6th FIAC 2020

The Food Ingredient Asia Conference

PROCEEDINGS

14 - 16 October, 2020

"on Food Science, Nutrition and Health"

EDITORS

Azis Boing Sitanggang
Emmanuel Hatzakis
Michael Murkovic
Chin-Kun Wang
Nuri Andarwulan
Umar Santoso

FiAC 2020

Proceedings of the
6th Food Ingredient Asia Conference

Food Science, Nutrition and Health

Bogor - Indonesia

October 14 - 16, 2020

Edited by Azis Boing Sitanggang, Emmanuel Hatzakis, Michael Murkovic, Chin-Kun Wang,
Nuri Andarwulan and Umar Santoso

Printed in Portugal

ISBN: 978-989-758-540-1

DOI: 10.5220/0000147000003108

Depósito Legal: 490276/21

http://seafast.ipb.ac.id/FiAC2020/

seafastseminar@gmail.com

CONTENTS

PAPERS

FULL PAPERS

The Effect of Fermented White Corn Flour and Wheat Flour Formulation on the Quality of Cookies

Jessica Selvira[1], Rahmawati Rahmawati[1], Rijanti Rahaju Maulani[2], Dase Hunaefi[3] and Dede Saputra[4]
[1]*Study Program of Food Technology, Faculty of Food Techonology and Health, Sahid University, Jakarta, Indonesia*
[2]*Study Program of Post-Harvest Technology, School of Life Science Technology, Institut Teknologi Bandung, Indonesia*
[3]*Departement of Science and Food Technology, Faculty of Agricultural Technology, IPB University, Bogor, Indonesia*
[4]*Departement Food Technology, Bina Nusantara University, Jakarta, Indonesia*
yanti.rm@gmail.com

Keywords: Fermented White Corn Flour, Wheat Flour, Cookies.

Abstract: Cookies are a type of cookie that is small, crispy, has a sweet taste and can be eaten by all ages. The thing to consider in cookie processing is crispness. Fermented white corn flour as a result of the Response Surface Method (RSM) optimization has a setback viscosity value close to wheat flour, so that when used as a raw material to make cookies, it will increase its crispness. This research aims to study the effect of fermented white corn flour and wheat flour formulation in cookie making. The formulations ratio of fermented white corn flour and wheat flour tested were: 0:100; 20:80; 40:60; 60:40; and 80:20. The results showed that the higher of the formulation of fermented white corn flour, the lower the hardness of cookies, ash content, and protein content, because the moisture content tends to increase. Based on physical, chemical and organoleptic tests, the formulation of fermented corn flour and wheat flour (20:80) is a formulation that can be produce quality cookies. The quality characteristics of the cookie produced are 3462.42 gF texture, 1.47% moisture content, 2.43% ash content, 7.29% protein content, 24.74% fat content, 64.08% carbohydrate content, and 1.34% crude fiber.

1 INTRODUCTION

Cookies are a type of cookie that is small, crispy, has a sweet taste, is a popular food product that can be consume by various consumer segments. According to National Standardization Agency of Indonesia (2011), cookies are a type of biscuit made from a soft dough, crispy and when broken, the texture looks less dense. Generally cookies are made from wheat flour, sugar and egg. Cookies can be made by other types of flour besides wheat flour. The research by Kausar *et al.* (2018) showed that cookies with carrot pomace powder 12% has sensory evaluation of 8,2 crispness value and 8,4 overall acceptability, it means like very much by panelists. The research by Alflen *et al*. (2016) showed that cookies with taro flour 30% has a preference level of 6,9 it means like moderately by panelists. Singh *et al*. (2008) conducted a study on sweet potato flour cookies, the best results with sweet potato flour 40% has crispness value of 3,7 it means fragile (breaks easily when consumed) and an overall acceptability of 3,6 which is acceptable to the panelists.

Another study conducted by Suarni (2005), substitution wheat flour with 80% corn flour has crispness value of 2,95 it means rather like by panelists. The advantage of cookies made from 80% corn flour has a higher fiber content (3,59%) compared to cookies made from 100% corn flour (0,98%) (Suarni, 2009). The research by Purnamasari (2019) showed that fermented white corn flour as a result of optimization of the *Response Surface Method* (RSM) has the lowest setback viscosity value among other fermentation treatments, that is 1039,00 cP. The low setback viscosity will increase its crispness and texture of product not as hard as other fermentation treatments, so that fermented corn flour is suitable for use in making cookies. Therefore, the thing that must be considered when processing cookies is crispness (Widiantara *et al*., 2018).

Based on the description above, this research was carried out on the effect of fermented white corn flour as a result of optimization of the RSM and wheat flour formulation in making cookies. The formulation using fermented white corn flour as a result of

Selvira, J., Rahmawati, R., Maulani, R., Hunaefi, D. and Saputra, D.
The Effect of Fermented White Corn Flour and Wheat Flour Formulation on the Quality of Cookies.
In *Proceedings of the 6th Food Ingredient Asia Conference (FiAC 2020) - Food Science, Nutrition and Health*, pages 38-46
ISBN: 978-989-758-540-1

optimization of the RSM was chosen because it has a low setback viscosity value.

2 MATERIALS AND METHODS

2.1 Materials

The ingredient used in making of cookies are fermented white corn flour as a result of the optimization RSM (Purnamasari, 2019), Kunci Biru brand flour (8-9% protein content), Blueband margarine, chicken egg, Dancow brand full cream milk, sugar, baking soda ($NaHCO_3$), and vanilla.

The chemicals used for protein content analysis include concentrated sulfuric acid (H_2SO_4), mercury oxide (HgO), potassium sulfate solution (K_2SO_4), sodium hydroxide solution (NaOH), sodium thiosulfate solution (Na_2SO_3), saturated boric acid solution (H_3BO_3), hydrochloric acid solution (HCl). The chemicals used for fat content analysis is hexane. The chemicals used for crude fiber content analysis is concentrated sulfuric acid (H_2SO_4), etc. The chemicals used are materials that are in the Chemical Laboratory of Bogor Agricultural Institute.

2.2 Methods

The process of making fermented white corn flour cookies consists of 3 stages: mixing, molding, and baking. The flowchart of the process making fermented white corn flour cookies can be seen in Figure 1.

2.2.1 Mixing

The first mixing are margarine and sugar, used the mixer at high speed for 5 minutes until homogeneous and creamy. After that, the second mixing with addition of 1 egg and mixed at medium speed for 5 minutes.

The third stage of mixing is the addition of fermented white corn flour and wheat flour (formulation 0:100; 20:80; 40:60; 60:40; and 80:20), full cream milk, baking soda, and vanilla, mixed to form a dough slowly until thoroughly and can be molded. The quantity of materials used can be seen in Table 1.

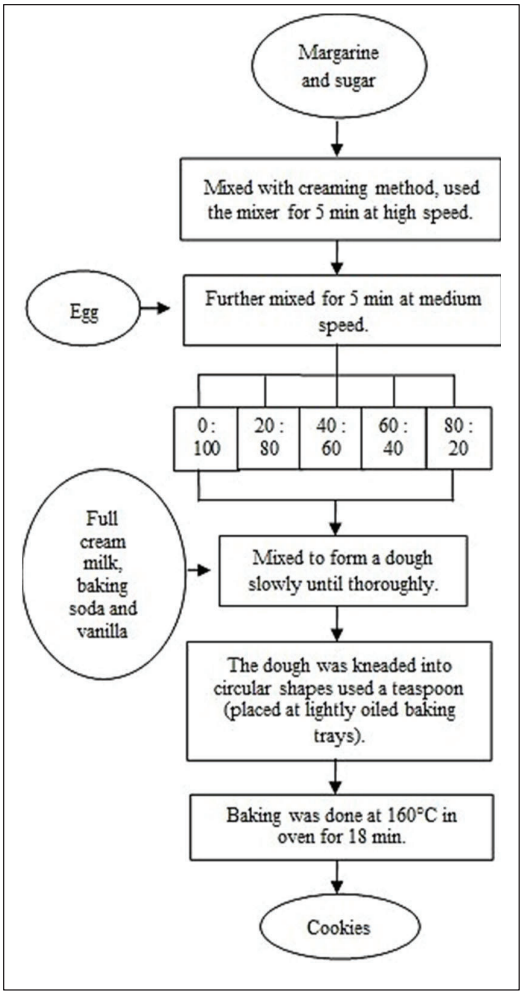

Figure 1: Flowchart of making fermented white corn flour cookies (modified) (Okpala & Ofoedu, 2018).

2.2.2 Molding

Molding was done by used the drop cookies method, the dough was kneaded into circular shapes used a teaspoon and then placed at lightly oiled baking trays.

2.2.3 Baking

The main purpose of the baking process is to improve the quality of food (*quality eating*) of the raw materials, as well as to add variety to foods. *Cookies* that have been molded and placed at lightly oiled baking trays are baked in the oven at 160°C for 18 minutes.

Table 1: Composition of raw materials in the production of fermented white corn flour cookies.

Raw Materials	Quantity (g)	%
J : T	130,00	40,37
Sugar	70,00	21,74
Margarine	63,00	19,57
Full cream powdered milk	13,00	4,04
Baking soda	4,00	1,24
Vanilla	2,00	0,62
Egg	40,00	12,42
Total	322,00	100,00

Note: J = Fermented white corn flour; T : Wheat flour

2.2.4 Testing Techniques

Quality testing of cookies was done through physical quality (hardness) used a Texture Analyzer XT21 Stable Micro System, quality chemical include moisture content with oven method (AOAC, 2006), ash content with furnace method (AOAC, 2006), protein content with Kjedahl method (AOAC, 2006), fat content with soxhlet method (AOAC, 2006), carbohydrate content (*by difference*) and crude fiber content (SNI 01-2891-1992); organoleptic quality (hedonic quality for color, aroma, taste and crispness; and test ranking based on the overall level of preference) (Permadi, *et al*., 2018 and Ebookpangan.com, 2006).

3 RESULT AND DISCUSSION

3.1 Texture Physical Quality (Hardness)

Hardness of cookies were tested used a Texture Analyzer XT21 Stable Micro System. Hardness value of cookies (gF) decrease along with the increase in the substitution concentration of fermented corn flour. The results of the analysis of variance showed that the different formulations of fermented corn flour and wheat flour did not significantly affect the hardness value of cookies. The graph of average hardness of cookies is presented in Figure 2.

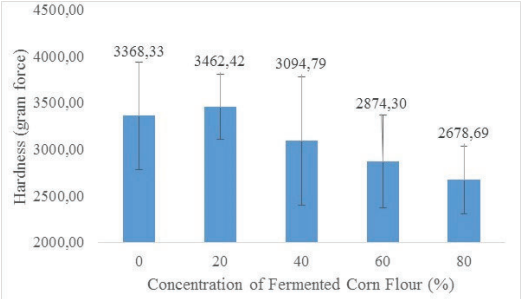

Figure 2: The graph of average hardness (gf) cookies.

The smaller the value obtained, the softer the texture of the cookies. The greater the value obtained, the greater the hardness, meaning the texture of the cookie is getting drier and crispy. Hardness value of cookies with fermented corn flour substitution highest in the treatment with a concentration of 20% i.e 3462,42 gF and the lowest in the treatment with fermented corn flour concentration of 80% i.e 2678,69 gF. This shows that the smaller the composition of fermented corn flour to 20% can increase the crispness of the cookies. According to Wulandari *et al*. (2016), the moisture content, fat content, carbohydrate, protein and all the ingredients used can determine the texture of the cookies.

3.2 Chemical Quality

3.2.1 Moisture Content

The moisture content in a food item affects the freshness and durability of food. Moisture content also affects physical properties such as hardness. The higher moisture content causes the cookies to be less crispy (Widiantara *et al*., 2018). The moisture content of cookies with fermented corn flour substitution is highest in treatment with a concentration of 40% i.e 2,13% and the lowest in treatment with a concentration of 20% i.e 1,47%. The moisture content of cookies in this research fulfills the SNI 2973:2011 requirements, i.e maksimum of 5%. The graph of average moistue content of cookies can be seen in Figure 3.

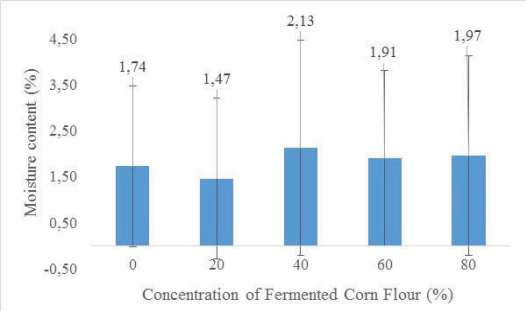

Figure 3: The graph of average moisture content of cookies.

Based on the graph, it can be seen that the moisture content of cookies with fermented corn flour concentration of 40, 60 and 80% tend higher than cookies without fermented corn flour, although there is no significant difference. The lowest the moisture content, the higher of the hardness of cookies, it makes the texture becomes crispy.

This is in accordance with the treatment with a concentration of fermented corn flour of 20% which indicates the lowest moisture content has the highest hardness value. Cookies absorb water from the surrounding air due to the hygroscopic nature of wheat flour (Kausar *et al.*, 2018).

3.2.2 Ash Content

The amount of minerals in the ingredients used in making cookies will affect of the ash content value (Wulandari *et al*., 2016). The higher the mineral content, the higher of the ash content value obtained. The ash content of cookies with fermented corn flour substitution is highest in treatment with a concentration of 20% i.e 2,43% and the lowest in treatment with a concentration of 80% i.e 2,25%. The graph of average ash content of cookies can be seen in Figure 4.

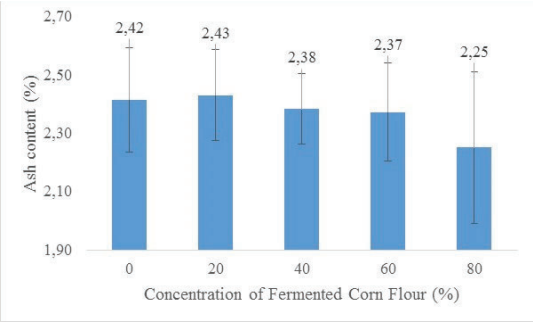

Figure 4: The graph of average ash content of cookies.

Based on the graph, it can be seen that the ash content of cookies decrease with the increase in the substitution concentration of fermented corn flour. However, the results of the analysis of variance showed that the different formulations of fermented corn flour and wheat flour did not significantly affect the ash content of cookies.

3.2.3 Protein Content

The protein in cookies is influenced by the composition of the constituent ingredients, especially the flour used because in this research the composition of the flour used is different. Wheat flour used is a type of low protein flour (8-9%) and the fermented corn flour used has a protein content of 6,90%. So that by increasing the concentration of fermented corn flour substitution will reduce the protein content of cookies.

Protein content of cookies with fermented corn flour substitution is highest in treatment with a concentration of 0% and 20% i.e 7,29% and the lowest in treatment with a concentration of 80% i.e 6,30%. Protein content of cookies in this research fulfills the SNI 2973:2011 requirements, i.e minimum of 5%. Graph of average protein content (%) cookies can be seen in Figure 5.

Based on the graph, it can be seen that the higher the concentration of fermented corn flour, the lower the protein content, although the results of the analysis of variance showed that the different formulations of fermented corn flour and wheat flour did not significantly affect the value of the protein content of cookies. From the results of his research, (Suarni, 2005) reported that the higher the concentration of corn flour, the lower the portein content in cookies.

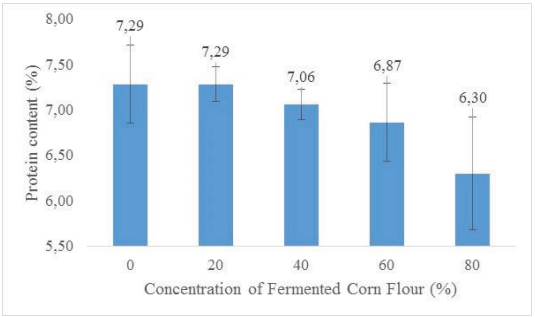

Figure 5: The graph of average protein content of cookies.

3.2.4 Fat Content

Fat can improve the physical structure of cookies, such as development, tenderness, texture, and aroma.

Based on the results of analysis of variance, the different formulations of fermented corn flour and wheat flour did not significantly affect the fat content of cookies. The graph of average fat content of cookies can be seen in Figure 6.

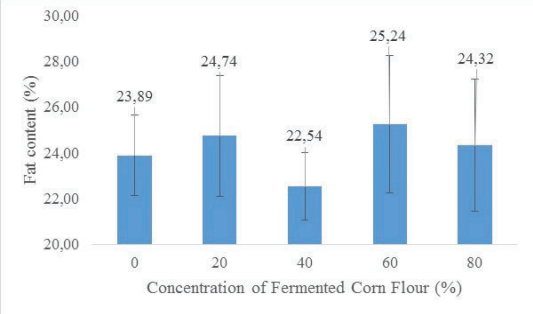

Figure 6: The graph of average fat content of cookies.

Based on the graph, it can be seen that the fat content of cookies tends to fluctuate. Even so, the fat content of cookies with the substitution of fermented corn flour with a concentration of 60% tends to show the highest value i.e 25,24% and the lowest at a concnetration of 40% i.e 22,54%. According to Wulandari *et al*. (2016), the fat content of cookies is influenced by the addition of margarine and egg. Margarine contains lipids that are bound as lipoprotein and cause cookies to have a high fat content when added with margarine. The results of research Suarni (2005) showed that the fat content of cookies was higher along with the increasing concentration of corn flour substitution.

3.2.5 Carbohydrate Content

Carbohydrate can determining the characteristic of food ingredients such as color, because carbohydrate contain reducing sugars which when reacting to the amino groups of the protein cause a non-enzymatic browning reaction (Wulandari *et al*., 2016). Carbohydrate are also a major source of calories. The results of analysis of variance showed that the different formulations of fermented corn flour and wheat flour did not significantly affect the carbohydrate content of cookies. The graph of average carbohydrate content of cookies can be seen in Figure 7.

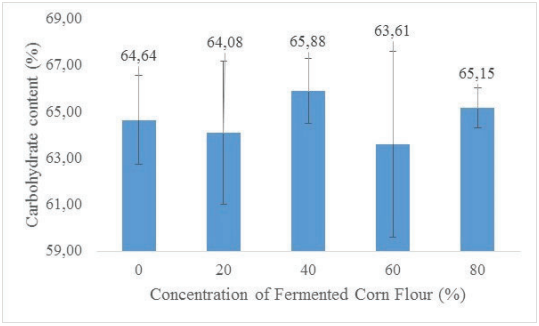

Figure 7: The graph of average carbohydrate content of cookies.

Based on the graph, it can be seen that the carbohydrate content of cookies tends to fluctuate. The carbohydrate content of cookies with fermented corn flour substitution tends to have the highest value in the treatment with a concentration of 40% i.e 65,88% and the lowest at a concentration of 60% i.e 63,61%.

The results of this research indicate that cookies with the highest carbohydrate content (65,88%) at 40% fermented corn flour concentration has the lowest fat content (22,54%) and cookies with the lowest carbohydrate content (63,61%) at 60% fermented corn flour concentration has the highest fat content (25,24%). The carbohydrate content is calculated by difference and is influenced by the water, ash, protein and fat content . Wulandari *et al*. (2016) states that the higher component of other nutrients (water, ash, protein and fat) then carbohydrates content decreases.

3.2.6 Crude Fiber Content

Crude fiber is needed by the body because it is good for digestion. Crude fiber can prevent constipation (difficulty defecating), so cookies with high crude fiber contentare good for the body (Wulandari *et al*., 2016). The results of analysis of variance showed that the different formulations of fermented corn flour and wheat flour did not significantly affect the crude fiber content of cookies. The graph of average crude fiber content of cookies can be seen in Figure 8.

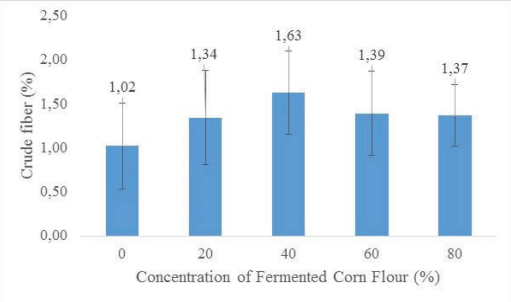

Figure 8: The graph of average crude fiber content of cookies.

Based on the graph, it can be seen that the value of crude fiber of cookies with fermented corn flour substitution of 20%, 40%, 60% and 80% tends to be higher than cookies without fermented corn flour. Crude fiber of cookies with fermented corn flour substitution is highest in a treatment with a concentration of 40% i.e 1,63% and the lowest at a concentration of 0% i.e 1,02%. A similar trend was observed by Suarni (2005) which states that corn flour based cookies has a higher crude fiber than cookies made from 100% wheat flour.

3.3 Organoleptic Quality

The organoleptic quality of cookies was determined based on the hedonic quality test assesment and ranking test with 25 semi-trained panelists. In the hedonic quality test, the panelists expressed an impression of good or bad about the product. In the ranking test, panelists were asked to measure the preference level of overall product. The parameters used were color, aroma, taste and crispness. The results of analysis of variance showed that the different formulations of fermented corn flour and wheat flour did not significantly affect the organoleptic quality of cookies. The results of the organoleptic quality analysis are shown in Table 2.

3.3.1 Color

The color produced by cookies is influenced by a non-enzimatic browning reaction (Maillard reaction) which is caused by a reaction between sugars and amino groups of protein during the baking process (Wulandari *et al*., 2016). The results of the hedonic quality test of color parameters (Table 2), the different formulations of fermented corn flour and wheat flour showed a color scale ranged from 2,84 – 4,68 (light brown – brownish yellow).

There is a tendency that the higher the concentration of fermented corn flour substitution, the higher the assessment of the cookies color scale, it means that the cookies produced has a yellowish brown color. The color hedonic quality test of cookies with fermented corn flour substitution is highest in treatment with a concentration of 20% i.e 4,21 (yellowish brown) and the lowest in treatment without fermented corn flour i.e 3,28 (light brown).

3.3.2 Aroma

The aroma parameter tested is the strength of the corn aroma that still smells on the cookies produced. The hedonic quality test of cookies aroma ranged from 3,08 – 3,64 (strong slightly – not strong) (Table 2). The aroma of the cookies was determined by the ingredients used in the cookies.

According to Suarni (2009), the aroma of the cookies is influenced by the components of the ingredients used and their comparisons, such as margarine, egg, additives, and types of flour. So that the different formulations of fermented corn flour and wheat flour will affect the aroma of the cookies produced.

This is confirmed by Sitohang *et al.* (2015) which states that mixing margarine and egg can cause a distinctive smell of dough and the baking process also affect the aroma of cookies. The results of aroma hedonic quality test showed a tendency that the higher

Table 2: Panelist preferences value for color, aroma, taste and crispness of cookies with different formulation of fermented corn flour and wheat flour.

Formulation of fermented corn flour and wheat flour	Hedonic Quality Scale			
	Color	Aroma	Taste	Crispness
0 : 100	3,28±0,6	3,40±0,1	3,45±0,2	4,12±0,5
20 : 80	4,21±0,4	3,40±0,2	3,45±0,1	3,85±0,7
40 : 60	4,20±0,1	3,35±0,3	3,24±0,2	2,75±0,4
60 : 80	3,89±0,6	3,31±0,1	3,25±0,4	3,43±0,2
80 : 20	4,12±0,4	3,23±0,2	2,91±0,2	2,76±0,8

Notes:
Color Scale: 1 = blackish brown, 2 = brown, 3 = light brown, 4 = yellowish brown, 5 = brownish yellow.
Aroma and Taste Scale: 1 = very strong, 2 = strong, 3 = strong slightly, 4 = not strong, 5 = very not strong.
Crispness Scale: 1 = very not crispy, 2 = not crispy, 3 = crispy slightly, 4 = crispy, 5 = very crispy.

substitution concentration of fermented flour, the less aroma of cookies, it means that the cookies produced has a strong slightly corn aroma.

The aroma hedonic quality test of cookies with fermented corn flour substitution is highest in treatment with a concentration of 0% and 20% i.e 3,40 and the lowest in treatment with a concentration of 80% i.e 3,23 has the same aroma, that is strong slightly. This is because the strong aroma of fermented corn flour has been mixed with other ingredients used, so the aroma of corn in the cookies produced is not too strong.

3.3.3 Taste

The taste parameter tested on the panelists is the strength of the taste corn on the cookies produced. The taste hedonic quality test of cookies ranged from 2,80 – 3,64 (strong slightly – not strong) (Table 2). The result of research by Suarni (2005) showed that the higher substitution concentration of fermented corn flour, the taste of the cookies produced was like slightly by the panelists. This is because the taste of the corn in the cookies can still be felt by the panelists.

The results of taste hedonic quality test showed a tendency that the higher the substitution concentration of fermented corn flour, the taste of cookies will decrease, it means that the cookies produced has a strong slightly corn taste. The taste hedonic quality test of cookies with fermented corn flour substitution is highest in treatment with a concentration of 0% and 20% i.e 3,45 and the lowest in treatment with a concentration of 80% i.e 2,91 has the same taste, that is strong slightly.

3.3.4 Crispness

The crispness hedonic quality test of cookies ranged from 2,12 – 4,56 (not crispy – crispy). The crispness of the cookies is influenced by the wheat flour and fermented corn flour use. Both of the flours contain low protein. The lower the protein value, the crispness will decrease. A similar tren was observed by Wulandari *et al*. (2016) which states that the crispness of substitution 30% breadfruit flour to cookies is not crispy because breadfruit flour contains a small amount of protein.

The results of crispness hedonic quality test showed a tendency that at concentration of fermented corn flour of 0% and 20% cookies are crispy at concentration of 40%, 60% and 80% cookies are crispy slightly. Moisture content also affects the crispness of cookies.

The test results showed that the higher the substitution concentration of fermented corn flour, the hardness value of cookies decreases, the moisture content tends to increase and the crispness hedonic quality decreases (not crispy). This is in line with the results of physical tests (texture) and chemical test (moisture content) that have been conducted.

3.3.5 Ranking Test

The ranking test are performed based on overall liking level. Panelists evaluate the sample from number 1 the most preferred to number 5 the most dislike. From the result, the sequence is converted into Fischer and Yates table scores. The results of the cookies ranking test in the treatment with fermented corn flour concentrations of 0% and 20% obtained positive values, while the concentrations of 40%, 60% and 80% obtained negative values. The results of the ranking test are shown in Figure 9.

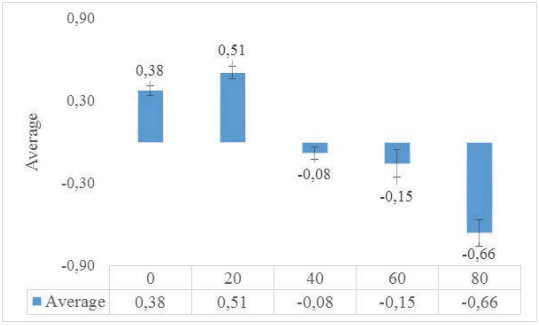

Figure 9: The graph of average of ranking test.

Table 3: Significance of the overall preference of fermented corn flour cookies.

Formulation of fermented corn flour and wheat flour	Score of Average Ranking Test (*)
0 : 100	0,3800±0,0 [b]
20 : 80	0,5100±0,0 [a]
40 : 60	-0,0800±0,0 [c]
60 : 40	-0,1533±0,1 [c]
80 : 20	-0,6567±0,1 [d]

Note: *) Mean numbers followed by different letters indicate significant difference according to the DMRT test at $\alpha = 0,05$.

Based on the graph, it can be seen that the higher the substitution concentration of fermented corn flour, the lower the level of panelists preference for overall cookies. The results of analysis of variance showed that the different formulations of fermented corn flour and wheat flour have a significantly affect on the panelist assessment of the overall cookie produced. The significance of differences is shown in Table 3.

The data in Table 3 showed that the substitution concentration of 80% fermented corn flour (80:20) resulted in a lower panelists assessment and were significantly different from other treatments. This is because the higher the substitution concentration of fermented corn flour, the physical test value of the texture hardness of cookies decreases (the cookies is softer) in line with the organoleptic quality of crispness hedonic decreases (not crispy).

Thus, the panelists evaluated the overall dislike along with the increased concentration of fermented corn flour substitution. The result of ranking test showed that the panelists liked the cookies with the formulation of fermented corn flour and wheat flour 20:80).

4 CONCLUSION

From the results of the research it can be concluded that different formualtions of fermented corn flour and wheat flour did not significantly affect on the parameters of physical quality of texture (hardness), chemical quality (moisture, ash, protein, fat, carbohydrate, and crude fiber content) and hedonic quality (color, aroma, taste and crispness), but significantly affect in the overall liking level parameter.

Based on physical, chemical and oragnoleptic tests, the formulation of fermented corn flour and wheat flour (20:80) is a formulation that can be produce quality cookies with the charachteristics: hardness value 3462,42 gF; moisture content 1,47%; ash content 2,43%; protein content 7,29%; fat content 24,74%; carbohydrate content 64,08%; crude fiber content 1,34%. Based on the organoleptic tests, the color is yeloowish brown, the aroma and taste of corn is strong slightly and the texture is crispy.

ACKNOWLEDGEMENT

The authors are thankful to Ministry of Research and Technology and Higher Education Republic of Indonesia for research funding through the Primary Reseacrh of Higher Education Program in 2019.

REFERENCES

Alflen, T. A., Quast, E., Bertan, L. C., and Bainy, E. M. 2016. *Partial Substitution of Wheat Flour with Taro (*Colocasia esculenta*) Flour on Cookie Quality*. Revista Ciencias Exatas e Naturais, 18(2): 202-212.

Association of Official Analytical Chemist. 2006. *Official Methods of Analysis of The Association of Analytical Chemist*. Washington DC: AOAC Inc.

Ebookpangan.com. 2006. *Organoleptic Testing in the Food Industry*. Food Technology, Muhammadiyah University, Semarang. http://tekpan.unimus.ac.id/wp-content/uploads/2013/07/Pengujian-Organoleptik-dalam-Industri-Pangan.pdf Accessed 28/6/20.

Kausar, H., Parveen, S., Aziz, M. M., and Saeed, S. 2018. *Production of Carrot Pomace Powder and Its Utilization in Development of Wheat Flour Cookies*. Journal of Agricultural Research, 56(1): 49-56.

National Standardization Agency of Indonesia. 1992. *Food and Beverages Test*. SNI 01-2891-1992.

National Standardization Agency of Indonesia. 2011. *Biscuits*. SNI 2973:2011.

Okpala, L. C., and Ofoedu, P. I. 2018. *Quality Characteristics of Cookies Produced From Sweet Potato and Wheat Flour Blend Fortified with Brewer's Spent Grain Flour*. Current Research in Nutrition and Food Science, 6(1): 113-119.

Permadi, M., Oktafa, H. and Agustianto, K. 2018. *Design of Food Sensorical Test System with Testing Preference Test (Hedonic and Hedonic Quality), Bread Case Study Tawar, Using Function Network Basis Radial Algorithm*. Mikrotik Journal, 8(1): 29-42.

Purnamasari, W. 2019. *Effect of Fermentation Duration and Amilolytic Culture Addition to Corn Flour Quality*. [Skripsi]. Sahid University, Jakarta.

Singh, S., Riar, C. S., and Saxena, D. C. 2008. *Effect of Incorporating Sweetpotato Flour to Wheat Flour on the Quality Characteristics of Cookies*. African Journal of Food Science, 2: 65-72.

Sitohang, K. A. K., Lubis, Z., and Lubis, L. M. 2015. *The Effect of Comparison of Total Wheat Flour and Breadfruit Flour with Stabilizer Types on the Quality of Breadfruit Cookies.* Journal of Food Engineering and Agriculture, 3(3): 308-315.

Suarni. 2005. *Development of Corn Flour Based Pastry Products in the Framework of Supporting Agroindustries.* Proceedings of the National Seminar of the Indonesian Agricultural Engineering Association, Faculty of Agricultural Technology, Padjadjaran University, LIPI, Bandung.

Suarni. 2009. *Prospects of Using Corn Flour for Cookies*. Journal of Agricultural Research, 28(2): 63-71.

Widiantara, T., Arief, D. Z. and Yuniar E. 2018. *Comparative Study of Koro Sword Bean Flour (*Canavalia ensiformis*) with Tapioca Flour and Egg*

Yolk Concentration on Characteristics of Koro Cookies. Pasundan Food Technology Journal, 5(2): 146-153.

Wulandari, F., Setiani, B. E. and Susanti, S. 2016. *Analysis of Nutritional Content, Energy Value, and Organoleptic Test of Rice Flour Cookies with Breadfruit Flour Substitution*. Journal of Food Technology Applications, 5(3): 107-112.