatment the majority of the panelists, 20 people (66%) liked the smell in the P3 treatment. white bread, and in treatment P2 as many as 27 people said they were normal/neutral to the smell of white bread.

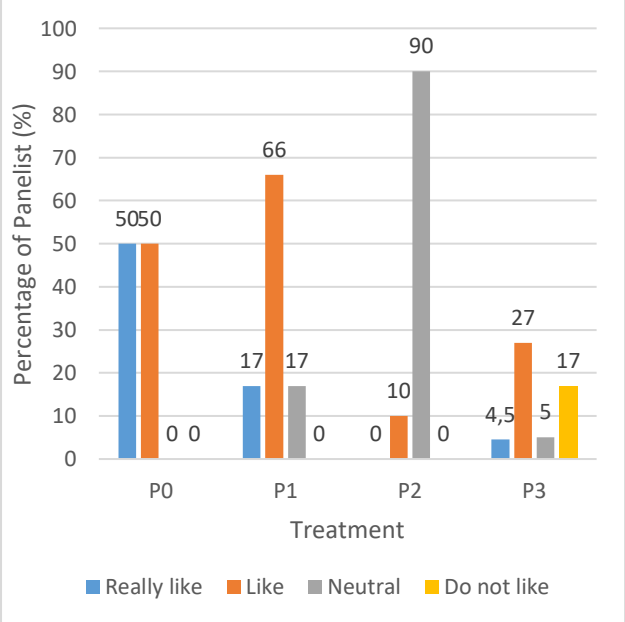

Figure. 3 Percentage of Panelists' Level of Likeness for Smell in White Bread as a Substitute for Sorghum Flour 2023

The results of the *Kruskal Wallis* test for the level of liking for the smell of white bread substituted for sorghum flour show that the difference in liking for smell between treatments is significant with results ($p<0.05$). The results of the *Mann-Whitney* test for differences in smell in each treatment will be presented in Table 6.

Table 6 *Mann Whitney* Smell Test Results

Parameter	Treatment	N	*Mann-Whitney*	Asym p.Sig
Smell	P0 P1	30	247,500	0,001
	P0 P2	30	22,500	0,000
	P0 P3	30	67,500	0,000
	P1 P2	30	114,000	0,000
	P1 P3	30	179,500	0,000
	P2 P3	30	427,500	0,674

A follow-up test using *Mann-Whitney* in the smell category showed that there were real differences in treatments P0-P1, P0-P2, P0-P3, P1-P2, and P1-P3 with significant values indicated by a P value of 0.05.

Texture Acceptability Test

Each food has its texture properties depending on its physical condition, size, and shape. Based on the results of assessing the level of preference for textures with 30

untrained panelists, the following results were obtained. As many as 18 people (60%) liked the flavor of white bread in the P0 treatment, while 13 people (43%) said they didn't like the flavor of white bread in the P3 treatment.

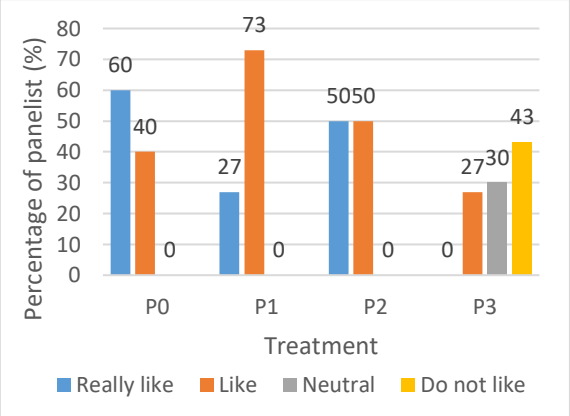

Figure. 4 Percentage of panelists' liking for the texture of white bread substituted for sorghum flour 2023

The results of the Kruskal Wallis test for the level of preference for the texture of white bread substituted for sorghum flour showed that the difference in preference for texture between treatments was significant (p<0.05).

Table 7 *Mann Whitney* Texture Test Results

Parameter	Treatment	N	*Mann-Whitney*	Asymp.Sig
Texture	P0 P1	30	285,000	0,005
	P0 P2	30	82,500	0,000
	P0 P3	30	44,000	0,000
	P1 P2	30	165,000	0,000
	P1 P3	30	88,000	0,000
	P2 P3	30	247,500	0,001

A follow-up test using *Mann-Whitney* in the texture category showed that there were real differences in all treatment groups with a significant value indicated by p value <0.05.

DISCUSSION

Flavor Acceptance Test

Based on Figure.1, it can be concluded that treatments P0 to P3 tend to be liked by panelists, P0 with a formulation of 100% wheat flour as a control treatment, the flavor is liked by panelists because it is similar to similar products on the market. Then P1 to P2, namely at 70% and 80% sorghum flour substitution, are also still at the level preferred by the panelists. However, when 90% was substituted for sorghum flour in the P3 treatment, the panel's flavor acceptance decreased to dislike. This may be because the flavor of sorghum is more dominant, many panelists are not familiar with the flavor of sorghum.

Substituting sorghum flour into white bread can affect the flavor of

white bread, this is because the flavor of sorghum flour and wheat flour is different, white bread which is substituted for sorghum flour will tend to have a typical fibrous and woody sorghum flavor, so the higher the sorghum flour formulation can be. reducing the level of panelists' preference for the flavor of white bread.

The decrease in the level of panelists' preference for flavor when sorghum flour was substituted was also in line with previous research conducted by Lufiria (2012) seen from the level of panelists' preference for the flavor of dry cakes made from wheat flour and rice flour substituted for sorghum. This may be because the glutamic acid content of sorghum flour is lower than that of flour. This is supported by research conducted by Suarni (2017) showing the influence of glutamic acid on the flavor of white bread substituted for sorghum flour.

Based on facts and theory, it can be concluded that more sorghum flour formulations can influence the level of panelists' preference for the flavor of white bread to decrease, this is because the flavor of sorghum flour is less familiar and different from wheat flour.

Color Acceptability Test

Based on Figure. 2, it can be concluded that treatments P0 to P3 tend to be preferred by panelists, P2 with a formulation of 20% wheat flour and 80% sorghum flour. The treatment that received the highest mode score, was because the addition of sorghum flour substitute could change the color of white bread to purplish brown. This might have caused the panelists to like this color because it was unique and different from the color of white bread sold in the market. Then P1 and P3, namely 70% and 90% substitution of sorghum flour, are also still at the level preferred by the panelists. However, when substituted with 100% wheat flour in the P0 treatment, the color acceptance of the panelists decreased. This may be because the color of the white bread is the same as similar products so the panelists are not interested.

The addition of sorghum to white bread can affect the color of the white bread, this is because the color of sorghum flour is brownish which is

different from wheat flour which is yellowish white. This can cause the panelists' preference level to increase towards the color of white bread substituted with sorghum flour.

This is in line with research conducted by Arisanti (2017) with research entitled Characteristics of the chemical properties of sorghum brownies with the substitution of wheat flour. Results were obtained from 3 treatments, with the highest value of 4.10 found in treatment B2 with a formulation of 75 grams of sorghum flour and 25 grams. wheat flour then the panelists' preference level decreased in treatment B3 with 100% sorghum flour substitution. This is because the colors on B2 are attractive and unique.

Based on the facts and results of previous research, it can be concluded that the substitution of sorghum flour has a significant effect on the color of the final white bread product produced so this can influence the panelists' level of preference for the color of white bread. The addition of 80% sorghum flour in this study can increase the panelists' preference for the color of white bread because the color is brownish and slightly purplish, which is different from white bread products on the market.

Smell Acceptance Test

Based on Figure. 3, it can be concluded that treatments P0 to P3 tend to be liked by panelists, P0 with a formulation of 100% wheat flour as a control treatment means the smell is liked by panelists because it is similar to similar products on the market. Then P1 to P3, namely at 70%, 80%, and 90% sorghum flour substitution, are also still at the level preferred by the panelists. However, when substituted for 90% sorghum flour in the P3 treatment, the panelists' acceptance of the smell decreased to dislike. This may be because the smell of sorghum is more dominant, many panelists don't like it because it is unpleasant.

Substituting sorghum flour into white bread can affect the smell of white bread, this is because the woody smell of sorghum flour is the cause, compared to wheat flour which has no smell, thus causing a decrease in the level of panelists' preference for the

smell of white bread with the higher the sorghum flour formulation.

This is in line with research conducted by Setyanti et al (2015) on the substitution of sorghum flour in muffins with 5 treatments. The muffin smell most preferred by the panelists was a formulation using 30% sorghum flour. The decline in muffin preference was caused by the characteristic smell of sorghum which has a woody or damp, dusty or musty smell.

Based on the facts confirmed by previous research, it can be concluded that the addition of sorghum flour can have a significant effect on the smell of the final white bread product. This can influence the panelists' level of preference for the smell of white bread substituted with sorghum flour. The panelists' preference for the smell of white bread is because the smell of white bread is like bran or wood so the panelists don't like this smell.

Texture Acceptability Test

P0 as a control treatment means the texture is liked by panelists because it is similar to similar products that are marketed. The higher the substitution of sorghum flour decreases the panelists' preference for the texture of white bread because the higher the substitution, the rougher and drier the texture of the white bread will be.

Substitution for sorghum flour can affect the texture of the resulting white bread. The more sorghum flour formulations given can reduce the level of panelists' preference for the texture of white bread. This is because sorghum flour is gluten-free, which causes white bread to not rise perfectly and causes it to become dense and hard.

This is in line with research conducted by Rosniar et al (2016) with research entitled Differences in the level of hardness and acceptability of sorghum flour biscuits from the results of the analysis that the addition of 15-30% sorghum sosoh flour to biscuits can affect the texture hardness of the biscuits. The greater the concentration of substitutes in the biscuit, the higher the texture hardness of the biscuit.

Based on the facts confirmed by previous research, it can be concluded that the addition of sorghum flour can have a significant effect on the texture

of the final white bread product. This can influence the panelists' level of preference for the texture of white bread substituted with sorghum flour. The panelists' preference for the texture of white bread is because the texture of white bread with a high sorghum flour formulation causes the final product of white bread to be dense and fibrous (Susiloningtyas, 2023).

4. CONCLUSION

Based on the results and discussion, it can be concluded that sorghum flour substitution has a significant effect on the organoleptic quality of the color, flavor, smell, and texture variables. The level of panelists' preference increased for white bread substituted for sorghum flour in treatment P1 with 70% sorghum flour. However, the more substitutes for sorghum flour, the lower the panelists' preference level.

5. REFERENCES

Arisanti, D. (2017). Karakteristik Sifat Kimiawi Brownis Sorgum (Sorghum bicolor L) dengan Subtitusi Tepung Terigu. *Journal of Agritech Science*, *2*(1), 1–8.

Fitriany, J., & Saputri, A. I. (2018). Anemia Defisiensi Besi. Jurnal. *Kesehatan Masyarakat*, *4*(1202005126), 1–30.

Kemenkes RI. (2018). *Hasil Utama Riskesdas 2018*.

Kementerian Kesehatan, T. R., Indonesia Kementerian Kesehatan Direktorat Jenderal Kesehatan Masyarakat Tabel Komposisi Pangan Indonesia, I. R., & Kesehatan, K. R. (2017). *Food Composition Table—Indonesia (Daftar Komposisi Bahan Makanan)*.

Kementrian Kesehatan Republik Indonesia. (2015). Rapat Kerja Kesehatan Nasional Regional Timur Menteri Kesehatan Republik Indonesia Pembangunan Kesehatan Menuju Indonesia Sehat. *Pembangunan Kesehatan Menuju Indonesia Sehat*, 1–48. http://www.depkes.go.id/resources/download/rakerkesnas-2015/reg-timur/kemenkes.pdf

Lufiria, P. Y. (2012). Kadar Protein, Zat Besi, dan Mutu Organoleptik Kue Kering Berbahan Dasar Tepung Terigu dan Tepung Beras Dengan Substitusi Tepung Sorgum (Sorghum bicolor L . Moench). *Journal of Nutrition Collage*, 1–7.

Rosniar, Mariza, Purwani, E., & Rauf, R. (2016). Perbedaan tingkat kekerasan dan Daya Terima Biskuit dari Tepung sorgum yang Disosoh dan Tidak Disosoh. *Records Management Journal*, *1*(2), 1–15.

Setyanti, F., Pranata, F. S., & Purwijantiningsih, L. M. E. (2015). Kualitas Muffin Dengan Kombinasi Tepung Sorgum (Sorghum Bicolor) Dan Tepung Terigu (Triticum Aestivum) Disusum Oleh : Fransiska Setyanti

Universitas Atma Jaya Yogyakarta Program Studi Biologi. *Thesis*, 1–18.

Sitepu, K. M. (2019). PENENTUAN KONSENTRASI RAGI PADA PEMBUATAN ROTI (Determining of Yeast Concentration on Bread Making). *Jurnal Penelitian Dan Pengembangan Agrokompleks*, 71–77.

Suarni, S. (2017). Peranan Sifat Fisikokimia Sorgum dalam Diversifikasi Pangan dan Industri serta Prospek Pengembangannya. *Jurnal Penelitian Dan Pengembangan Pertanian*, *35*(3), 99. https://doi.org/10.21082/jp3.v35n3.2016.p99-110

Susila, B. (2005). Quality Excellence Nutrition and Functional properties of sorghum (Sorghum vulgare). *Proc. of the Sem. on Postharvest Innov. Tech. for the Develop. of Agric. Based Indust.*, 527–534.

Susiloningtyas, I. (2023). Pemberian zat besi (Fe) dalam Kehamilan. *Majalah Ilmiah Sultan Agung*, *50*(128), 73–99.

Syafitri, S., Priawantiputri, W., & Dewi, M. (2019). Produk Biskuit Sumber Zat Besi Berbasis Bayam dan Tepung Sorgum Sebagai Makanan Tambahan Ibu Hamil. *J. Riset Kesehatan Poltekkes Depkes Bandung*, *11*(2), 13–21. https://juriskes.com/index.php/jrk/article/view/676

Syahputri, D. A., & Wardani, A. K. (2015). Pengaruh fermentasi jali (Coix lacryma joni-L) pada proses pembuatan tepung terhadap karakteristik fisik dan kimia cookies dan roti tawar. *Jurnal Pangan Dan Agroindustri*, *3*(3), 984–995.