JPPIPA 9(Special Issue) (2023)

Jurnal Penelitian Pendidikan IPA

Journal of Research in Science Education

http://jppipa.unram.ac.id/index.php/jppipa/index

The Effect of the Addition of Guava Leaf Extract (*Psidium guajava* L.) to Coconut Milk Yoghurt (Niyoghurt) as A Functional Food

Hotnida Sinaga[1*], Dwi Suryanto[2], Raihan Dary[1]

[1] Department of Food Technology, University of Sumatera Utara, Medan, Indonesia.
[2] Department of Biology, University of Sumatera Utara, Medan, Indonesia.

Received: October 25, 2023
Revised: November 30, 2023
Accepted: December 25, 2023
Published: December 31, 2023

Corresponding Author:
Hotnida Sinaga
Hotnida.sinaga@uq.net.au

DOI: 10.29303/jppipa.v9iSpecialIssue.6261

Abstract: Niyoghurt is yoghurt made from coconut milk. Coconut milk has a creamier, softer texture, and provides a distinctive taste compared to cow's milk. Guava leaf contain a flavonoid compound, quercetin, which is antibacterial. This study aimed to evaluate the effect of the addition of guava leaf extract (*Psidium guajava* L.) to coconut milk yoghurt (niyoghurt) as a functional food. This study aimed to identify the water content, ash content, fat content, protein content, pH, total lactic acid, antioxidant activities, and hedonic color, flavor, taste, and texture from two types guava leaves (guava leaf and crystal guava leaf) and different concentration of extract (3%, 4%, and 5%). The results of the study showed that types of guava leaves had very significantly effects (P<0.01) on protein content, total lactic acid, hedonic color, texture and taste. The concentration of guava leaf extract had a very significantly effect (P<0.01) on fat content, protein content, total lactic acid, antioxidants, hedonic color, aroma, texture and taste, but did not have a significantly effect (P>0.05) on water content and ash content. The interaction between the type and concentration of guava leaf extract had a very significantly effect (P<0.01) on the hedonic color, texture, aroma and taste.

Keywords: Coconut Milk; Guava leaf extract; Niyoghurt

Introduction

Yoghurt is a milk product that has gone through a fermentation proess with the addition of starter from good organisms, namely Lactobacillus bulgaricus and Streptococcus thermophilus (Routray & Mishra, 2011). Making yoghurt consists of preparing ingredients, preparing starter, pasteurizing milk, inoculating milk with starter, incubating (fermentation) (Jannah et al., 2014). The composition of yoghurt is 4-6% protein, 0.1-1% fat, 2-3% lactose, 0.6-1.3% lactic acid, pH 3.8-4.6 (Susilorini & Sawitri, 2007). Yoghurt can be beneficial for lactose intolerant sufferers, fighting the growth of pathogenic bacteria, reducing cancer or tumors in the digestive tract, lowering cholesterol levels, maintaining stomach health, and preventing digestivetract cancer (Mauliana et al., 2011). Yoghurt doesn't only come from cow's milk, but can be made from vegetable sources, one of which is from coconut milk that called niyoghurt.

Coconut milk is an alternative substitute for animal fat and cow's milk for lactose intolerant sufferers because it contains lauric acid (Kumolontang, 2015). Coconut milk contains lauric acid which has antibacterial properties, which helps keep the arteries and liver clean so it can benefit the heart. Coconut milk is antibacterial so it can kill bad bacteria from the stomach which can cause poor food digestion. Coconut milk has a high fat content, so it gives a savory taste to food products (Cahyono & Yuwono, 2015).

Guava leaf have a very high flavonoid content, especially quercetin. This compound is useful as an antibacterial. Other ingredients in guava leaf include

How to Cite:
Sinaga, H., Suryanto, D., & Dary, R. (2023). The Effect of the Addition of Guava Leaf Extract (Psidium guajava L.) to Coconut Milk Yoghurt (Niyoghurt) as A Functional Food. *Jurnal Penelitian Pendidikan IPA*, *9*(SpecialIssue), 585–591. https://doi.org/10.29303/jppipa.v9iSpecialIssue.6261

saponins, essential oils, tannins, anti-mutagenics, flavonoids and alkaloids (Hasniarti, 2012). Previous research (Rahman et al., 2022) shows that guava leaf extract (psidium guajava) can inhibit the growth of Serratia marcescens bacteria at a minimum concentration of 15%.

Based on data of the great potential of guava leaf and coconut milk, researchers are interested in conducting research with the title The Effect of the Addition of Guava Leaf Extract (*Psidium guajava* L.) to Coconut Milk Yoghurt (Niyoghurt) as A Functional Food, as seen from its physichochemical and sensory characteristics.

Method

The materials and tools used in this study were coconut milk, powdered skim milk, guava leaves, starter (Lactobacillus bulgaricus and Streptococcus thermophilus), and sugar. The tools used in this study included a water bath, thermometer, soft incubator (Eyela SLI 450 N), digital scales, low temperatur incubator (Eyela LTI-600SD), soxhlet extraction tube, and refrigerator.

Procedure for Making Niyoghurt

1) Guava leaf extraction

This study used two types of leaves, guava leaves and crystal guava leaves. Guava leaves were dried in place not exposed to sunlight. Simplicia guava leaves were crushed and weighed 500 g. Add 5 L of 70% ethanol for maceration. The maceration was 2 x 24 hours. Filtered and remaceration. The filtrate was evaporated using a rotary evaporator at 40°C to produce extract.

2) Making niyoghurt

100 ml coconut milk was added with 121.56 g and 234.23 g of sugar (according to standard solid non fat calculations). Pasteurized at 70°C for 15 minutes, then lowered the temperature to 45°C. Added 3% starter (Lactobacillus bulgaricus and Streptococcus thermophilus with a ratio of 1:1). Incubated at temperature 43°C for 7 hours. Variations of guava leaves extract were added (J_1= guava leaves; J_2= crystal guava leaves) with variations of concentrations (K_1= 3%, K_2= 4%, and K_3= 5%).

Analysis

The parameters analyzed were water content (Wulandari, 2017), ash content (AOAC, 2012), fat content (AOAC, 2012), protein content, pH, total lactic acid, antioxidant activities (Mastura, et al. 2019), and sensory analysis used a hedonic rating test 1-5 (very dislike, do not like, neutral, like, really like).

Result and Discussion

Water Content

Figure 1 showed that the water content of guava leaf extract niyoghurt was between 76.00%-78.33%. The highest water content was 78.33%, niyogurt with the addition of 3% crystal guava leaf extract and the lowest was 76.33%, niyoghurt with the addition of 5% guava leaf extract.

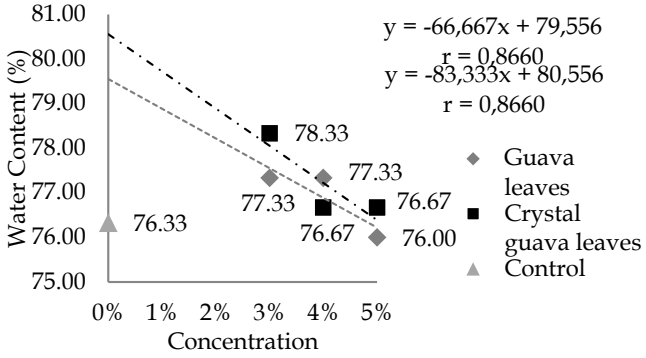

Figure 1. The effect of the addition guava leaf extract on water content

The results of this study showed that types of leaves, concentration, and their interactions did not have a significantlly effect (P>0.05) on water content. According to (Kuntom & Hadi, 2019) adding extracts to a product didn't add water content, because extracts generally do not or only contain a small amount of water. The water content in dairy products such as yoghurt can be influenced by other factors such as product consistency, processing temperature, and product manufacturing process.

Ash Content

Figure 2 showed that the ash content of guava leaf extract niyoghurt was between 0.57%-0.83%. The highest ash content was 0,83%, niyogurt with the addition of 5% guava leaf extract and the lowest was 0,57%, niyoghurt with the addition of 3% crystal guava leaf extract.

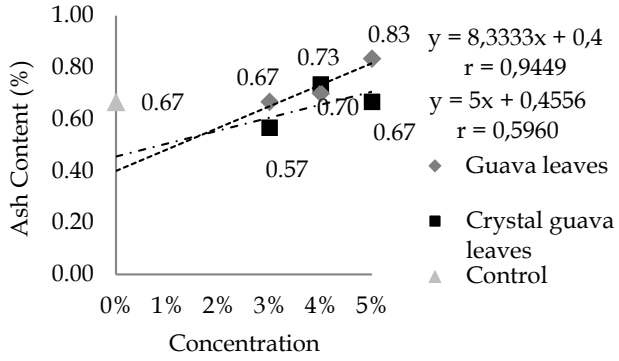

Figure 2. The effect of the addition guava leaf extract on ash content

The results of this study showed that types of leaves, concentration, and their interactions did not have a significantly effect (P>0.05) on ash content. The research results of (Zulharmita & Rivai, 2013) showed that the addition of guava leaf extract often does not affect the ash content value of a product, this is because basically the ash content of guava leaf extract is low.
Based on the results of the study, the ash content of niyoghurt that has been addes with extract was included in the small category. Ash content can be used to evaluate the nutritional value of food ingredients and shows the total mineral that can be toxic contained in the material where the higher the ash content, the worse the quality of the food ingredients (Tahar et al., 2017).

Fat Content

Figure 3 showed that the fat content of guava leaf extract niyoghurt was between 3.17-3.80%. The highest fat content was 4.53%, niyogurt without the addition of guava leaf extract (control) and the lowest was 3.17%, niyoghurt with the addition of 5% guava leaf extract.

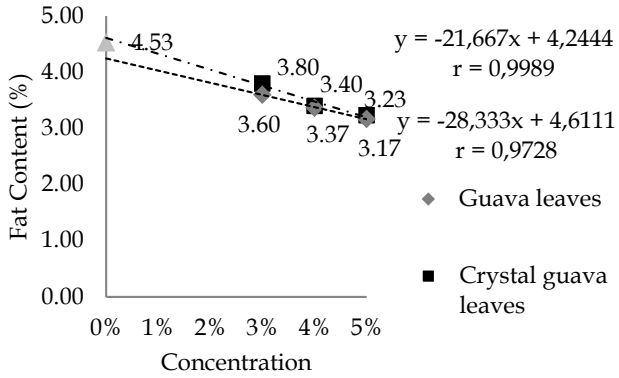

Figure 3. The effect of the addition guava leaf extract on fat content

The results of this study showed that the types of leaves had significant effect (P<0.05) on fat content. The concentration had very significant effect (P<0.01) on fat content. The interaction between the two did not have significantly effect (P>0.05) on fat content. The highest the concentration of guava leaf extract added, the lower the fat content in niyoghurt. The research results of (Fitriyah et al., 2022) showed that the higher the concentration of guava leaf extract added to the tiramisu chocolate formulation, the lower the fat content. Generally, niyoghurt has a higher fat content than other yoghurt because the coconut milk used in the fermentation process has a higher fat content than milk. 100 ml of coconut milk contains 34.3 g of fat, while 100 ml of milk contains 8 g of fat. Therefore, the addition of guava leaf extract is very effective to be added to fermented coconut milk.

Protein Content

Figure 4 showed that the protein content of guava leaf extract niyoghurt was between 3.30-4.13%. The highest protein content was 4.13%, niyogurt with the addition of 5% guava leaf extract and the lowest was 3.17%, niyoghurt without the addition of guava leaf extract.

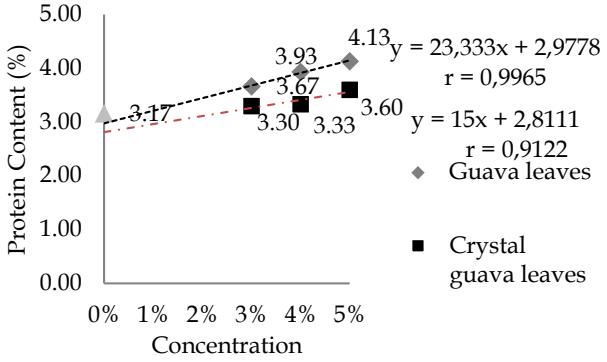

Figure 4. The effect of the addition guava leaf extract on protein content

The results of this study showed that the types and concentration of guava leaf extract had very significantly effect (P<0,01) on protein content. The interaction between the two did not have significantly effect (P>0,05) on protein content. The higher the concentration of guava leaf extract added, the higher the protein content. This is caused by the protein content in guava leaves. The research results of (Sylvia et al., 2021) showed that the guava leaves themselves contain protein, where the protein in old guava leaves is higher than in young guava leaves.

pH

Figure 5 showed that pH of guava leaf extract niyoghurt was between 4.10-4.43. The lowest pH was 4.10, niyogurt with the addition of 5% guava leaf extract and the highest was 4.43, niyoghurt with the addition of 3% crystal guava leaf extract.

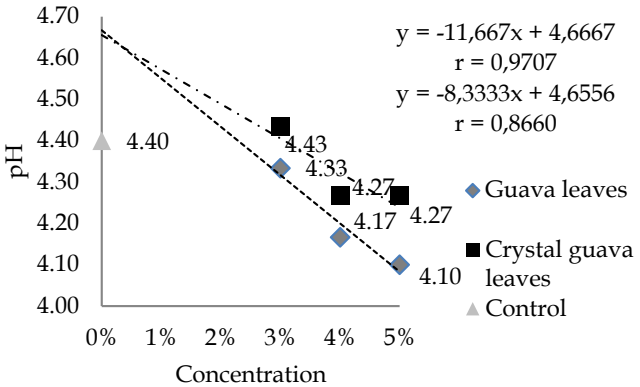

Figure 5. The effect of the addition guava leaf extract on pH

The results of this study showed that the types of leaves did not have significantly effect (P>0,05) on pH. The concentration had significant effect (P<0.05) on pH. The interaction between the two did not have significantly effect (P>0,05) on pH. The addition of guava leaf extract can increase the activity of lactic acid bacteria, so that the amount of acid formed also increases. The more acid that is formed results in a decrease in the pH value. (Food standards Australia New Zealand, 2016) stated that good yoghurt pH has a value ranging from 3.80 -4.50. This standard aims to ensure the quality and safety of yoghurt products produced in accordance with established standards. The results of this study showed that pH of niyoghurt with guava leaf extract was included in the good standard.

Total Lactic Acid

Figure 6 showed that total lactic acid of guava leaf extract niyoghurt was between 1.28-1.98. The lowest total lactic acid was 1.28, niyogurt with the addition of 3% guava leaf extract and the highest was 1.98%, niyoghurt with the addition of 5% guava leaf extract.

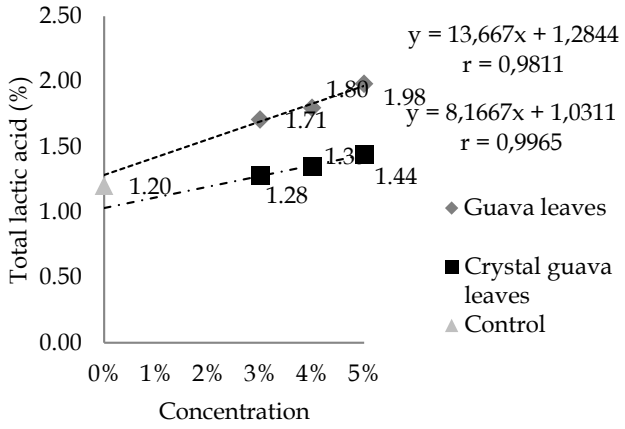

Figure 6. The effect of the addition guava leaf extract on total lactic acid

The results of this study showed that the types and concentration of guava leaf extract had very significantly effect (P<0,01) on total lactic acid. The interaction between the two did not have significantly effect (P>0,05) on total lactic acid. The higher the addition of guava leaf extract, the total lactic acid also increases. It is suspected that this increase was due to the availability of nutrients in the growth medium, in this case a mixture of raw materials and guava leaf extract. The more extract available, the more substrate available to be broken down by lactic acid bacteria into pyruvic acid which is then converted into organic acids. Apart from being converted into organic compounds, the extract is also used by lactic acid bacteria to produce energy which is used for cell proliferation.

Antioxidant activities

Figure 7 showed that antioxidant activities of guava leaf extract niyoghurt was between 39.76-46.93. The highest antioxidant activities was 81.05 ppm, niyogurt without the addition of guava leaf extract and the lowest was 39.76 ppm, niyoghurt with the addition of 5% guava leaf extract.

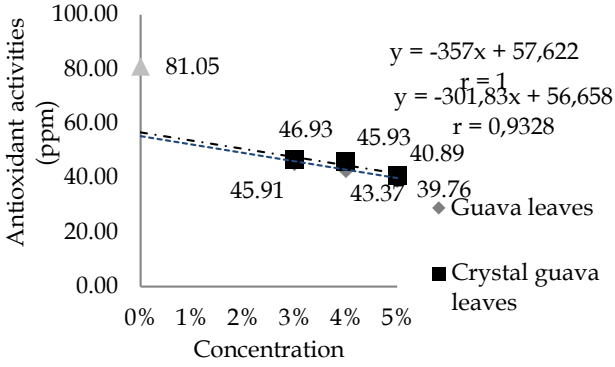

Figure 7. The effect of the addition guava leaf extract on antioxidant activities

The results of this study showed that the types of leaves had significantly effect (P<0.05) on antioxidant activities. The concentration had very significantly effect (P<0.01) on antioxidant activities. The interaction between the two did not have significantly effect (P>0.05) on antioxodant activities The higher the concentration of added guava leaf extract, the higher the antioxidant activities. The antioxidant activites with the addition of guava leaf extract was higher than crystal guava leaf extract and the control. According to (Naseer et al., 2018), phenolic compounds play a greater role in increasing antioxidant activity in guava than flavonoid compounds. This high level of antioxidants may make yoghurt added with guava leaf extract a potential functional beverage.

Hedonic Test

Color

Figure 8. showed that the color hedonic of guava leaf extract niyoghurt was between 3.61-3.89. The highest score was 3.89, niyogurt with the addition of 5% crystal guava leaf extract and the lowest was 3.61, niyoghurt with the addition of 4% guava leaf extract.

The results of this study showed that types of leaves, concentration, and their interactions had very significantly effect (P<0.01) on color hedonic. Panelists preferred niyoghurt with the addition of 5% crystal guava leaf extract compared to other niyoghurts. The results study by (Kwak & Park, 2016) showed that color influences consumers' preferences for fermented milk products.

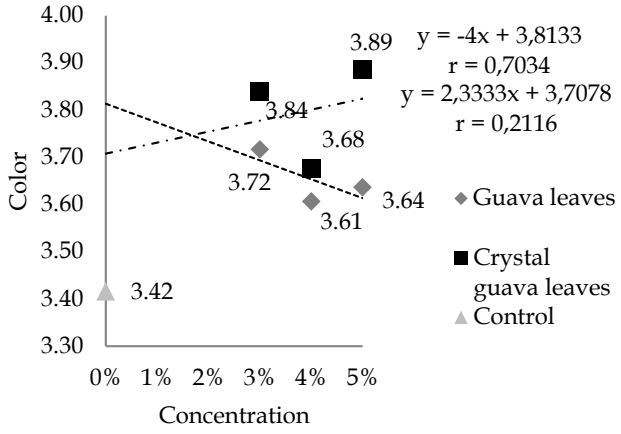

Figure 8. The effect of the addition guava leaf extract on color

Flavor

Figure 9 showed that the aroma of guava leaf extract niyoghurt was between 3.63-4.04. The highest score was 4.04, niyogurt with the addition of 5% crystal guava leaf extract and the lowest was 3.63, niyoghurt with the addition of 3% crystal guava leaf extract.

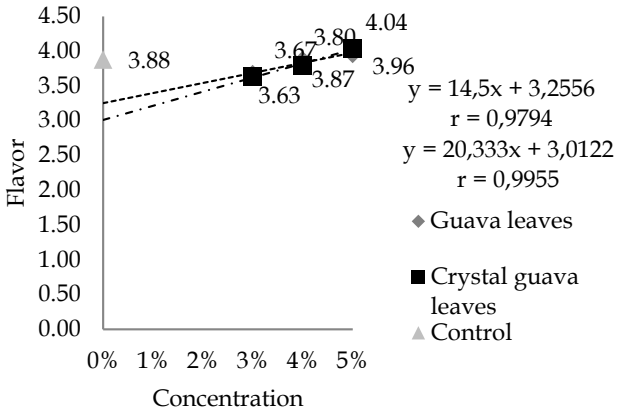

Figure 9. The effect of the addition guava leaf extract on flavor

The results of this study showed that the types of leaves did not have significantly effect (P>0.05) on flavor. The concentration had very significantly effect (P<0.01) on flavor. The interaction between the two had very significantly effect (P<0.01) on flavor. The distinctive aroma of guava leaves that occurs naturally in the product can attract panelists' interest. This is supported by the results of research (Wulansari, 2020) which examined the formulation of guava leaves on the physicochemical and organoleptic characteristics of pindang eggs, where the results of the research showed that the higher the guava leaf formulation added, the more the panelists liked the aroma of pindang eggs with the criteria "very aromatic." guava leaves" with the addition of 80 g of guava leaves.

Taste

Figure 10 showed that the taste of guava leaf extract niyoghurt was between 3.00-3.68. The highest score was 3.72, niyogurt without the addition of guava leaf extract and the lowest was 3.00, niyoghurt with the addition of 5% crystal guava leaf extract.

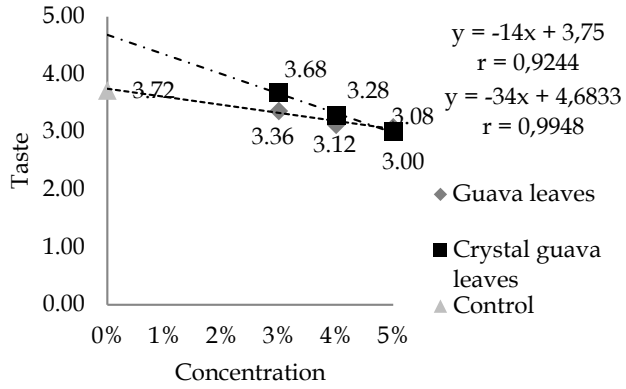

Figure 10. The effect of the addition guava leaf extract on taste

The results of this study showed that types of leaves, concentration, and their interactions had very significantly effect (P<0.01) on taste. The addition of guava leaf extract tends to reduce consumen preference for the taste of the product, this is because of the bitter taste produced by the extract. This is in accordance with research conducted by (Fitriyah et al., 2022) who conducted research on the use of guava leaf extract as a food additive in making tiramisu chocolate candy. Where the results of this study showed that the panelists' liking level decreased with increasing concentration of guava leaf extract added to tiramisu chocolate.

Texture

Figure 11 showed that the texture of guava leaf extract niyoghurt was between 2.82-3.41. The highest score was 3.41, niyogurt with the addition of 3% crystal guava leaf extract and the lowest was 2.82, niyoghurt with the addition of 5% crystal guava leaf extract.

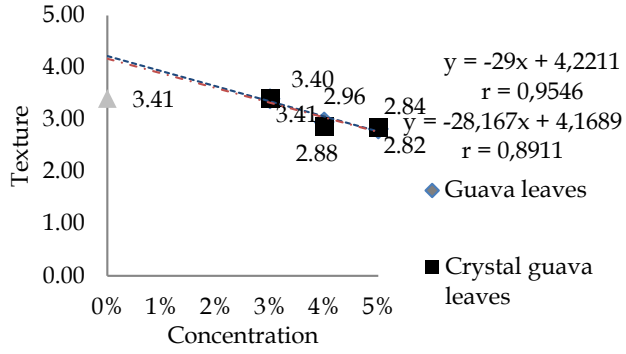

Figure 11. The effect of the addition guava leaf extract on texture

The results of this study showed that types of leaves, concentration, and their interactions had very significantly effect (P<0.01) on taste. The more extracts added, the less the panelists liked the niyoghurt texture. The more extracts added, the greater the viscosity value. This was due to the use of guava leaf extract which consits of dissolved fine particles so that it can increase the viscosity value of the resulting mouthwash. This is in accordance with the results of research by (Setianto et al., 2016) which tested the effect of viscosity on the organoleptic test of the texture of Pondoh salak extract yoghurt. Where the results obtained if the viscosity of the yoghurt is higher, the panelists' acceptance of yoghurt will decrease.

Conclusion

Types of guava leaves had very significantly effects on protein content, total lactic acid, hedonic color, texture and taste. The concentration of guava leaf extract had a very significantly effect on fat content, protein content, total lactic acid, antioxidants, hedonic color, aroma, texture and taste, but did not have a significantly effect on water content and ash content. The interaction between the type and concentration of guava leaf extract had a very significantly effect on the hedonic color, texture, aroma and taste and a significantly different effect on protein content.

The more concentration of guava leaf extract that is added, the lower the water content, fat content, pH, value of niyogurt, organoleptic taste and texture, but the protein, ash, antioxidant activity and total lactic acid levels become higher as the extract is added.

Acknowledgments

Thanks to all parties who have supported the implementation of this research.

Author Contributions

The authors listed in this article, have read and agreeto the published version of the manuscript.

Funding

This research received no external funding

Conflicts of Interest

The authors declare no conflict of interest

References

Cahyono, M. A., & Yuwono, S. S. (2015). Pengaruh proporsi santan dan lama pemanasan terhadap sifat fisiko kimia dan organoleptik bumbu gado gado instan. *Jurnal Pangan Dan Agroindustri*, *3*(3), 1095–1106. https://jpa.ub.ac.id/index.php/jpa/article/view/232

Fitriyah, T. A., Setiawan, H. S., Halik, A., Baharuddin, Utami, R. R., & Afriyanto, M. M. (2022). Pemanfaatan ekstrak daun jambu biji (Psidium guajava L) sebagai bahan tambahan pada permen coklat tiramisu. *Jurnal Industri Hasil Perkebunan*, *17*(1), 1–12. http://ejournal.kemenperin.go.id/bbihp/article/view/7685/5935

Food standards Australia New Zealand. (2016). *Compendium of microbioligcal criteria for food*. Food Standards Australia New Zealand (FSANZ).

Hasniarti. (2012). *Studi Pembuatan Permen Buah Dengan (Dillenia serrata Thumb.)* [Script]. Universitas Hasanuddin.

Jannah, A. M., Legowo, A. M., Pramono, Y. B., Al-Baarri, A. N., & Abduh, S. B. M. (2014). Total bakteri asam laktat, pH, keasaman, citarasa dan kesukaan yoghurt drink dengan penambahan ekstrak buah belimbing. *Jurnal Aplikasi Teknologi Pangan*, *3*(2), 7–11. https://jatp.ift.or.id/index.php/jatp/article/view/36/15

Kumolontang, N. (2015). Pengaruh Penggunaan Santan Kelapa Dan Lama Penyimpanan Terhadap Kualitas "Cookies Santang." *Jurnal Penelitian Teknologi Industri*, *7*(2), 69–79. https://media.neliti.com/media/publications/286040-pengaruh-penggunaan-santan-kelapa-dan-la-5bde973c.pdf

Kuntom, A., & Hadi, H. (2019). Pengaruh penambahan ekstrak teh hijau terhadap sifat fisikokimia es krim. *Jurnal Ilmu Dan Teknologi Pangan*, *7*(2), 43–50. https://journal.unpak.ac.id/index.php/fitofarmaka/article/view/167

Kwak, H. S., & Park, H. J. (2016). Effects of color on consumer preferences for dairy beverages. *Journal of Food Quality*, *39*(5), 438–445.

Mauliana, I., Yunita, D., Rohaya, S., & El Husna, N. (2011). Pembuatan niyogurt dengan perbedaan perbandingan Streptococcus thermophilus dan Lactobacillus bulgaricus serta perubahan mutunya selama penyimpanan. *Jurnal Teknologi Pertanian*, *12*(2), 83–90. https://www.jtp.ub.ac.id/index.php/jtp/article/view/335/423

Naseer, S., Hussain, S., Naeem, N., Pervaiz, M., & Rahman, M. (2018). The phytochemistry and medicinal value of Psidium guajava (guava). *Clinical Phytoscience*, *4*(32), 1–8. https://clinphytoscience.springeropen.com/articles/10.1186/s40816-018-0093-8

Rahman, I. S., Fadlilah, R. N., Ka'bah, Kristiana, H. N., & Ayusti, D. (2022). Potensi ekstrak daun jambu biji

(psidium guajava L) dalam menghambat pertumbuhan Serratia marcescens. *Jurnal Ilmu Alam Dan Lingkungan*, *13*(1), 14–22. https://journal.unhas.ac.id/index.php/jai2/article/view/20452

Routray, W., & Mishra, H. N. (2011). Scientific and Technical Aspects of Yogurt Aroma and Taste: A Review. *Comprehensive Reviews in Food Science and Food Safety*, *10*(4), 208–220. https://doi.org/10.1111/j.1541-4337.2011.00151.x

Setianto, Y. C., Pramono, Y. B., & Mulyani, S. (2016). Nilai pH, viskositas, dan tekstur yoghurt drink dengan penambahan ekstrak salak pondoh (Salacca zalacca). *Jurnal Aplikasi Teknologi Pangan*, *3*(3). https://jatp.ift.or.id/index.php/jatp/article/view/93

Susilorini, T. E., & Sawitri, M. E. (2007). *Produk Olahan Susu*. Penebar Swadaya.

Sylvia, D., Apriliana, V., & Rasydy, A. L. O. (2021). Analisis kandungan protein yang terdapat dalam daun jambu biji (psidium guajava L) menggunakan metode kjedahl dan spektrofotometri Uv-Vis. *Jurnal Farmagazine*, *3*(2). https://www.neliti.com/id/publications/455332/analisis-kandungan-protein-yang-terdapat-dalam-daun-jambu-biji-psidium-guajava-l

Tahar, N., Fitrah, M., & David, N. A. (2017). Penentuan kadar protein daging ikan terbang (Hyrundicthys oxycephalus) sebagai substitusi tepung dalam formulasi biskuit. *Jurnal Farmasi*, *5*(36), 251–257.

Wulansari, S. (2020). *Formulasi daun jambu biji (Psidium guajava l) terhadap karakteristik fisikokimia dan organoleptik telur pindang* [Script]. Universitas Semarang.

Zulharmita, K. U., & Rivai, H. (2013). Pembuatan dan karakterisasi ekstrak kering daun jambu biji (psidium guajava L.). *Jurnal Farmasi Higea*, *5*(1). https://www.jurnalfarmasihigea.org/index.php/higea/article/view/70/67