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Optimization Formula: Additions of Flour from Nutmeg Dregs (*Myristica fragrans*) and Elephant Ginger (*Zingiber officinale*) on Cookie Making Using RSM (Response Surface Method)

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Abstract

Nutmeg and elephant ginger possess high economic value, such as for the production of essential oil which is good for the body health. However, the application of both spices in Indonesia community is still limited, for instance, in the making of wedang, a traditional herbal beverage. The objective of this research was to valorize nutmeg and elephant ginger dregs (waste) from wedang production in a form of cookies which is obtained from the blend of nutmeg pulp flour and elephant ginger dregs flour. The study employed five cookies formula using RSM (Response Surface Method). Formula F1 = 100% Nutmeg Dregs Flour, F2 = 75% Nutmeg Dregs Flour + 25% Elephant Ginger Dregs Flour, F3 = 50% Nutmeg Dregs Flour + 50% Elephant Ginger Dregs Flour, F4 = 25% Nutmeg Dregs Flour + 75% Elephant Ginger Dregs Flour, F5 = 100% Elephant Ginger Dregs Flour. The optimum response to the organoleptic tests (taste, aroma, texture and color) were determined from 29 untrained panelists and 1 expert panelist. The results showed that cookies with the addition of nutmeg dregs flour and elephant ginger dregs flour (F5) were the most popular formula for the panelists. However, in terms of utilization of wedang byproducts, (F3) have the highest value.

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Introduction

Nutmeg is one of the spices that has high economic value. Nutmeg (Myristica Fragrans Houtt) is a native Indonesian plant (Kamelia and Silalahi, 2018). The part of the nutmeg plant that has economic value is the pulp. Nutmeg itself consists of 83.3% pulp; 3.22% mace; 3.94% seed shell; and 9.54% seed pulp. Seeds and mace are the main products of the nutmeg plant, which is mostly used for export purposes. The main function of the seeds and mace is as a spice, both for daily use and for the food and beverage industry. The young pulp is widely used for food and beverages such as sweets, candy, juices and syrups (Pakasi, 2017).

Among them are the business by-products of *wedang* nutmeg that cannot be reused, that is the pulp of the nutmeg obtained from the remaining juice of the nutmeg. The remaining juice are only used for it starch while the dreg from the remaining juice is thrown away, even though the pulp of the nutmeg is available in large quantities, Nutmeg fruit has no selling value, so to increase the benefits of nutmeg pulp which still has a selling value, this research aims to provide added value to the nutmeg pulp, that is to mention by making food products in a way of adding nutmeg pulp to cookies as an attempt to increase nutritional value and image of the product's taste.

Ginger dregs, a byproduct of filtering ginger juice in the process of making ginger syrup and instant ginger which are not used for food ingredients (Putri, 2019). By using this ginger dreg into cookies, it is expected to substitute wheat flour and give the product a distinctive aroma. Besides that, it can also provide added value for ginger entrepreneurs. The use of ginger dregs can make the cookies produced as a type of functional food, because it contains bioactive components that can have a positive effect on the function of human metabolism. The bioactive

components of food that cause physiological effects are commonly referred to as food properties, they are mainly found in food groups of fruits, vegetables and herbs or spices (Romadhani, 2018).

Considering the explanation above, the researchers hope that a practical product can be made, a product that is in great demand by all ages because it is easy to consume, which comes from the process of adding nutmeg and elephant ginger dregs flour to processed food products in the form of cookies that will produce unique aroma, taste, characteristics and properties that are good for consumption purpose.

However, nutmeg and elephant ginger dregs are disposed of as a waste after people extracti only the juice out of them. By optimally utilizing the pulp of nutmeg and elephant ginger through diversification of processed products of nutmeg and elephant ginger can increase income and provide multiple benefits for nutmeg and ginger farmers. Therefore, research on making cookies from nutmeg pulp and elephant ginger pulp is conducted to determine the making process of cookies from nutmeg and elephant ginger pulp, the benefits, and to know the results of the organoleptic test.

Materials and Methods

This research is conducted in February 2020. The research is conducted at the Food Laboratory, Faculty of Applied Science, Suryakancana University. In conducting this research, the researchers use several tools and materials needed. Tools used: Grater, sieve, container, wooden spatula, spoon, plastic wrap, dough roller, cake mold, baking sheet, parchment paper and piping bag, oven, scale, and knife. While the ingredients are: nutmeg dreg, elephant ginger dreg, flour, refined sugar, butter, eggs, powdered milk, cornstarch.

Process of Making

Based on this research, the making process is as follows:

1. The process of making nutmeg pulp dreg

The pulp of the nutmeg is cleaned by washing it thoroughly and then peeling it, after which the nutmeg is grated. Nutmeg is boiled with the addition of water for 15 minutes, after which, it is squeezed so that only the pulp remains. Dry it in the oven at 180°C for about 3 hours. The dry dregs is blended and sieved (170 mesh) to form flour.

2. The process of making elephant ginger dregs flour

Ginger is cleansed by washing it thoroughly and then peeling it, after which the elephant ginger is grated. Ginger is boiled with the addition of water for 15 minutes, after which, it is squeezed so that only the pulp remains. Dry it in the oven at 180°C for about 2 hours. The dry dregs is blended and sieved (170 mesh) to form flour.

3. The process of making cookies, nutmeg and ginger pulp are as follows:

Butter, powdered sugar, and egg yolks are mixed evenly using a mixer.

Add the flour, nutmeg pulp flour, elephant ginger flour, cornstarch, and milk powder. Then put the batter on the piping bag and put it in the pan. Bake at 180°C for 20 minutes. Nutmeg and elephant ginger pulp cookies are ready for consumption

Experimental Design

This study evaluated organoleptic parameters on cookies from the addition of nutmeg and ginger dregs flour which includes taste, aroma, texture, and color. Where this research involved 29 panelists and 1 expert panelist. The design of this study uses the RSM (Response Surface Method), that is described in the tables:

Table 1. Experimental Design of Nutmeg Dregs Flour Cookies and Gajah Ginger Dregs Flour

Handling	Nutmeg Dregs formula%	Elephant Ginger Dregs Formula%	Total
F1	100	0	100
F2	75	25	100
F3	50	50	100
F4	25	75	100
F5	0	100	100

Primary data in this research are obtained through Hedonic testing by distributing questionnaires given to consumers who ate cookies of nutmeg pulp flour and elephant ginger dregs flour, which involved 29 panelists and 1 expert panelist.

Data Analysis

The data analysis method in this research is the RSM (Response Surface Method): The method used is statistics to see the relationship between one or more handling variables and the response surface method, that is a set of mathematical methods carried out quantitatively with a response variable that aims to optimize the response in an experiment (Montgomery, 2009 in Trihaditia, 2015).

With seven levels of variables including 1. Very Strongly Dislike, 2. Very Dislike, 3. Dislike, 4. Neiter Dislike nor Like, 5. Like, 6. Very like, 7. Very Strongly Like.

Results and Discussion

The results of this research will explain how the dreg of nutmeg and elephant ginger are processed into cookies that have a distinctive taste. It is continued by determining the optimization value of the organoleptic test, the best samples of processed nutmeg and elephant ginger dreg into cookies which are assessed from taste parameters, aroma, texture and color.

In this research, it is an assessment of foodstuffs that determines whether a processed food product is accepted or not, the indicator that determine is the sensation received including taste, aroma, texture and color by the five organs of human

senses as the main tool for measuring the acceptance of a product.

Taste

After making a research design for taste parameters, then conducting the Central Composite Design calculation the researchers get the following graph:

The calculation result of the Central Composite Design:

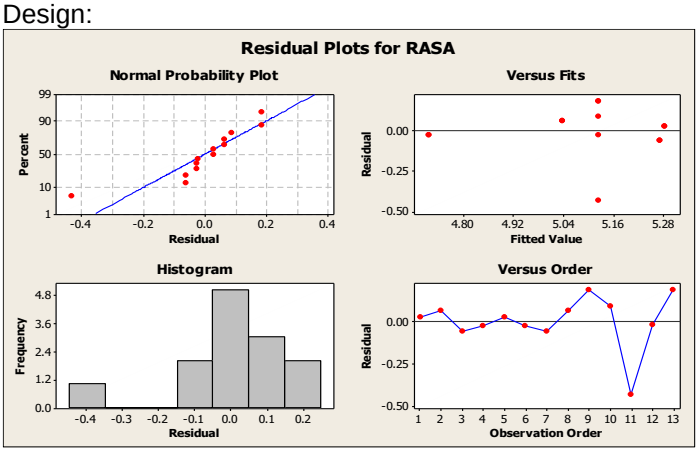

Figure 1. ANOVA Calculation Graph of Taste Parameter

Based on Figure 1, it can be seen that the distribution of data for taste is evenly distributed, where the data points are close to the normal line and have a good normal probability, for that, the next calculation can be conducted:

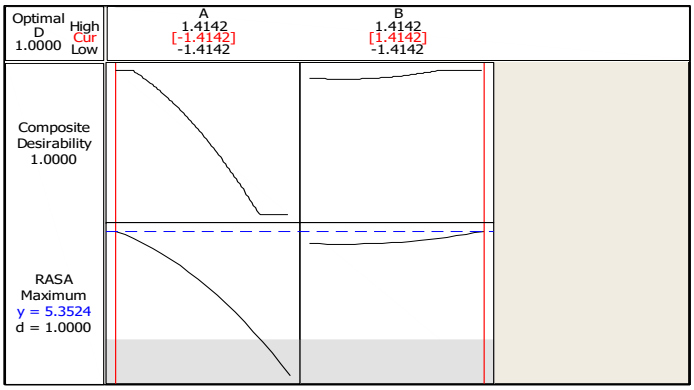

Figure 2. Optimization Value of Taste Parameter

In Figure 2, the calculation for the optimization value shows a sense of optimal at 5.3524 in the form of an inverted parabola, which means that it has an optimal value and shows the scale of the desirability function of 1.00, which means that the value of the taste parameters is acceptable to the panelists. After the optimization value of the taste parameter is known, the optimization area will be determined by the Contour and Surface graph so that the following results are obtained:

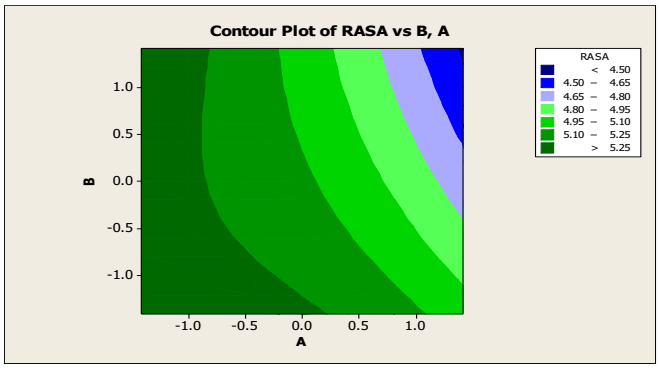

Figure 3. Optimized Contour Plot of Taste

From Figure 3 it can be inferred that the area boundary for the optimization value is between 4.50 - 5.25. Determination of the optimization area in 3D is as follows:

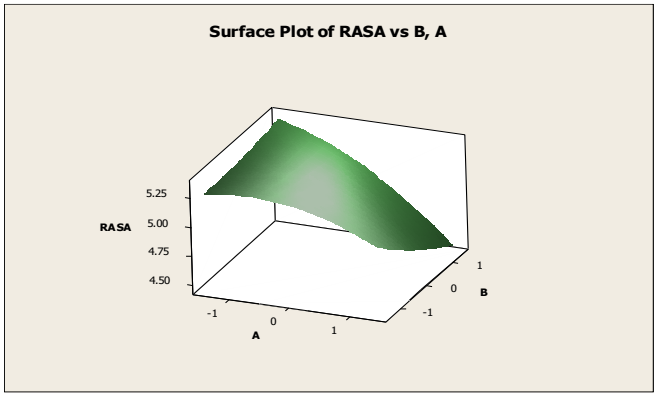

Figure 4. Surface Plot in Optimization Areas of Taste

From Figure 4 the Surface Plot of the Optimization Area is based on the accumulated average value of the panelist test results obtained based on the organoleptic test of 29 panelists on the parameters of taste, aroma, texture and color with 5 different test formulations. The results of the research data are obtained in the table as follows:

Table 2. Optimization Areas for Average Taste

Optimization Area	Average Taste
1	>5,25
2	5,10 – 5,25
3	4,95 – 5,10
4	4,80 – 4,95
5	4,65 – 4,80
6	4,50 – 4,65
7	<4,50

Source: Primary data (processed) in 2020

To get the optimal value from the sample used, the sample average value will be entered into the contour plot/optimization area plot, so that the average optimization value of the sample will be obtained then presented in Table 3:

Table 3. Optimization Value of Average Taste

Sample*	Average	Optimization Area
F1	5.31	1
F2	5.10	2
F3	5.21	2
F4	4.69	5
F5	5.31	1

Primary Data Sources (Processed) in 2020. *Details refer to Table 1.

From the data, it can be seen that in Table 3, it is known that F2 (75% Nutmeg Dregs Flour + 25% Elephant Ginger Dregs Flour) has an optimization value of 2, the same as the F3 sample (50% Nutmeg Dregs Flour + 50% Elephant Ginger Dregs Flour) which hasvalue Optimization of 2, the sample average is in the region with an optimization value of 2, while for F4 (25% Nutmeg Dregs Flour + 75% Elephant Ginger Dregs Flour) is in the optimization value area of 5.

For the best sample, the average optimization value of taste is F1 (100% Nutmeg Dregs Flour) at the optimization value 1 and sample F5 (100% Elephant Ginger Dregs Flour) at optimization value 1, because the sample is in the optimization value area of 1. Thus, it can be concluded with the presumption that the panelists are happier in terms of taste, like the dominant taste, not the taste of the mixture of nutmeg and ginger dregs flour because each of them has its own special taste, therefore the nutmeg and ginger taste cannot be blend together, based on the organoleptic test of cookies on panelists.

Taste plays an important role in determining the acceptance of a food. Sense of taste is divided into four flavors, namely sweet, salty, bitter and sour. Panelists' acceptance of taste is influenced by chemical compounds, temperature, concentration and interactions with other taste components (Winarno, 2004).

In this research, based on the optimization assessment, the panelists preferred the taste that is not mixed between sour from nutmeg and spicy from ginger, because the taste component between sour and spicy interacted with the primary flavor component which resulted in a decrease of the intensity of taste, resulting an incompatible taste of the characteristics for each component.

Generally, the organoleptic nature of humans does not usually combine sour and spicy tastes in processed food products in the form of cookies, because in secondary metabolites, humans will produce foreign flavors or new tastes for the panelists who try them. Basically, the identical sour taste mixed with sweet, besides the spicy taste is identical to the sweet or salty taste, so that the response to the mixture of sour and spicy flavors of these cookies is less attractive to panelists because of their incompatibility on the tongue.

Aroma

After making the aroma parameter design, the Central Composite Design calculation is carried out and the following graph results are obtained:

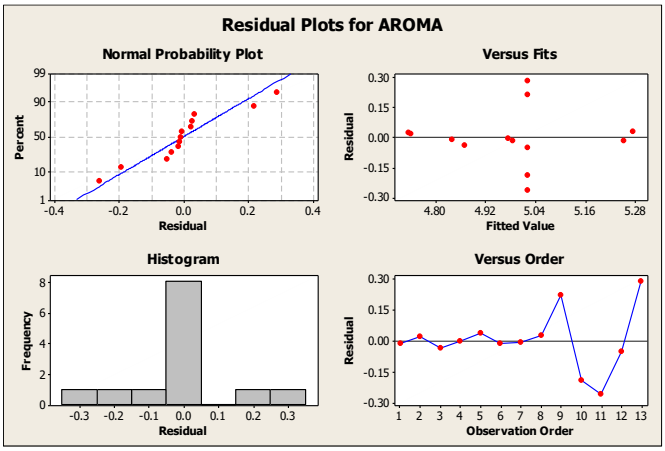

Figure 5. ANOVA calculation graph of Aroma Parameters

It can be seen based on Figure 5, that the data distribution for aroma is evenly distributed, and provides data points close to the line which illustrates that the normal probability is good, therefore because the data is normal and spread evenly, further calculations can be conducted.

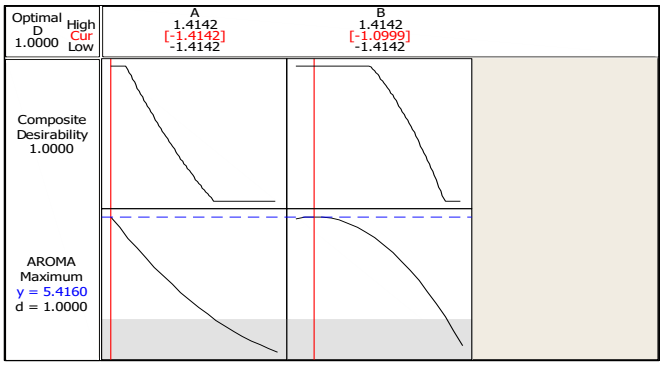

Figure 6. Optimization Value of Aroma Parameters

It can be seen in Figure 6 that the value of the calculation for the optimization of aroma parameters is 5.4160, which means that it has an optimal value which can be seen forming an inverting parabola and the desirability function shows a value of 1.00, which means that the optimization value of the aroma parameter is quite good, then the determined optimization area can be seen on the Contour and Surface charts as follows:

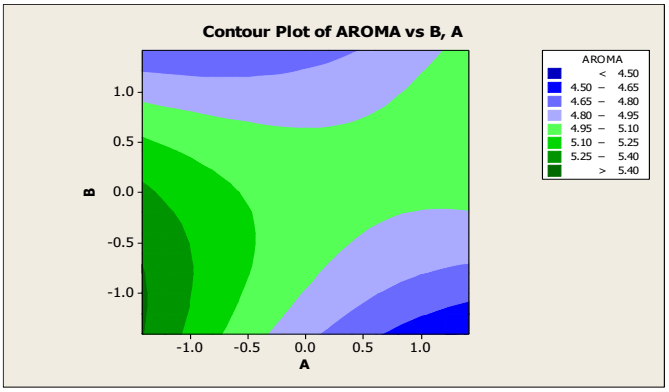

Figure 7. Optimization Contour Plot of Aroma

As can be seen in Figure 7, it is known that the area boundary for the optimization value is between 4.50 - 5.40, the determination of the optimization area can be seen in 3D as follows:

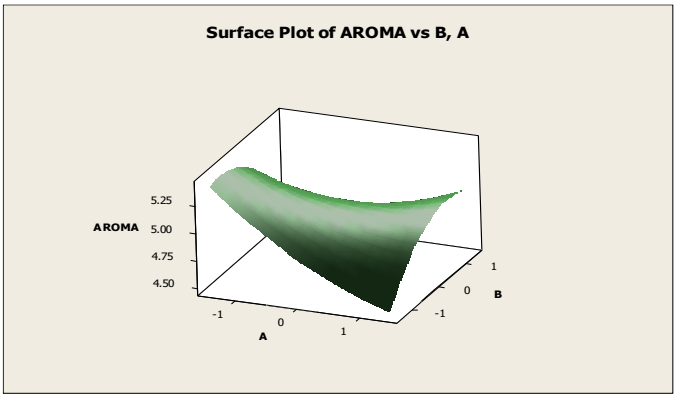

Figure 8. Surface plot of the Optimization Area of Aroma

In Figure 8, the Surface Plot of the Optimization Area results from the accumulated average value of the organoleptic test on the panelists is as many as 29 people based on the parameters of taste, aroma, texture and color with 5 different formulations so that the calculation results obtained in the research data are presented in the following table:

Table 4. Optimization Area for Average Aroma

Optimization Area	Average Aroma
1	>5,40
2	5,25 – 5,40
3	5,10 – 5,25
4	4,95 – 5,10
5	4,80 – 4,95
6	4,65 – 4,80
7	4,50 – 4,65
8	<4,50

Source: Primary data (processed) in 2020

To get the optimal value of the sample used, the sample average value will be put into the contour plot/optimization area plot, so that the average optimization value of the sample will be obtained, it is presented in the table:

Table 5 Optimization Value of Average Aroma

Sample*	Average	Optimization Area
F1	5.24	3
F2	4.76	6
F3	4.83	5
F4	4.97	4
F5	5.31	2

Primary Data Sources (Processed) in 2020. *Details refer to Table 1.

From the Table 5, it can be concluded that F2 (75% Nutmeg Dregs Flour + 25% Elephant Ginger Dregs Flour) has an optimization value of 6 because it is in the area of optimization value of 6, for sample F3 (50% Nutmeg Dregs Flour + Elephant Ginger Dregs flour 50%)) has an optimization value of 5 due to the optimization value area of 5, while for sample F4 (25% Nutmeg Dregs Flour + 75% Elephant Ginger Dregs Flour) the optimization value is 4 because it is in the optimization value area of 4, and for sample F1 (Nutmeg Dregs Flour 100%) has an optimization value of 3 because the sample average is in an area with an optimization value of 3, for sample F5 (100% Elephant Ginger Dregs Flour) it has an optimization value of 2 because the sample is in an area with an optimization value of 2.

Therefore, it can be concluded from the research in terms of aroma parameters that the best sample is the formula F5 (100% Elephant Ginger Dregs Flour), because the sample is in the area of optimization value of 2, this value is obtained from the results of organoleptic tests on panelists so that it is suspected that the panelists prefer the aroma of ginger because basically ginger has a distinctive aroma, there are aromatic compounds in ginger that can warm the body and give the impression of a fragrant and warm aroma to cookies.

In making these cookies, nutmeg and ginger have their own distinctive aroma, such as sour nutmeg and spicy ginger, but the panelists prefer the aroma of ginger because it has aromatic compounds or volatile compounds, ginger contains volatile oil components (Susanti, et al., 2019). which is commonly called essential oil, it is a component that gives a distinctive odor. In addition, ginger contains non-volatile oil, commonly called oleoresin, which is a component of spicy and bitter taste (Alvicha Putri, 2014). The non-volatile components of ginger are phenolic compounds. Essential oil is a mixture of volatile organic compounds, insoluble in water and has a distinctive odor (Azalia, et al., 2019). Ginger essential oil is only found in the rhizome of ginger, while at the leaves there are none. The essential oil in ginger causes the distinctive aroma of ginger (Bustan *et al*., 2008).

Texture

The texture parameter research design already exists, from the calculation of the Central Composite Design, the following graph results are obtained:

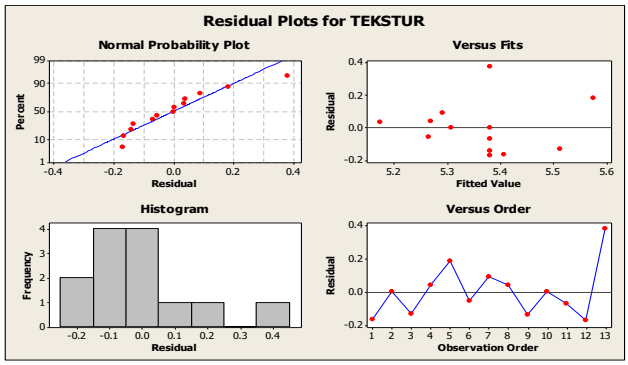

Figure 9. Graph of ANOVA calculation on Texture Parameters

As seen in Figure 9, it can be concluded that the distribution of data for textures is evenly distributed and where the data points are close to the normal probability line so that it is said to be good data, therefore the data is said to be normal and the distribution is evenly distributed, further calculations can be carried out:

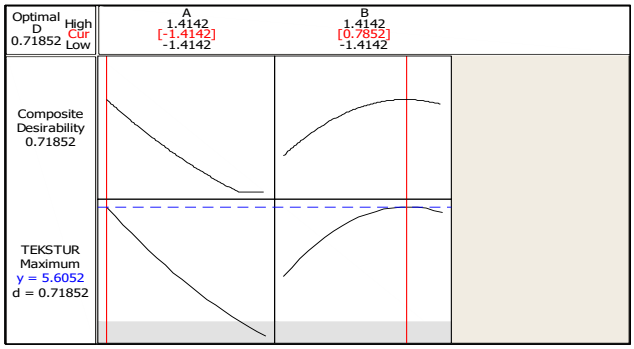

Figure 10. Optimization Value of Texture Parameters

It can be seen from Figure 10, that the calculation of the texture optimization value will be optimal at 5.6052. Where in the image, it is in the form of an inverted parabola so that it can be concluded that the texture value has an optimal value and the desirability function shows a scale of value of 1.00 which means that it has a good value in texture that can be accepted by panelists. Henceforth, after knowing the optimization value of the texture parameters, then proceed to determine the optimization area from the graph by contour and surface as follows:

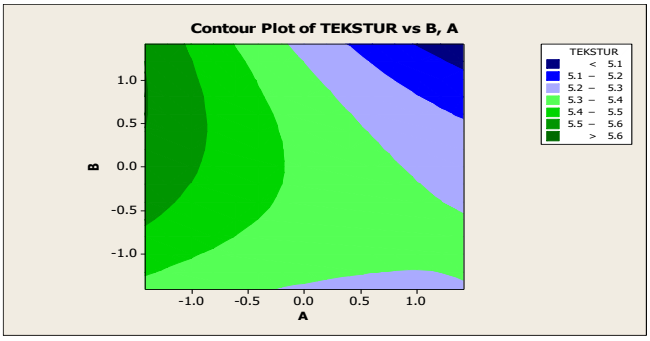

Figure 11. Contour Plot Optimization of Textures

The picture above shows that the area boundary for the optimization value is between 5.1 - 5.6. Thus, it can be seen that the optimization area in 3D is as follows:

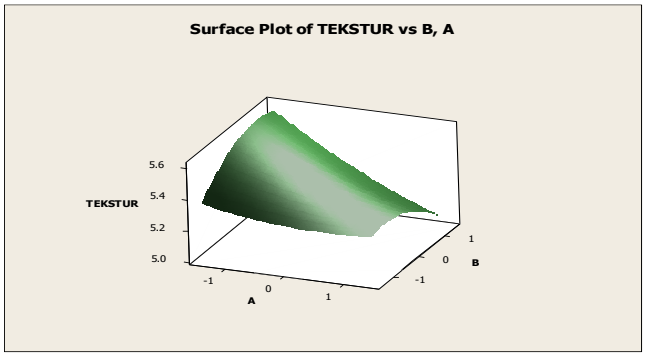

Figure 12. Surface Plot Optimization Area of Texture

Figure 12 shows the Surface Plot of the optimization area based on the average sample value. This research is based on testing 5 different formulations involving 29 panelists, and organoleptic tests, the results of the research data were presented in the table:

Table 6. Average Texture Optimization Areas

Optimization Area	Average Texture
1	>5,6
2	5,5 – 5,6
3	5,4 – 5,5
4	5,3 – 5,4
5	5,2 – 5,3
6	5,1 – 5,2
7	<5,1

Source: Primary data (processed) in 2020

To get the optimal value of the sample used, the sample average value will be put into the contour plot/optimization area plot, so that the average optimization value of the sample will be obtained, it is presented in the table:

Table 7. Average Texture Optimization Value

Sample*	Average	Optimization Area
F1	5.24	5
F2	5.31	4
F3	5.38	4
F4	5.21	5
F5	5.76	1

Primary Data Sources (Processed) in 2020. *Details refer to Table 1

It can be concluded that in table 10, it is known that samples F1 (100% Nutmeg Dregs Flour) and F4 (25% Nutmeg Dregs Flour + 75% Ginger Dregs Flour) have the same optimization value, namely 5 where both are in areas with optimization values of 5, while F2 (75% Nutmeg Dregs Flour + 25% Elephant Ginger Dregs Flour) and F3 (50% Nutmeg Dregs

Flour + 50% Elephant Ginger Dregs Flour) are at the same value, that is the optimization value of 4 due to the average value. The sample average is in an area with an optimization value of 4, while for sample F5 (100% Elephant Ginger Dregs Flour) has an optimization value of 1, because the average value of the sample is in an area with an optimization value of 1.

For the best sample, the average texture of average optimization value is F5 (100% Elephant Ginger Dregs) because it has an optimization value of 1 and it is in the area of the best optimization value of 1. It is suspected that the panelists prefer the fibrous texture of ginger because it can give the cookies a crunchier texture because texture is one of the characteristics of food products that considered as one of important things in influencing consumer acceptance (Tarwendah, 2017).

Because ginger has a fairly high crude fiber content, it can cause the ginger to become crispy when it is heated, this is due to the ginger, which, through the heating process, forms small pores or cavities so that the mixture of ginger dregs in the cookies becomes crispy so that the panelists prefer it. The fiber component of ginger is between 2-10 grams/100 grams of ginger (Fajri Putri, 2019), therefore ginger can make cookies much crunchier than nutmeg which has almost no fiber content in it.

It can be concluded that in terms of texture parameters, the nutmeg dregs flour mixture is less attractive to consumers because of the lack of crispiness in the cookies, this is due to the absence or little fiber in the nutmeg, in the process of making these cookies there are no cavities or pores which result in reduced cookie crunch. This is another case with ginger dregs mixed cookies which are more desirable because of the high fiber content that causes crunchiness in processed cookies. This explains because the molecular size is less in the ginger dregs flour so that the flour is lighter and does not easily absorb water which makes the texture of the cookies mixed with ginger dregs flour have a crunchier texture, compared to the nutmeg dregs flour which absorbs more moisture which results in a sluggish texture. Assessments in terms of texture parameters, F5 (Elephant Ginger Dregs) is the most popular among panelists.

Color

The research design for the color parameters has been made so does the Central Composite Design calculations. The graph of the calculation results is as follows:

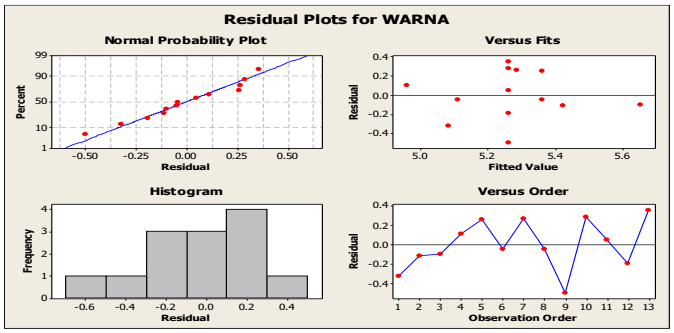

Figure 13. ANOVA calculation graph of Color Parameters

It can be seen from the picture above that the distribution of colors is evenly distributed, so that it has a good normal probability, which is because the data points are close to the normal probability line. Therefore, the data obtained is normally distributed and evenly distributed, for that reason, the following calculations can be carried out:

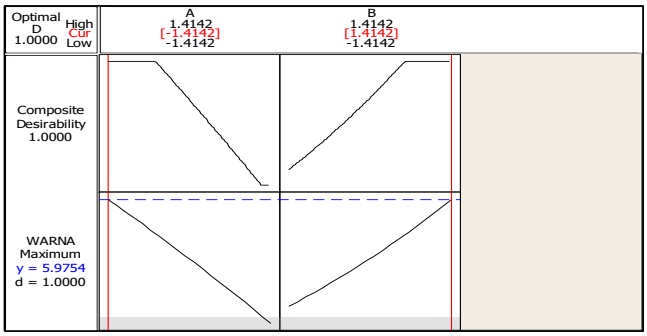

Figure 14. Optimization Value of Color Parameters

It can be seen in the figure above that the optimal color value will be at 5.9754. Where the shape in the graphic is an inverted parabola, which means that the value of the color has an optimal optimization value, with the desirability function showing a scale of 1.00 which means that the color parameters are good so that they can be accepted by the panelists, for that, the optimization area will be determined by the graphic contour and surface as follows:

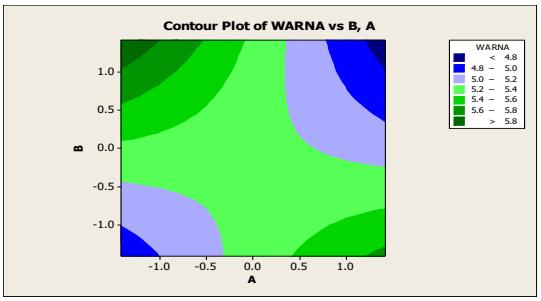

Figure 15. Optimized Contour Plot of Color

The figure above shows that the boundary area for determining the optimization value is between 4.8 - 5.8. For that it can be seen in 3D as follows:

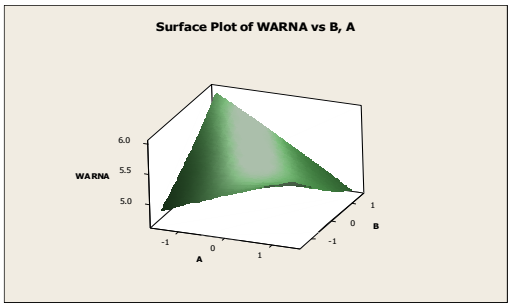

Figure 16. Surface Plot Optimization Areas of Color

From Figure 16. The Optimization Area of Surface Plot will be obtained. It is based on the average value of the sample. This research is based on tests of 5 different formulations involving 29 panelists, and after organoleptic tests were carried out on color parameters, the results of the research data are presented in the table:

Table 8. Area of Average Color Optimization

Optimization Area	Average Color
1	>5,8
2	5,6 – 5,8
3	5,4 – 5,6
4	5,2 – 5,4
5	5,0 – 5,2
6	4,8 – 5,0
7	<4,8

Source: Primary data (processed) in 2020

To get the optimal value of the sample used, the sample average value will be put into the contour plot/optimization area plot, so that the average optimization value of the sample will be obtained, it is presented in the table:

Table 9. Average Color Optimization Value

Sample*	Average	Optimization Area
F1	4.76	7
F2	5.31	4
F3	5.55	3
F4	5.07	5
F5	5.62	2

Primary Data Sources (Processed) in 2020 *Details refer to Table 1.

So that it can be explained that the average optimization value table for color shows that the F1 sample (100% Nutmeg Dregs Flour) has an optimization value of 7, because the sample average is in an area with an optimization value of 7, for F2 (75% Nutmeg Dregs Flour) + Elephant Ginger Dregs Flour 25%) has an optimization value of 4, because it is in an area with an optimization value of 4, while for F3 = (50% Nutmeg Dregs Flour + Elephant Ginger Dregs Flour 50%) has an optimization value of 3, because it is in an area with an optimization value of 3, while for F4 (25% Nutmeg Dregs Flour + 75% Ginger Dregs Flour) has an optimization value of 5, which is because the sample average is in an area with an optimization value of 5, and for F5 (Elephant Ginger Dregs Flour 100%) has an optimization value of 2, because the average sample is in an area with an optimization value of 2.

For this reason, it can be concluded that the best sample for the average optimization value in the color parameter is F5 (100% Elephant Ginger Dregs), because it can be seen that the graph shows that the sample has an optimization value of 2. Therefore, the panelists prefer the color of the cookies which are slightly brownish in color, this is due to the large amount of ginger dregs flour mixture and the protein or amino acids in ginger are more than the nutmeg.

Browning usually occurs in fruits or vegetables, flavor compounds and some food processes. The reaction that occurs is the "Milard Reaction", which is a reaction between amino acids (proteins) and sugars that involves condensation and rearrangement (Marpaung dan Arianto, 2018). Mailard is a thermal or heating process from foods containing protein or amino acids and sugars (Zuhra, 2006)

From the table 10 below, it shows that the average optimization value is varied from the organoleptic characteristics, the table above shows the smaller the optimization value, the higher the value obtained, the class value in organoleptic, therefore the sample that gets the smallest optimization value is the most desirable and most preferred samples that received the highest scores from the panelists.

Table 10. Determination of the Best Sample

Sample*	Taste		Aroma		Texture		Color	
	Average	Optimization	Average	Optimization	Average	Optimization	Average	Optimization
F1	5.31	1	5.24	3	5.24	5	4.76	7
F2	5.10	2	4.76	6	5.31	4	5.31	4
F3	5.21	2	4.83	5	5.38	4	5.55	3
F4	4.69	5	4.97	4	5.21	5	5.07	5
F5	5.31	1	5.31	2	5.76	1	5.62	2

Primary Data Sources (Processed) in 2020. *Details refer to Table 1

In the sample F5 (100% Elephant Ginger Dregs Flour) showed the highest average optimization value in terms of taste, aroma, texture and color parameters, while in terms of taste F1 (100% Nutmeg Dregs Flour) also received high optimization values. It proved that the samples F5 (100% Elephant Ginger Dregs Flour) and F1 (100% Nutmeg Dregs Flour) were the most popular among researchers with high optimization values.

The research material is nutmeg and elephant ginger dregs which later made into flour, so that there is a process of utilizing the byproducts of the production of other products such as *wedang* (nutmeg and ginger). Nutmeg 50% + Elephant Ginger Dregs Flour 50%) can be recommended to be processed into the utilization of nutmeg and elephant ginger dregs. This is because the results of the research show that the average range of the optimization area is equal to 3.5, this value is smaller than the F1, F2 and F4 treatments. In line with Dumadi, S. R. research. (2009) nutmeg products have a good taste, a taste which the panelists like. Syroop contains 1.22% vitamin C and 25.35% reduced sugar.

Conclusion

It can be concluded, that in this research, the making of cookies with the addition of nutmeg dreg flour and elephant ginger dreg flour has an effect on taste, aroma, texture and color. The characteristics of the organoleptic test on panelists in the parameters of taste, aroma, texture and color are the most desirable values F5 (100% Elephant Ginger Dregs) because it has the highest average optimization value.

If it is related to the utilization of *wedang* by-products (nutmeg and ginger), then F3 (50% Nutmeg Dregs Flour + 50% Elephant Ginger Dregs Flour) can be recommended to be processed into the utilization of nutmeg and elephant ginger pulp. This is because the results of the research show that the average range of the optimization area is equal to 3.5, this value is smaller than the F1, F2 and F4 treatments.

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