Variations In The Substitution Of Peanut Flour For Almond Flour On Macaron Skin Characteristics

Ida Ningrumsari

Departemen Teknologi Pangan, Fakultas Pertanian, Universitas Ma'soem, Jln. Cipacing No 22 Sumedang 45363 Indonesia

Article Info	ABSTRACT
Keywords: Almond flour, macaron, peanut flour, substitution.	Macarons are simple cakes usually made from egg whites, sugar and almond flour. Almonds and almond flour are not produced in Indonesia, and have to be imported from abroad, causing the price of almonds and almond flour to be quite expensive on the market. Therefore, in this research, peanut flour was substituted for almond flour in making macarons. The aim of this research is to find the right substitution for peanut flour for almond flour to produce the best macaron skin characteristics in terms of water content, protein content, fat content, swelling power and organoleptics. This research used a Randomized Group Design (RAK) consisting of 6 treatments and 4 repetitions. The treatment was the substitution of 0%, 10%, 20%, 30%, 40% and 50% peanut flour for almond flour at 100%, 90%, 80%, 70%, 60% and 50%. The analysis in this research includes water content, protein content, fat content and swelling power as well as organoleptic tests in the form of color, aroma, taste, texture and appearance of the macarons produced. The results showed that treatment D (30:70) produced the best macaron characteristics. This determination was based on the level of preference for aroma 4.25 (like), texture 4.30 (like), and taste 4.41 (like). The nutritional content of treatment D (30:70) consists of water content of (2.89%), protein content of (5.16%) and fat content of (18.54%) and flowering capacity of (30.02%).
	Corresponding Author: Ida Ningrumsari Departemen Teknologi Pangan, Fakultas Pertanian, Universitas Ma'soem, Jln. Cipacing No 22 Sumedang 45363 Indonesia idaningrumsari123@gmail.com

INTRODUCTION

Macaron is a type of pastry originating from Italy, which was then brought to France. Based on its history, macaron is a typical French cake that is well known to many people in Indonesia. This cake is usually made from almond flour, sugar and egg whites, where two macaron shells are glued together and filled in the middle in the form of ganache, cream cheese or butter cream. The appearance of these macarons is phenomenal, because macarons have a small shape and a color that attracts the attention of everyone who sees them. Apart from that, macarons also have a unique taste with a texture that is soft on the outside and slightly chewy when eaten. Adnyasuari, et al 2019.

The main ingredient in making macarons is almond flour which is usually called almond meal, almond powder or ground almonds. Almonds are divided into two types, namely sweet almonds (Prunur amygdalu var. dulcis) which are commonly consumed, because they have a delicious taste and are usually used as a raw material for almond flour, and bitter almonds (Prunus amygdalu var. amara) which are usually used as a raw material. making almond oil and aroma M. Astawan, 2009. Almond flour is a low carbohydrate food ingredient, rich in vitamins, minerals and fat and contains more protein and nutrients than wheat and is also gluten free. Almonds and almond flour are not produced in Indonesia but have to be imported from abroad, thus making the price of almonds and almond flour on the market quite high Adnyasuari, et al 2019. Therefore, alternatives are being sought to replace almond flour with almost the same characteristics in making macarons. One local food ingredient that can be used is peanut flour.

Peanuts (Arachis hypogeae L.) are a type of legume plant that is widely grown by farmers in Indonesia. The production value of peanuts in Indonesia in 2022 will be 416,457 tons BPS 2022. Peanuts are a food ingredient that contains quite high levels of protein and fat. Peanut protein content reaches 25g per 100g and fat content reaches 43g per 100g. Peanuts are rich in unsaturated fatty acids which can lower blood cholesterol. Astawan, 2009. Not much different from almonds which contain protein of 21g per 100g and fat content of 51g per 100g USDA.

Fat and protein are the most important components in making macarons. The use of protein in making macarons functions to form the dough and provide the density and strength needed to trap air in the ingredients so that the dough expands when baked. When the dough is baked in the oven, the air trapped in the dough will be released by the hot air flow. The dry surface of the macaron means that air cannot reach the surface, causing the bottom of the macaron to rise and form a macaron foot. The fat in making macarons plays a role in developing macaron cells in the final proof process which will improve the texture of the macaron so that it is relatively crunchy when broken. M. Braun, 2012. in Y. R. P. Riansari, 2018.

Based on the description above, the author is interested in conducting research on "The Effect of Substituting Peanut Flour (Arachis hypogaea L.) for Almond Flour (Prunus dulcis) on the Characteristics of Macaron Skin".

METHOD

Place and time of research
This research will be carried out in the Chemistry Laboratory and Food Processing Laboratory, Faculty of Agriculture, Ma'soem University and the Chemistry Laboratory of the Bakti Asih Analyst College.

Materials and tools
The materials used in this research consist of raw materials, additional materials and chemicals. The raw materials used consist of peanuts, eggs (only the white part taken) obtained from the Cibeusi resik market as well as almond flour (greenara), caster sugar (numanis) and icing sugar (haan) obtained from e-commerce. The additional ingredient used

is vanilla flavoring (koepoe-koepoe) which is obtained from Griya Jatinangor. The chemicals used in carrying out the analysis include distilled water, filter paper, cotton, hexane, K_2SO_4, $CuSO_4$, H_2SO_4, 50% NaOH, Zn, 0.1 N HCl and methyl red indicator.

The tools used in the process of making macaron shells include bowls, measuring spoons, analytical scales, blenders, baking pans, mixers, spatulas, ovens, oven temperature thermometers, sieve cooking thermometers (80 mesh) and macaron molds. Equipment used for analysis includes: fat flask (pyrex), kjeldahl flask, analytical balance, measuring cup (pyrex), beaker glass (pyrex), dropper pipette, cup, tweezers, desiccator, oven, spatula, erlenmeyer, funnel, tube rack , hot plate, distillation apparatus, water bath, Kjeldahl flask and vernier caliper.

Research design

The research design used in this research was a Randomized Block Design (RAK) with peanut flour substitution treatment for almond flour in making macaron shells. There were six substitution treatments tried, each repeated four times. The substitution treatments tried can be seen in the following table:

Table 1. Substitution of Peanut Flour for Almond Flour

Treatment Notation	Peanut Flour (%)	Almond Flour (%)
A	0	100
B	10	90
C	20	80
D	30	70
E	40	60
F	50	50

The data obtained was analyzed with a variety fingerprint and if there were differences between treatments, testing was done between treatments with Duncan's multiple range test (Duncan Multiple Range Test) at a real level of 5%.

Research Implementation

Making Peanut Flour

Peanuts were weighed at 2 kg, then washed and soaked in boiling water for 45 seconds, then dried by spreading them flat on a tray. After that, the peanuts are roasted in sangria until the skin is browned, then the skin is peeled. Next, the peanuts are crushed using a grinder. Grinding the peanuts is done little by little so that the peanuts do not clump and release oil, after that it is sieved with an 80 mesh sieve, the peanut flour that passes through the sieve is then weighed to determine the yield.

Making Macaron Shells Substituting Peanut Flour

Macarons are made by substituting peanut flour for almond flour with the ingredient formulation presented in table 2.

Table 2. Formulation of Macaron Ingredients Substituting Peanut Flour for Almond Flour

Material	Formulation of Treatment (g)					
	A	B	C	D	E	F
Material A						
Peanut Flour	0	10	20	30	40	50
Almond Flour	100	90	80	70	60	50
Icing Sugar	100	100	100	100	100	100
Egg whites	36	36	36	36	36	36
Vanilla Flavor	1	1	1	1	1	1
Material B						
Caster Sugar	100	100	100	100	100	100
water	36	36	36	36	36	36
Material C						
Egg whites	36	36	36	36	36	36

Ingredient B is put into a pan and heated to a temperature of 117 °C while continuing to stir. Simultaneously with making the sugar solution, add ingredient C to the container and mixer at medium-high speed gradually until it is pale white and foamy while waiting for the sugar solution to cook. The sugar solution is gradually added as the arrow goes into the foam and beaten at high speed until stiff (meringue dough). Material A (according to treatment) is put into a blender and ground, then sifted. Mix ingredients A with the meringue mixture using the fold-in technique until the mixture forms a ribbon and flows slowly when the spatula is lifted. After that, put the mixture into a plastic papping bag and spray it into the macaron mold, then hit the mold so that the air in the mixture rises to the surface. Poke off any air bubbles that rise to the surface so that the macaron shell is smooth. After that, leave the macarons in the oven for 30 minutes – 1 hour at a temperature of 35-45 °C. Do a touch test, if you feel a hard skin has formed and it doesn't stick when touched, put it in the oven at 135–140°C for 20 minutes. Bake the macarons for the first 10 minutes. If the oven heats unevenly, rotate the pan 180° then bake again for 5 minutes. After 5 minutes, turn off the oven and leave the macarons in the slightly opened oven for 5 minutes. The cooked macaron shells are cooled and then analyzed.

Observed parameters

In this study, the parameters observed were water content using the drying method S. Sudarmadjiet al 1989, protein content using the Kjedahl method S. Sudarmadji et al 1989, fat content using the Soxhlet method S. Sudarmadji et al 1989, swelling power using the A term tool Winata, 2019 and organoleptic tests include color, taste, aroma, texture and appearance using the T. Soewarno and et al, 1985. test in E. Karlina, 2020.

RESULTS AND DISCUSSION

Raw Material Characteristics

The raw materials used in this research were peanut flour and almond flour. Raw material analysis aims to determine the chemical characteristics (water content, protein content and

fat content) which can influence the characteristics of the final macaron product produced. The results of the raw material analysis can be seen in table 3.

Table 3. Chemical Analysis Data for Raw Materials

Parameter	Peanut Flour (%bk)	Almond Flour (%bk)
Water content	2,55	3,54
as much protein	36,99	11,01
Fat level	51,52	57,05

Note: Each data is the average of three repetitions

Table 3 shows that the water content of peanut flour is (2.55%) smaller than the water content of almond flour (3.54%), the protein content of peanut flour is (36.99%) greater than the protein content of flour. almond (11.01%) and the fat content of peanut flour is (51.52%) smaller than the fat content of almond flour (57.05%).

Water content

Based on data from statistical analysis, the substitution of peanut flour for almond flour has a significantly different effect on the water content of the macarons produced. The results of Duncan's multiple distance test on the average value of macaron water content can be seen in table 4.

Table 4. Effect of Substituting Peanut Flour for Almond Flour on Content Water (%) Macaron Shell

Treatment	A (0:100)	B (10:90)	C (20:80)	D (30:70)	E (40:60)	F (50:50)
Average	3,45 b	2,65 a	3,09 ab	2,89 a	3,52 b	4,41 c

Note: Average numbers followed by different letters are significantly different at the 5% significance level according to Duncan's multiple range test.

Table 4 shows that the substitution of peanut flour for almond flour has a significantly different effect on the water content of the macaron shell. Treatment F (50:50) produced the highest average water content value of 4.41% which was significantly different from treatments A, B, C, D and E. The lowest average water content value was produced by treatment B, namely 2.65% , which is significantly different from treatments A, C, E and F but not significantly different from treatment D. Meanwhile, treatment A (control) produces an average water content value of 3.45% which is not significantly different from treatment E (40:60).

The results of the study showed an increase and decrease in the water content of macaron skin. The water content of macaron shells can be influenced by increasing the substitution of peanut flour where peanut flour has a water content of 2.55%. Apart from that, peanut flour also has a high protein content, namely 36.99%. The higher the protein flour added, the water content will increase and the macaron's breaking strength will decrease. Apart from that, other factors that cause increases and decreases in water content are independent variables such as unstable temperature in the oven due to poor air circulation during macaron drying at a temperature of 35-40°C. Y. R. P. Riansari, 2018.

As much protein

Based on data from statistical analysis, the substitution of peanut flour for almond flour has a significantly different effect on the protein content of the macarons produced. The results of Duncan's multiple distance test on the average value of macaron protein content can be seen in table 5.

Table 5. Effect of Substituting Peanut Flour for Almond Flour on Content Protein (%bk) Macaron Shell

Treatment	A (0:100)	B (10:90)	C (20:80)	D (30:70)	E (40:60)	F (50:50)
Average	12,50 c	3,42 a	5,68 b	5,16 b	12,58 c	14,66 d

Note: Average numbers followed by different letters are significantly different at the 5% significance level according to Duncan's multiple range test.

Table 5 shows that the substitution of peanut flour for almond flour has a significantly different effect on the protein content of macaron shells. Treatment F (50:50) produced the highest average protein content value, namely 14.66%, which was significantly different from treatments A, B, C, D and E. Meanwhile, treatment B produced the lowest average protein content value of 3.42 %, which is significantly different from treatments A, C, D, E and F. Meanwhile, treatment A (control) produces an average protein content value of 12.50% which is not significantly different from treatment E (40:60).

The higher the substitution of peanut flour for almond flour, the higher the protein content of the macaron shell. This is because the protein content of peanut flour is (36.99%) greater than the protein content of almond flour (11.01%). Apart from that, protein levels can be influenced by heat treatment during roasting. The use of high enough heat (150°C) in the process of making cookies can cause the proteins in the dough to experience denaturation due to heat which can change the structure of the protein and cause the protein to lose biological activity, precipitate and lose some functional properties [8]. In general, proteins experience denaturation at a temperature of ±80°C Novia, D S, et al 2011 in A. Winata, 2019.

Fat level

Based on data from statistical analysis, the substitution of peanut flour for almond flour has a significantly different effect on the fat content of the macarons produced. The results of Duncan's multiple distance test on the average value of macaron fat content can be seen in table 6.

Table 6. Effect of Substituting Peanut Flour for Almond Flour on Content Fat (%bk) Macaron Shell

Treatment	A (0:100)	B (10:90)	C (20:80)	D (30:70)	E (40:60)	F (50:50)
Average	17,46 ab	18,86 d	17,57 b	18,54 c	16,76 a	16,62 a

Note: Average numbers followed by different letters are significantly different at the 5% significance level according to Duncan's multiple range test.

Table 6 shows that the substitution of peanut flour for almond flour has a significantly different effect on the fat content of the macaron shell. Treatment B (10:90) produced the highest average value of fat content, namely 18.86%, which was significantly different from treatments A, C, D, E and F. The lowest average value of fat content was produced by treatment F (50:50) namely 16.62%, which is significantly different from treatments A, B, C and D but not significantly different from treatment E. Meanwhile, treatment A (Control) produces an average fat content value of 17.46%.

The fat content of macaron shells can be influenced by the fat content contained in the raw material, where peanut flour (51.52%) is more and the fat content of almond flour (57.05%). The higher the substitution of peanut flour for almond flour, the lower the fat content of the macaron shell. However, in this study there was an increase and decrease in the fat content of macaron shells, this could be caused by unstable storage of raw materials and temperature during baking.

Flower Power

Based on the data from statistical analysis, the substitution of peanut flour for almond flour has a significantly different effect on the rising power of the macarons produced. The results of Duncan's multiple distance test on the average value of macaron swelling power can be seen in table 7.

Table 7. Effect of Substituting Peanut Flour for Almond Flour on Power Flowers (%) Macaron Shell

Treatment	A (0:100)	B (10:90)	C (20:80)	D (30:70)	E (40:60)	F (50:50)
Average	18,86 a	29,01 b	31,27 d	30,02 c	32,03 e	33,81 f

Note: Average numbers followed by different letters are significantly different at the 5% significance level according to Duncan's multiple range test.

Table 7 shows that the substitution of peanut flour for almond flour has a significantly different effect on the rise power of the macaron shell. Treatment F (50:50) produced the highest average value of flowering power, namely 33.81%, which was significantly different from treatments A, B, C, D and E. Meanwhile, treatment A (control) produced the lowest average value of flowering power of 18.86%, which is significantly different from treatments B, C, D, E and F.

The higher the substitution of peanut flour for almond flour, the higher the percentage of rising power of the macaron shell produced. The rising power occurs due to the use of egg whites in the formulation, causing "feet" to appear on the macaron shell which is a characteristic of this product. Protein, amylopectin and fat can affect flowering power. This is because the protein is denatured, making it difficult for the product to swell, amylopectin stimulates the product to swell, while fat can interact with starch and prevent hydration, resulting in an increase in viscosity to a low level, fat will form a layer on the outside of the starch and prevent water from penetrating inside. resulting in high gelatinization and the product becoming less fluffy Adnyasuari, et al 2019.

Level of Likeness for Colors

Color is the first sensory attribute that can be assessed directly by the panelists. Based on the data from statistical analysis, the substitution of peanut flour for almond flour had no significantly different effect on the level of preference for the color of the macaron skin produced. The results of Duncan's multiple distance test on the average value of macaron skin color preference can be seen in table 8.

Table 8. Effect of Substituting Peanut Flour for Almond Flour on Levels Macaron Skin Tone Favorites

Treatment	A (0:100)	B (10:90)	C (20:80)	D (30:70)	E (40:60)	F (50:50)
Average	3,75 a	3,50 a	3,84 a	3,82 a	3,58 a	4,05 b

Note: Average numbers followed by different letters are significantly different at the 5% significance level according to Duncan's multiple range test.

Table 8 shows that the substitution of peanut flour for almond flour has no significantly different effect on the degree of preference for macaron skin color. Treatment F (50:50) produced the highest average value, namely 4.05 (like) compared to treatment A (Control) of 3.75 (neutral-like). The lowest average value was produced by treatment B (10:90), namely 3.50 (Neutral).

The higher the substitution of peanut flour for almond flour, the higher the level of preference for macaron skin color. The color that the panelists like is a browner macaron skin color. The formation of a browner color is influenced by the addition of peanut flour, where peanut flour has a typical golden brown color while almond flour has an ivory white color. Apart from that, the formation of a browner color is influenced by the maacaron baking process. The Maillard reaction is a reaction between carbohydrates that produces the compound hydroxymethylfulfural. Furfural polymerizes which then forms a brown melanoidin compound, there is a reaction between reducing sugars and amino groups at high temperatures T. Isnaini, 2018 in A. Fairus et al 2021. Apart from that, brown color can be produced from the caramelization reaction. Caramelization is a browning process caused by the degradation of sugar without the presence of amino acids or proteins at high temperatures J. Cleveland et al 2001 in A. Winata, 2019. Continuous heating of sugar until it reaches its melting point will cause caramelization. This caramel formation will sharpen the color and give it a brownish color. F. G. Winarno, 2002 in A. Winata, 2019.

Level of Likeness for Aroma

Aroma is one of the organoleptic parameters of macaron substitution of peanut flour for almond flour which is very important to know. The aroma of a product comes from the volatile compounds contained in the basic ingredients. Based on the data from statistical analysis, the substitution of peanut flour for almond flour has a significantly different effect on the level of preference for the aroma of the macaron produced. The results of Duncan's multiple distance test on the average value of macaron aroma preference level can be seen in table 9.

Table 9. Effect of Substituting Peanut Flour for Almond Flour on Levels Favorite Macaron Shell Scent

Treatment	A (0:100)	B (10:90)	C (20:80)	D (30:70)	E (40:60)	F (50:50)
Average	3,70 a	3,85 a	4,06 b	4,25 c	3,80 a	3,67 a

Note: Average numbers followed by different letters are significantly different at the 5% significance level according to Duncan's multiple range test.

Table 9 shows that the substitution of peanut flour for almond flour has a significantly different effect on the level of preference for the aroma of the macaron shell. Treatment D (30:70) produced the highest average value, namely 4.25 (like) compared to treatment A (control), namely 3.70 (neutral-like). The lowest average value of 3.67 (neutral-like) was produced by treatment F (50:50) which was significantly different from treatments C and D but not significantly different from treatments A, B and E. Treatment C (20:80) produced The average value of 4.06 (like) is significantly different from treatments A, B, D, E and F.

The greater the substitution of peanut flour for almond flour used, the greater the level of panelists' preference for the aroma of macaron shells, but the level of panelists' preference for the aroma of macaron shells decreased again in treatment E (40:60). This is because the higher the substitution of peanut flour for almond flour, the resulting macaron shell with a stronger peanut aroma. Panelists have a tolerance limit for the aroma of peanuts and the panelists' tolerance limit is in treatment D (30:70). Another additional ingredient that can affect the aroma of macaron shells is vanilla flavoring.

Level of Likeness for Texture

Texture is the touch value of a material. The texture can be rough-smooth, hard-soft, crunchy-soft, and others. The expected macaron texture is a crunchy and soft sensation. Based on the data from statistical analysis, the substitution of peanut flour for almond flour has a significantly different effect on the level of preference for the texture of the macaron produced. The results of Duncan's multiple distance test on the average value of macaron texture preference level can be seen in table 10.

Table 10. Effect of Substituting Peanut Flour for Almond Flour on Macaron Skin Texture Favorite Level

Treatment	A (0:100)	B (10:90)	C (20:80)	D (30:70)	E (40:60)	F (50:50)
Average	3,26 a	3,70 b	3,84 b	4,30 c	3,71 b	3,37 a

Note: Average numbers followed by different letters are significantly different at the 5% significance level according to Duncan's multiple range test.

Table 10 shows that the substitution of peanut flour for almond flour has a significantly different effect on the level of preference for the texture of the macaron shell. Treatment D (30:70) produced the highest average value, namely 4.30 (like) compared to treatment A (control), namely 3.26 (neutral), which was the lowest average value.

Treatment A is significantly different from treatments B, C, D and E, but not significantly different from treatment F. Treatment D is significantly different from A, B, C, E and F while treatments B, C and E have mean values that are not real different.

The results showed that treatment A (control) produced a lower value of texture preference compared to the treatment with peanut flour substitution, this was due to the protein content of peanut flour (36.99%) being greater than the protein content of almond flour (11.01%). High protein content can reduce the breakability of cookies so that cookies are preferred by panelists A. Faridah, et al 2021 in Y. R. P. Riansari, 2018. However, there was a decrease in the liking level values in treatments E (40:60) and F (50:50), this is because the breaking strength in treatments E (40:60) and F (50:50) is too low so it is too crunchy and is not liked by the panelists. According to the panelists, the right texture is the macaron skin texture produced by treatment D (30:70).

Level of Likeness for Taste

Based on the data from statistical analysis, the substitution of peanut flour for almond flour has a significantly different effect on the level of preference for the taste of the macaron produced. The results of Duncan's multiple distance test on the average value of macaron taste preference level can be seen in table 11.

Table 11. Effect of Substituting Peanut Flour for Almond Flour on Macaron Skin Taste Favorite Level

Treatment	A (0:100)	B (10:90)	C (20:80)	D (30:70)	E (40:60)	F (50:50)
Average	4,20 c	4,06 c	3,60 a	4,41 d	3,97 b	3,42 a

Note: Average numbers followed by different letters are significantly different at the 5% significance level according to Duncan's multiple range test.

Table 11 shows that the substitution of peanut flour for almond flour has a significantly different effect on the level of preference for the taste of macaron shells. Treatment D (30:70) produced the highest average value, namely 4.41 (like) compared to treatment A (control), namely 4.20 (like). The lowest average value of 3.42 (neutral) was produced by treatment F (50:50) which was significantly different from treatments A, B, D and E but not significantly different from treatment C. Treatment A was not significantly different from treatment B but was different significantly different from treatments C, D, E and F. Treatment D is significantly different from treatments A, B, C, E and F.

The higher the substitution of peanut flour for almond flour, the sweeter the resulting macaron shell tastes. However, because the sugar content in macarons is quite high, the substitution of peanuts which is too high causes the taste of the macaron shell to be too sweet, so the panelists don't like it. Other factors that can influence taste are chemical compounds, temperature, and interactions with other flavor components. Different chemical compounds produce different flavors. The sour taste comes from proton donors, the salty taste comes from inorganic salts, the sweet taste comes from aliphatic organic compounds

and the bitter taste comes from alkaloids. Interactions with other components can certainly influence the taste value of the product F. G. Winarno, 1997 in A. Fairus, et al 2021.

Level of Likeability for Appearance

Based on the data from statistical analysis, the substitution of peanut flour for almond flour has a significantly different effect on the level of preference for the appearance of the macarons produced. The results of Duncan's multiple distance test on the average value of the level of liking for the appearance of macarons can be seen in table 12.

Table 12. Effect of Substituting Peanut Flour for Almond Flour on Macaron Skin Appearance

Treatment	Preferred Level					
	A (0:100)	B (10:90)	C (20:80)	D (30:70)	E (40:60)	F (50:50)
Average	4,31 b	3,72 a	4,08 b	3,65 a	3,69 a	3,56 a

Note: Average numbers followed by different letters are significantly different at the 5% significance level according to Duncan's multiple range test.

Table 12 shows that the substitution of peanut flour for almond flour has a significantly different effect on the level of preference for the appearance of the macaron shell. Treatment A (control) produced the highest average value of 4.31 (like) while the lowest average value of 3.56 (neutral) was produced by treatment F (50:50) which was significantly different from treatments A and C but not different. significantly different from treatments B, D and E. Treatment A was not significantly different from treatment C.

The assessment of the appearance of the macaron is based on the shape of the macaron shell. The form of macaron skin preferred by the panelists is macaron skin which has neat legs and does not spread out. The appearance of this macaron can be influenced by beating the egg whites when making the meringue. In addition, macaron feet can be affected by the fat content in peanuts. The fat in peanuts is a vegetable fat that contains phytosterols and is higher in unsaturated fatty acids so it is usually in liquid form.

CONCLUSION

Based on the research results, it can be concluded that the substitution of peanut flour for almond flour has a significantly different effect on water content, protein content, fat content, swelling power, level of preference for aroma, texture, taste and appearance but is not significantly different on the level of color preference. resulting macaron shells. Substitution treatment D (30:70) produces the best macaron characteristics. This determination is based on the level of preference for aroma 4.25 (like), texture 4.30 (like), and taste 4.41 (like). The nutritional content of treatment D (30:70) consists of water content of (2.89%), protein content of (5.16%) and fat content of (18.54%) and flowering capacity of (30.02%).

REFERENCES

A.G. Adnyasuari, I. G. A. Ekawati, and N. M. I. H. Arihantana, 2019. Substitusi Tepung

Almond dengan Tepung Kemiri (*Aleurites moluccana* Wild) terhadap Karakteristik Kulit Macaron, J. Ilmu dan Teknol. Pangan, vol. 8, no. 2, pp. 122–130, Online. Available: https://ojs.unud.ac.id/index.php/itepa/article/download/50281/29915

A. Fairus, N. Hamidah, and Y. I. Setyaningrum, 2021. Subatitusi Tepung Terigu Dengan Tepung Ubi Ungu (*Ipomoea batatas* L. Poir) Dan Tepung Kacang Tanah (*Arachis hypogaea*) Pada Pembuatan Cookies : Kajian Kadar Protein Dan Mutu Organoleptik, Heal. Care Media, vol. 5, no. 1,.

A. Faridah, S. Pada K, A. Yulastri, and L. Yusuf, 2021. Patiseri Jilid 1-3. Jakarta: Departemen Pendidikan Nasional.

A. Winata, 2019 . Pengaruh Substitusi Tepung Terigu dengan Tepung Umbi Dahlia (Dahlia sp.) dan Penambahan Baking Powder dalam Pembuatan Cookies, Brawijaya,.

BPS (Badan Pusat Statistika), "Produksi Kacang Tanah, 2022. https://www.bps.go.id/

E. Karlina, 2020. Pengaruh Konsentrasi Emulsi Lilin Lebah Terhadap Karakteristik Cabai Merah (*Capsicum annum* L.) Selama Penyimpanan 7 Hari, Universitas Ma'soem,.

F. G. Winarno, 1991. Kimia Pangan dan Gizi. Jakarta: Gramedia Pustaka Utama.

F. G. Winarno, 1997. Kimia Pangan dan Gizi. Jakarta: Gramedia Pustaka Utama.

F. G. Winarno, 2002. Kimia Pangan dan Gizi. Jakarta: Gramedia Pustaka Utama.

J. Cleveland, J. M. Thomas, F. N. Ingolf, and L. C. Michael, "Bacteriocins 2001 . Safe, Natural Antimicrobials for Food Preservation, J. Food Preserv. J. Food Microbiol., vol. 71, pp. 1–20,.

M. Astawan, 2009. Sehat dengan Hidangan Kacang & Biji-Bijian, 1st ed. Jakarta: Penebar Swadaya.

M. Braun, 2012. Macarons. Germany: Martin Braun Gruppe,. Novia, D S, Melia, N Z, and Ayuza., 2011. "Kajian Suhu Pengovenan Terhadap Kadar Protein dan Nilai Organoleptik Telur Asin. Jurnal Peternakan," J. Peternak., vol. 8, no. 2, pp. 70–76,.

S. Sudarmadji, H. B, and Suhardi, 1989. Prosedur Analisis Untuk Bahan Makanan dan Pertanian. Yogyakarta: Liberty,.

S. N. L. Abdjul, 2017. Perbandingan Tepung Kacang Tanah (*Arachis Hypogaea*, L.) Dengan Tepung Ubi Jalar Merah (*Ipomoea batatas*, L.) Dan Suhu Pemanggangan Terhadap Karakteristik Biskuit Gluten Free.

T. Isnaini, 2018. Kadar Protein, Tekstur, dan Sifat Organoleptik Cookies yang Disubstitusi Tepung Ganyong (*Canna Edulis*) dan Tepung Kacang Kedelai (*Glycine Max*). J. Pangan dan Gizi, vol. 8, no. 6,

T. Soewarno and Soekarto, 1985. Penilaian Organoleptik Untuk Industri Pangan. Pusbangtepa IPB-Bogor,.

USDA (United States Department of Agriculture), 2022. Nut, Almond, Whole, Raw. *FoodData Central*,. htttps://fdc.nal.usda.go

Y. R. P. Riansari, 2018. Inovasi Penggunaan Tepung Kacang Hijau (Vigna radiata L.) dan Tepung Kacang Kedelai (*Glycine max* L. Merr) sebagai Pengganti Tepung Almond (*Prunus dulcis*) pada Pembuatan Macaron, Brawijaya.