

The Utilization of Watermelon Peel Flour in Making Traditional Nagasari Cakes

Alya Syabila Dwiputri

Batam Tourism Polytechnic, Indonesia

Email: alyasyabila173@gmail.com

Abstract. Watermelon (*Citrullus lanatus*) is advantageous because it can be cultivated year-round. However, data from the Central Statistics Agency of Riau Islands Province (2025) show that its production has fluctuated over the years. This research aims to utilize watermelon peel as a substitute for rice flour in making traditional *nagasari* cakes. The innovation addresses the high percentage of wasted watermelon peels, which can cause environmental pollution. The study used an experimental method with a Complete Randomized Design (RAL) and three substitution levels of watermelon peel flour: 25%, 50%, and 75%. The peels were dried at 60°C for 9–10 hours, then ground and sifted into fine flour. The resulting *nagasari* products were evaluated organoleptically by 20 panelists using hedonic and hedonic quality tests. Results showed that increasing the substitution level significantly affected color, producing a darker appearance due to the Maillard reaction. In contrast, no significant differences were found in aroma and taste among the formulas. However, texture varied, with higher substitution producing softer cakes. The 25% substitution formula (sample 173) received the highest rating from panelists. Therefore, using watermelon peel flour in *nagasari* production supports food diversification while offering an innovative approach to reducing organic waste, consistent with zero-waste and sustainable food principles.

Keywords: watermelon peel flour; traditional cakes; waste; food substitution; organoleptic test.

INTRODUCTION

Watermelon (*Citrullus lanatus*) is a horticultural crop that is very popular among Indonesian people (Amzeri et al., 2021). This fruit belongs to the pumpkin family (*Cucurbitaceae*) and is classified as a vine-like herb fruit (Lutfiani, 2023). Watermelon has an advantage in terms of availability because it can grow all year round in different seasons (Haryati et al., 2022). Data from the Central Statistics Agency of Riau Islands Province in 2025 shows that watermelon production fluctuates from year to year.

Table 1. Watermelon Growth Fluctuations in the Riau Islands

Year	Quantity (quintal)
2019	1.139
2020	2.299
2021	933,52
2022	1.200
2023	1.450

Source: (Riau Province Central Statistics Agency 2025)

Although watermelon has great potential as a local food source, its utilization has not been maximized (Dube et al., 2021; Maoto et al., 2019). Generally, people consume sweet and fresh meat because it contains a lot of water (Molina et al., 2023). Watermelon meat is made up of about 92% water and 8% other nutrients, such as carbohydrates, protein, fat, fiber, as well as natural sugars such as fructose, dextrose, and sucrose (Nadeem et al., 2022). The seeds themselves contain protein, fat, and carbohydrates. White part (*rind*) also contains a lot of vitamin A, vitamin C, and is rich in the amino acid citrulline (Mazmanyman, 2023). As many as

32% – 48% of the skin is often thrown away and becomes waste (Niamah, 2023) which has the potential to pollute the environment. Although it decomposes easily, if it accumulates in an enclosed space, watermelon peel can produce harmful methane gas and can even trigger an explosion (Almualimah et al., 2024).

In Indonesia The use of watermelon peel is still relatively low, seeing the potential in watermelons that have not been fully utilized, the idea emerged to use it in the form of partial substitution of food products (Kataria & Kaur, 2023). The food product that will be used is a traditional cake that is still sustainable today, namely nagasari cake (Cataluna & Wardana, 2025). Nagasari cake is a wet cake that has the contents of steamed banana pieces with banana leaf wrappers (Irwan & Fatmawati, 2025). This cake is usually made from a mixture of rice flour, tapioca flour, sugar, coconut milk, and pandan leaves (Murtini et al., 2020). The combination of rice flour and tapioca flour gives a chewy and soft texture that is the favorite texture of Indonesians.

This substitution aims to make nagasari cakes by utilizing watermelon peel waste as a product diversification in Indonesian cuisine, can also be an alternative solution in reducing household and fruit industry organic waste while increasing the economic value of the watermelon peel itself. The use of watermelon peel waste is in line with the principles of sustainable food processing and the *zero waste* (Capossio et al., 2022), which is increasingly relevant in the context of raising awareness of the importance of efficient use of resources. The substitution of food products can also increase the nutrients contained in them (Cifelli et al., 2022; Ibsen et al., 2021). Despite the change in character, the product is still sensorially acceptable.

Here is a critical analysis of two previous studies and the gap addressed by this research (Ciappei et al., 2023). First, Ashoka (2021) demonstrated that watermelon rind flour is rich in fiber, which can lower the glycemic index and improve functional properties in cookies, with sensory results still acceptable to consumers. However, the matrix of the product studied was wheat-fat-sugar-based cookies, which does not represent steamed traditional cakes (such as rice/tapioca flour-based) with gel texture, and the cultural acceptance of such products was not evaluated. Secondly, ALbahrani (2025) successfully developed watermelon rind flour and high-fiber bread with good microbiological and proximate quality, but it focused on a gluten-based bread system with baking processes, and the implications for non-gluten gel-based systems (such as Indonesian wet cakes) and the optimal substitution limits for maintaining elasticity/unique sensory qualities were not addressed. Therefore, this study fills the gap by evaluating partial substitution of watermelon rind in nagasari, a steamed rice/tapioca-based wet cake, to assess its impact on sensory properties (elasticity, aroma, overall acceptance), nutritional value, and consumer acceptability in the context of Indonesian cuisine, while also offering a valorization of watermelon rind waste aligned with zero-waste principles.

This research aims to analyze the effect of partial substitution of watermelon rind in nagasari on sensory quality, nutritional composition, and consumer acceptance, as well as determine the optimal substitution level that maintains the unique texture of the traditional wet cake. Theoretically, this research expands the literature on the utilization of watermelon rind from wheat-based baking matrices to non-gluten gel systems typical of Indonesia, while practically offering a product diversification model and reducing household or fruit industry

organic waste, which can be adopted by food SMEs toward zero-waste practices.

METHOD

This research is a quantitative experiment conducted from June to September 2025 at the researcher's private residence, namely in Batam City, Riau Islands. This type of research is an experiment using a Complete Random Design (RAL). The percentage reference was obtained from a journal reference entitled "Watermelon Skin Flour Cookie Formulation as an Alternative to Alternative Foods for Hypertensive Patients" (Hadiza Buan & Farida, 2024). The tools used in this study are cutting boards, knives, storage containers, drying machines, closed containers, blenders, sieves, *Pan*, spatula, steamer. The ingredients used are rice flour, watermelon peel flour, tapioca flour, salt, sugar, coconut milk, water, pandan leaves, banana kepok, and banana leaves. There are 3 formulas with a ratio of watermelon flour to rice flour, namely 25% (173), 50% (237), and 75% (371).

The reference for the nagasari cake recipe used is a recipe from *Chef Rudy Choirudin*.

Table 2. Nagasari Cake Recipe

Material	Quantity
Rice flour	225 gr
Tapioca flour	75 gr
Coconut milk	900 ml
SKM	2 Sachet
Sugar	125 gr
Horn bananas	2 pieces
Salt	1 tsp
Pandan Leaves	2 sheets
Banana Leaves	Enough

Source: (Taste Gallery, 2022)

Processing of Raw Materials from Watermelon Peel Waste



Figure 1 Watermelon Peel Slices



Figure 2 Watermelon peel drying process



Figure 3 Dried watermelon peel



Figure 4 Watermelon Peel Flour

The research stage starts from making watermelon peel flour, which is from dried and mashed watermelon peels, then watermelon flour is used in experiments according to a predetermined formula. Watermelon peel is washed thoroughly, then thinly sliced and dried using *dehydrator* at 60°C for ± 9 -10 hours. If the watermelon peel has been ensured to be dry and not moist, the watermelon peel is then mashed using *Blender*, then filtered using a sieve to obtain fine grains of flour (Arivuchudar, 2023).

Making Nagasari Cake with Watermelon Peel Flour Substitution

Table 3. Recipes with substitution formulations

Composition	Treatment		
	173 (25%)	273 (50%)	371 (75%)
Rice flour (g)	42	28	14
Watermelon flour (g)	14	28	42
Tapioca flour (g)	19	19	19
Sleeping Time (g)	31	31	31
Thick coconut milk (g)	113	113	113
Air (g)	112	112	112
Salt (tsp)	1/4	1/4	1/4
Banana Peels (pcs)	1/2	1/2	1/2
Daun pendant (cm)	5	5	5
Banana Leaves	As needed	As needed	As needed
Total	333 gr	333 gr	333 gr

Source: (Panelist, 2025)

The elimination of sweetened condensed milk (SKM) is with the aim of improving the nutritional quality of nagasari cakes. SKM is a dairy product that contains high levels of lactose and sucrose, which has the potential to cause health problems (Fang et al., 2023). According to Estiasih and Ahmadi, recipe modification in food research, including substitution, can include replacing, reducing, or adding ingredients according to the goals to be achieved. In this case, the elimination of SKM aims to reduce the added sugar content and increase the fiber content.

How to make nagasari cake:

1. Prepare the dry ingredients and the wet ingredients in *different bowls*.



Figure 5. dry ingredients and the wet ingredients

2. In a *pan*, combine all the ingredients until dissolved and cook until the dough is solid.



Figure 6. Pan cook

3. Take banana leaves, add a little dough, flatten them. Place the banana slices, then cover with the dough.



Figure 7. dough

4. Fold the banana leaves with the nagasari packet and steam for 40 minutes over medium to high heat.



Figure 8. dough steam

RESULTS AND DISCUSSION



Figure 9. Nagasari Results with 3 Watermelon Peel Flour Substitution Formulas

The food product produced is a nagasari cake with a method of substituting some food ingredients using watermelon peel flour. This cake is usually made from a mixture of rice flour, tapioca flour, sugar, and coconut milk, has a sweet taste and has a chewy and soft texture (Irwan & Fatmawati, 2025). Judging from the raw materials used in making nagasari cakes, there are carbohydrates, proteins, fats, fiber, and also water content (Kusuma). The food ingredient that is substituted is rice flour which is considered to affect several aspects in the organoleptic test carried out after the food product experiment.

Organoleptic testing is a quality assessment method using human senses that includes sensory aspects such as color, aroma, taste, and texture. Organoleptic testing plays a role in ensuring that the product has sensory characteristics that suit market tastes while maintaining quality consistency.

Organoleptic tests include hedonic tests and hedonic quality tests. Hedonic test is a testing method that aims to determine the level of consumer liking or acceptance of a food product using a scale from "very disliked" to "very liked". According to Soekarto, hedonic quality test

is a test that evaluates the sensory quality of a certain product's attributes, with the original product as a reference (Galiñanes Plaza et al., 2022). Attributes tested such as color intensity, aroma strength, texture softness, or sweet level of flavor. The scales used are from "very pale" to "very intense" for color, or "very soft" to "very hard" for texture.

Table 4. Hedonic Test Table

No	Hedonic Scale	Numeric Scale
1	Very Like	5
2	Like	4
3	Quite Like	3
4	Dislike	2
5	Very Dislike	1

Source: (Wangiyana, I. G. A. S. & Triandini, 2022)

Table 5. Hedonic Quality Test Table

Aspect	Score	Evaluation	112	122	212	222	312	312
Color		Light Brown						
		Light Yellow						
		Brown						
		Dark Brown						
		Black						
Aroma		Not Fragrant						
		Faintly Smelly						
		Slightly Smelly						
		Smelly						
		Very Smelly						
Sweet Taste		Not Sweet						
		Slightly Sweet but Weak						
		Slightly Sweet						
		Sweet						
		Very Sweet						
Savory Taste		Not Savory						
		Slightly Savory but Weak						
		Slightly Savory						
		Savory						

Source: (Galuh, 2019)

This study was carried out on a small scale and aimed at finding out sensory properties or characteristics rather than substitution products, so organoleptic tests were carried out on 20 panelists with a composition of trained, semi-trained, and untrained panelists with an experimental design within-subject, where each panelist evaluated all three formulas. Trained panelists are selected to determine the intensity of the sensory character or overall quality of a meal, consisting of a small number of members, varying between 5 to 10 people (Jayoti Vidyapeeth Women's University, 2021). Trained panelists include lecturers of the Batam Campus Culinary Study Program Tourism Polytechnic, Half Chef from the Marriott Batam hotel, Pastry Chef of SMT School, as well as MSME actors who produce traditional cakes. Then 7 semi-trained panelists consisting of 7th semester Batam students Tourism Polytechnic. Then 6 untrained panelists were selected to represent from the consumer side which includes

the general public in Batam City.

The data obtained from the organoleptic test will be statistically analyzed using the Analysis of Variance (ANOVA) method to see if there is a difference at the level of 5% (0.05). If F is a table $\leq F$ is calculated, then it is followed by the Tukey Test.

Discussion

1. Aspect of the Color of Watermelon Skin Flour Nagasari Cake

Data analysis carried out on objects obtained the following data:

a. Hedonic Quality Test (Sensory Test)

Table 6. Average score of color aspect on watermelon peel flour nagasari cake

Sample	Panel			
	Trained	Semi-Trained	Untrained	Common
173	4	3,29	3,67	3,65
237	2,29	2,14	2,67	2,37
371	1,43	1,71	1,33	1,49

The results of the hedonic quality test can be concluded that sample 173 obtained the highest color score compared to other samples. The color difference in nagasari cake with watermelon peel flour substitution can be seen in the ANOVA test in table 6.

b. ANOVA Test

Table 7. ANOVA Color Cake Color Watermelon Skin Powder

ANOVA	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	46.900	2	23.450	30.310	0.000
Within Groups	44.100	57	0.774		
Total	91.000	59			

The results of the ANOVA test showed a difference in color. This can be seen from the significant level results of $0.000 < 0.05$, therefore the anova test is followed by the Tukey test to find out the difference between each ratio shown by table 8.

c. Post *hoc* test Tukey

Table 8. Taste of the Color of the Chocolate Chip Cake

Treatment	N	Subset for alpha = 0.05		
		1	2	3
75% Watermelon Skin Flour	20	1.50		
50% Watermelon Skin Flour	20		2.35	
25% Watermelon Skin Flour	20			3.65
Sig.		1.000	1.000	1.000

The results of Tukey's test in table 8 show that nagasari cake with watermelon peel flour substitution was declared to have a significant difference in each treatment. The onset of color is caused by the browning reaction or the maillard reaction. The intensity of this color also depends on the length of the frying temperature.

d. Hedonic Test (Preference Test)

Table 9. Hedonic test score of color aspect on watermelon peel flour nagasari cake

Sample	Panel			
	Trained	Semi-Trained	Untrained	Common
173	3,43	3,29	3,83	3,52
237	3,57	3,29	3,67	3,51
371	3,57	4,14	2,67	3,46

The table above shows in general the average likability score in the color aspect is in the range of 3.5 where the criteria range from likes to enough likes.

2. Aspects of the Aroma of Watermelon Skin Flour Nagasari Cake

a. Hedonic Quality Test (Sensory Test)

Table 10. Average score of aroma aspects on watermelon peel flour nagasari cake

Sample	Panel			
	Trained	Semi-Trained	Untrained	Common
173	4,57	4,86	4,33	4,59
237	4,43	4,29	4,00	4,24
371	4,43	4,29	4,00	4,24

The table above shows that the three samples had an average score of 4.35 with the criterion of watermelon aroma being less smelly. According to (Du et al., 2022) This can be caused by the nature of watermelon that is not *aromatic*. Processing or cooking techniques also affect evaporation so that it can cause different sensory properties (Zia et al., 2024). In this case, watermelon peel goes through 3 processes, namely, drying, cooking, and steaming, which is very possible for enzyme changes in the watermelon peel that make the aroma less or even not identifiable. The difference in aroma in nagasari cake with watermelon peel flour substitution can be seen in the ANOVA test in table 11.

b. Anova Test

Table 11. ANOVA Test Aroma of Watermelon Skin Flour Nagasari Cake

Aroma	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.633	2	0.817	0.925	0.402
Within Groups	50.300	57	0.882		
Total	51.933	59			

The results of the ANOVA test showed no difference in aroma. This can be seen from the results of the level, which is $0.402 > 0.05$, therefore the aroma in the 3 formulas was not found to have a significant difference. Therefore, the aroma aspect was not continued to *Tukey's* post hoc test.

c. Hedonic Test (Favorite)

Table 12. Hedonic test score of aroma aspect on watermelon peel flour nagasari cake

Sample	Panel			
	Trained	Semi-Trained	Untrained	Common
173	3,43	3,71	4,50	3,88

Sample	Panel			
	Trained	Semi-Trained	Untrained	Common
237	3,43	3,29	3,83	3,52
371	3,43	3,14	3,33	3,30

The hedonic test table above shows that in general the average score is in the range of 3.57 where the criteria range from likes to quite likes. However, the sample of 173 showed the highest average score, which reached 3.88 where the criteria were declared quite likeable.

3. Taste Aspects of Watermelon Skin Flour Nagasari Cake

a. Hedonic Quality Test (Sensory Test)

Table 13. Average score of taste aspects on watermelon peel flour nagasari cake

Sample	Panel			
	Trained	Semi-Trained	Untrained	Common
173	4,14	4,29	4,50	4,31
237	3,86	4,00	4,17	4,01
371	3,43	3,71	3,83	3,66

The average score of the hedonic quality test showed that the sample of 173 had the highest score. The difference in taste in watermelon peel flour nagasari cake can be seen in table 14.

b. ANOVA Test

Table 14. ANOVA Test the Taste of Watermelon Flour Nagasari Cake

Taste	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.233	2	2.417	5.303	0.008
Within Groups	22.750	57	0.399		
Total	26.983	59			

The results of the ANOVA test showed a significant difference between the 3 formulas, which can be seen from the results of the level of $0.008 < 0.05$. Therefore, the ANOVA test is continued with the Tukey test to find out the difference between each ratio shown by table 15.

c. Post Hoc Test Tukey

Table 15. Test the taste of the Nagasari Cake with Watermelon Skin Flour

Treatment	N	Subset for alpha = 0.05	
		1	2
375% Watermelon Skin Flour	20	3.65	
50% Watermelon Skin Flour	20	4.00	
25% Watermelon Skin Flour	20		4.30
Sig.		0.195	0.298

The results of the Tukey test in table 10 show that sample 371 has similar taste properties to sample 237 and sample 173 has similar taste properties to sample 237.

d. Hedonic Test (Preference Test)

Table 16. Hedonic test score of taste aspect on watermelon peel flour nagasari cake

Sample	Panel			
	Trained	Semi-Trained	Untrained	Common
173	3,86	4,29	4,67	4,27
237	3,86	3,86	4,17	3,96
371	3,14	3,57	3,50	3,40

From the hedonic test table above, it was concluded that for the taste aspect, sample 173 got a score with the criteria of quite like to very like.

4. Texture Aspects of Watermelon Skin Flour Nagasari Cake

a. Hedonic Quality Test (Sensory Test)

Table 17. Average score of texture aspects on watermelon peel flour nagasari cake

Sample	Panel			
	Trained	Semi-Trained	Untrained	Common
173	4,43	4,57	4	4,33
237	3,71	4	4	3,90
371	3	3	3,33	3,11

The results of the hedonic quality test showed that the average highest score was obtained in a sample of 173 compared to other samples. The difference in taste in this watermelon peel flour nagasari cake can be seen in the ANOVA test in table 10.

b. ANOVA Test

Table 18. ANOVA Test Texture of Watermelon Skin Flour Nagasari Cake

Texture	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	16.033	2	8.017	17.474	0.000
Within Groups	26.150	57	0.459		
Total	42.183	59			

The results of the ANOVA test showed a significant difference in the texture aspect where the result was $0.000 < 0.05$. Therefore, the ANOVA test is continued with the Tukey test to find out the difference between each ratio shown by table 19.

c. Post *Hoc* Test Tukey

Table 19. Test the texture of the Nagasari Watermelon Flour Cake

Treatment	N	Subset for alpha = 0.05	
		1	2
75% Watermelon Skin Flour	20	3.10	
50% Watermelon Skin Flour	20		3.90
25% Watermelon Skin Flour	20		4.35
Sig.		1.000	0.099

The results of Tukey's test in table 19 show that sample 173 has similar taste properties

to sample 237 and is different from sample 371.

d. Hedonic Test (Preference Test)

Table 20. Hedonic test score of taste aspect on watermelon peel flour nagasari cake

Sample	Panel			
	Trained	Semi-Trained	Untrained	Common
173	3,14	3,86	3,33	3,44
237	3,14	3,71	3,50	3,45
371	2,86	3,29	3,00	3,05

Based on the hedonic test table above, from the three samples for texture aspects in general, the average score was 3.31 with the criteria of liking.

CONCLUSION

The substitution of watermelon peel flour in traditional *nagasari* cakes can enhance nutritional value by increasing fiber content and antioxidant activity. The study found that higher substitution levels darkened the product's color due to the Maillard reaction between sugars and amino acids at high temperatures. There was no significant difference in aroma among the three formulas, as watermelon peel likely contributes minimally to scent and taste. Slight variations were observed in flavor, while texture differences were more notable, with sample 371 showing a softer consistency resulting from drying and grinding processes that influence flour characteristics such as water and oil absorption. Overall, panelists favored sample 173 for its close resemblance to the original *nagasari* in sensory qualities. The product's durability remained comparable to traditional *nagasari*, lasting about one week in the freezer and two to three days in the refrigerator. Future research should explore optimizing processing techniques to improve texture consistency and assess the nutritional and antioxidant retention during storage.

REFERENCES

- ALbahrani, I., El-Beltagi, H., Hegras, M., Ahmed, A., Taha, H., Elkatary, H., Al Akkad, H., Farag, H., Osman, A., & El-Khateeb, A. (2025). Hydrocolloids Impact On Rheological Properties Of Watermelon Peel Flour And Baladi Bread Wheat Flour. *Journal of Microbiology, Biotechnology and Food Sciences*, e12466–e12466.
- Almualimah, V. A., Nafiah, P. B., & Susanti, D. (2024). *Calisa (Cake Kulit Semangka): Pemanfaatan Limbah Dalam Inovasi Produk Pangan Yang Tinggi Serat, Kalium, dan Antioksidan. 1*.
- Amzeri, A., Badami, K., Gita, P., Syah, M. A., & Daryono, B. S. (2021). Phenotypic and genetic diversity of watermelon (*Citrullus lanatus*) in East Java, Indonesia. *Biodiversitas Journal of Biological Diversity*, 22(11).
- Arivuchudar, R. (2023). Nutritional and Sensory Characterization of Watermelon Rind Powder Incorporated Crackers. *Biosciences Biotechnology Research Asia*, 20(1), 263–269. <https://doi.org/10.13005/bbra/3087>
- Ashoka, S., Shamshad Begum, S., & Vijayalaxmi, K. G. (2021). Byproduct utilization of watermelon to develop watermelon rind flour based cookies. *The Pharma Innovation Journal*, 10(2), 196–199.

- Badan Pusat Statistik. (2025). Produksi Tanaman Buah–Buahan dan Sayuran Tahunan Menurut Jenis Tanaman, 2024. In *Badan Pusat Statistik*.
- Capossio, J. P., Fabani, M. P., Román, M. C., Zhang, X., Baeyens, J., Rodriguez, R., & Mazza, G. (2022). Zero-Waste Watermelon Production through Nontraditional Rind Flour: Multiobjective Optimization of the Fabrication Process. *Processes*, 10(10). <https://doi.org/10.3390/pr10101984>
- Cataluna, T., & Wardana, A. A. (2025). Quality Improvement of Indonesian Traditional Cake Products: A Systematic Review. *IOP Conference Series: Earth and Environmental Science*, 1488(1), 12104.
- Ciappei, C., Liberatore, G., & Manetti, G. (2023). A systematic literature review of studies on women at the top of firm hierarchies: critique, gap analysis and future research directions. *Sustainability Accounting, Management and Policy Journal*, 14(7), 202–231.
- Cifelli, C. J., Auestad, N., & Fulgoni III, V. L. (2022). Replacing the nutrients in dairy foods with non-dairy foods will increase cost, energy intake and require large amounts of food: National Health and Nutrition Examination Survey 2011–2014. *Public Health Nutrition*, 25(2), 332–343.
- Du, X., Davila, M., Ramirez, J., & Williams, C. (2022). Free Amino Acids and Volatile Aroma Compounds in Watermelon Rind, Flesh, and Three Rind-Flesh Juices. *Molecules*, 27(8). <https://doi.org/10.3390/molecules27082536>
- Dube, J., Ddamulira, G., & Maphosa, M. (2021). Watermelon production in Africa: challenges and opportunities. *International Journal of Vegetable Science*, 27(3), 211–219.
- Fang, R., Jiang, H., Lin, C., Xia, T., Xu, S., Chen, Q., & Xiao, G. (2023). Characterization and shelf stability of sweetened condensed milk formulated with different sucrose substitutes during storage. In *Food Chemistry* (Vol. 404). <https://doi.org/10.1016/j.foodchem.2022.134402>
- Galeri Rasa, C. (2022). Rudy Choirudin | Kue Olahan Pisang Anti Gagal ~ Resep Nagasari - YouTube.
- Galiñanes Plaza, A., Saulais, L., & Delarue, J. (2022). Hedonic response sensitivity to variations in the evaluation task and culinary preparation in a natural consumption context. *Frontiers in Nutrition*, 9. <https://doi.org/10.3389/fnut.2022.1008577>
- Galuh, K. (2019). *Form Mutu Hedonik*.
- Hadiza Buan, A., & Farida, E. (2024). Formulasi Cookies Tepung Kulit Semangka Sebagai Alternatif Makanan Selingan Bagi Penderita Hipertensi. *Ijphn*, 4(1), 9–17.
- Haryati, I. S., Eriza, N. S. P. M. S., Simbolon, H. S. . M. S., Tama, Y. C. P. S. ., Yuliasuti, E. R. S. . M. ., Krisna, D. E., Sudiaz, R. S. ., Apriyadi, T. E. S. T. . M. ., Baroroh, R. A. A. M., & Wijaya, R. S. . (2022). Buku Pedoman Budidaya Semangka. *Direktorat Jenderal Hortikultura Kementerian Pertanian*.
- Ibsen, D. B., Laursen, A. S. D., Würtz, A. M. L., Dahm, C. C., Rimm, E. B., Parner, E. T., Overvad, K., & Jakobsen, M. U. (2021). Food substitution models for nutritional epidemiology. *The American Journal of Clinical Nutrition*, 113(2), 294–303.
- Irwan, & Fatmawati, I. (2025). *Nagasari, Kue Tradisional dengan Sentuhan Pisang yang Manis*.
- Jayoti Vidyapeeth Women's University. (2021). *Handbook On Sensory Evaluation*.
- Kataria, D., & Kaur, J. (2023). From waste to wellness: exploring the nutritional composition,

- health benefits and utilization of watermelon rind. *J Food Chem Nanotechnol*, 14, 9.
- Lutfiani, R. (2023). *Analisis Komparatif Usahatani Semangka (Citrullus Lanatus) Panen Buah Dan Panen Benih Di Kabupaten Jember*.
- Maoto, M. M., Beswa, D., & Jideani, A. I. O. (2019). Watermelon as a potential fruit snack. *International Journal of Food Properties*, 22(1), 355–370.
- Mazmanyany, V. (2023). *Watermelon nutrition: glycemic index, calories, net carbs, diets*.
- Molina, T., Zhang, L., Nishimura, T., Johansen, S., Buenaventura, K., Wickstrom, C., & Hong, M. Y. (2023). Effects of blenderized watermelon with the rind on satiety, postprandial glucose, and bowel movement, with sensory evaluation. *Human Nutrition and Metabolism*, 34(November), 200223. <https://doi.org/10.1016/j.hnm.2023.200223>
- Murtini, E. S., Yuwono, S. S., Setyawan, H. Y., & Nadzifah, N. (2020). Pandan leaf powder: characteristics and its application in Pandan sponge cake making. *IOP Conference Series: Earth and Environmental Science*, 475(1), 12041.
- Nadeem, M., Navida, M., Ameer, K., Siddique, F., Iqbal, A., Malik, F., Ranjha, M. M. A. N., Yasmin, Z., Kanwal, R., & Javaria, S. (2022). Watermelon nutrition profile, antioxidant activity, and processing. *Food Science and Preservation*, 29(4), 531–545.
- Niamah, A. (2023). *Pemanfaatan Limbah Kulit Semangka Menjadi Produk Olahan Teh Cilla Sumber Antioksidan Alami Dan Kalium Dengan Penambahan Bunga Melati*.
- Wangiyana, I. G. A. S. & Triandini, I. G. A. A. H. (2022). Uji hedonik teh herbal daun tanaman pohon menggunakan berbagai pendekatan statistik. *Journal of Agritechnology and Food Processing*, 2(2), 43–53.
- Zia, H., Slatnar, A., Košmerl, T., & Korošec, M. (2024). A review study on the effects of thermal and non-thermal processing techniques on the sensory properties of fruit juices and beverages. *Frontiers in Food Science and Technology*, 4(August), 1–23. <https://doi.org/10.3389/frfst.2024.1405384>



© 2021 by the authors. Submitted for possible open access publication under the terms and conditions of the Creative Commons Attribution (CC BY SA) license (<https://creativecommons.org/licenses/by-sa/4.0/>).