Journal of Global Nutrition (JGN)
Volume 3 No 1 (2023) April: page 223 – 235
ISSN: 2776-7051
Published by *Ikatan Sarjana Gizi Indonesia (ISAGI)* – The Indonesian Nutrition Scholars Association

Original Research

Effect on Organoleptic Properties, pH Value, and Vitamin C Levels of Guava (*Psidium guajava)* Addition in Cowpea Yogurt (*Vigna unguiculata*)

Pengaruh Penambahan Jambu Biji (Psidium Guajava) Terhadap Mutu Organoleptik, Nilai pH, dan Kadar Vitamin C pada Yoghurt Kacang Tunggak (Vigna Unguiculata)

Chynthia Regina Wijaya[1], Diyan Yunanto Setyaji[1*], Rijantono Franciscus Maria[1]
[1]Nutrition Bachelor Department, Sekolah Tinggi Ilmu Kesehatan Panti Rapih Yogyakarta, Yogyakarta, Indonesia

* Email corresponding author: diyansetyaji@stikespantirapih.ac.id

Abstract: *Yogurt is a great source of probiotics and is claimed to be a healthy dietary supplement. Yogurt is usually made from animal sources. This study used yogurt made from vegetable protein sources such as cowpea. Cowpea is rich in protein but low in vitamin C. Guava is added to yogurt as a source of vitamin C.* ***Objectives:*** *This study aims to determine the effect of adding guava juice on organoleptic properties including color, taste, texture, aroma, after taste, and overall preference, pH value, and vitamin C of cowpea yogurt.* ***Methods:*** *Experimental research was conducted with a completely randomized design (CRD) in the control sample group (P0) and three sampels with the addition of guava 10% (P1), 20% (P2), and 30% (P3). Organoleptic properties were analyzed by Friedman test and continued by Wilcoxon test. The pH and vitamin C values were analyzed descriptively.* ***Results:*** *The results showed that the highest scores for the color and taste parameters were obtained from the group with the addition of 30% guava with a score of 4.43±0.68 and 3.80±0.81 respectively. The highest score for the aroma parameter of 3.63±0.89 was obtained from the group with the addition of 20% guava. The group with the addition of 30% guava got the highest score for the overall preference parameter with a score of 3.67±1.06. Each sample group has a texture and aftertaste that is not statistically significant.* ***Conclusion:*** *The increase in giving guava to cowpea yogurt caused the pH value to decrease, the acidity level to increase, and vitamin C levels to decrease. It can be concluded that the addition of guava affects the parameters of color, taste, aroma, overall preference, lowers the pH value, but does not affect the parameters of texture, after taste, and does not increase the vitamin C content of cowpea yogurt.*

Keywords: cowpea yogurt, guava, organoleptic properties, pH value, vitamin C

1. INTRODUCTION

Yogurt is one of the most widely consumed sources of probiotics and is claimed to be a healthy food supplement (1). The benefits of yogurt for the human body's metabolism are that it can have a good impact on the balance of the intestinal microflora and can produce anti-microbial substances (2) in inhibiting the rate of development of pathogenic bacteria (3). In probiotic products, the microbiota can play a role in the health of the gastrointestinal tract and brain. Probiotics have anti-inflammatory

properties that can inhibit apoptosis due to the reduction of pro-inflammatory cytokines in the healing process of depression and intestinal health (4)

Yogurt imported by Indonesia is smaller than its exports, yogurt exports in 2019 were 2,741.42 tons to 5,109.08 tons in 2020, an increase of 86.4% (5). Yogurt is made from animal milk, such as cow, goat, sheep, camel milk, etc (6). The basic ingredients for making yogurt are not only derived from animals but also can use vegetable ingredients, one type of nut that can be used as a base for vegetable milk is cowpea (Vigna unguiculata). Some of the advantages of peanuts are that there are types of nutrients such as protein (24.4 g/100 g), calcium (481 mg/ 100 g), and iron (13.9 mg/100 g) (7) but low in vitamin C in 100 g. The dry cowpea is known to be 1.69 mg/100 g of vitamin C (8).

The adequacy of vitamin C for children is 40-45 mg/day, adolescents need vitamin C of 50-90 mg/day, and the needs of adults and the elderly are 75-90 mg/day (9) Humans can consume various types of fruits and vegetables that are rich in vitamin C to obtain vitamin C naturally (10), one of which is red guava fruit (Psidium guajava) which contains vitamin C 87 mg/100 grams, as a source of natural antioxidants because it contains compounds flavonoids. The researcher intends to make the most preferred yogurt formula, producing the best pH value and vitamin C content with the addition of guava. The organoleptic quality of yogurt products with the addition of red guava juice that will be observed includes color, taste, texture, aroma, and overall preference. This research will get the best formulation that can provide additional information about the use of red guava fruit in vegetable-based yogurt that is healthy and tastes good.

2. METHODS

Experimental research with a completely randomized design (CRD) one factor from the ratio of addition of guava juice. There was 1 control 0% (P0) without the addition of guava juice and 3 treatments with the addition of guava juice 10% (P1), 20% (P2), and 30% (P3). The independent variable was the addition of guava juice and the dependent variable was the organoleptic quality (color, taste, texture, aroma, after taste, overall preference), pH value, and vitamin C. The study was conducted from May to July 2022, at the Food Technology Laboratory of Sekolah Tinggi Ilmu Kesehatan Panti Rapih Yogyakarta and at the Laboratory of the Center for Food and Nutrition Studies UGM.

Making yogurt using cowpea (vigna unguiculata) as raw material from Gowok Market, Caturtunggal, Yogyakarta. The variety of guava (Psidium guajava) is getas from Gowok Market, Caturtunggal, Yogyakarta. Skim milk brand lactona, sugar brand gulaku, CMC brand koepoe, aquades, and culture bacteria powder is probiogama (Lactobacillus plantarum Dad-13) from the Center for Food and Nutrition Studies UGM. Equipment in research, such as knives, cutting boards, blenders, pans, filter cloth, spoons, measuring cups, stainless basins, pans, stoves, water thermometers, sealed glasses (jars), incubators, autoclaves, 500 ml baking cups, 25 ml measuring cups , 100 ml measuring cup, tong grip, lighter, bunsen, digital scale, and analytical scale.

The first process of making cowpea yogurt is the process of making cowpea juice. After the cowpeas are sorted and washed; Soak the cowpeas for ± 11 hours, wash again with clean water, and separate the skin from the nuts. The beans are boiled for ± 30 minutes, and the beans are mashed in a blender and added with hot water in a ratio of 1: 4. After that, take the cowpea juice by filtering it using a filter cloth. Taking guava juice by

blanching at a temperature of 83^0 C (3-5 minutes), the ratio of aquades and guava is 1:1, and taking guava juice using a filter cloth.

The next step is to boil the cowpea juice at a temperature of 85^0 C - 90^0 C for 15 minutes and add 5% granulated sugar, 10% skim milk powder, and 0.25% CMC to the cowpea juice. Lower the temperature of the cowpea juice to 43^0 C - 45^0 C and inoculate the culture bacteria as much as 5 grams with 1000 ml volume of raw materials. Incubate for ± 17 hours at a temperature of 43^0 C with the yogurt tightly closed. After the incubation period was done, the temperature of the yogurt was lowered using a refrigerator for 1 hour and added with guava juice according to the 10%, 20%, and 30% treatments.

The collection of organoleptic properties test data with sensory methods, there is a scoring-preference (hedonic test) and scoring-difference test to determine the level of preference or acceptance of the product and determine differences in sample characteristics. The organoleptic properties test used 30 untrained respondents from nutrition students at Sekolah Tinggi Ilmu Kesehatan Panti Rapih with simple random sampling. Testing the pH value using a pH meter was carried out at the Laboratory of Food Technology of Sekolah Tinggi Ilmu Kesehatan Panti Rapih and vitamin C levels were tested using the iodometry method at the Laboratory of the Center for Food and Nutrition Studies UGM. The results of the organoleptic properties test were analyzed using SPSS version 21 with the Friedman test statistical test and if there was a significant effect, it can be continued to the Wilcoxon test. The test results of pH values and vitamin C levels were analyzed descriptively with a bar chart. Ethical clearance is carried out at the Health Research Ethics Commission (HREC) of Aisyiyah University Yogyakarta (UNISA Yogyakarta). The ethical number that has been set by HREC is 2080/KEP-UNISA/V/2022, valid for 1 year.

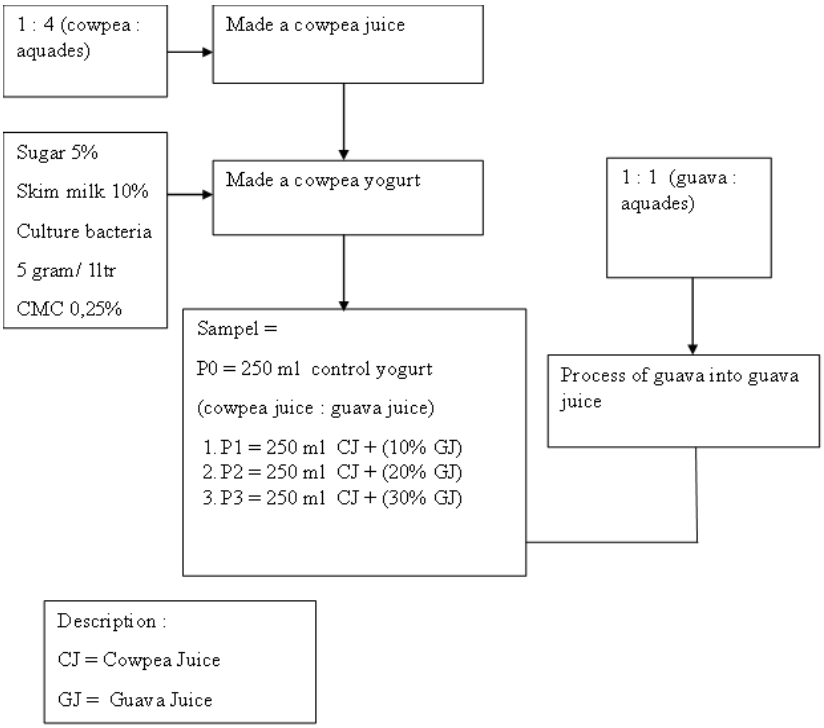

Figure 1. Production Flow of Cowpea Yoghurt
(11; 12; 13; 14; 15)

3. RESULTS

Organoleptic properties

The results of the scoring-preference test (hedonic test) related to the acceptability of the panelists and the scoring-difference test to determine the characteristics of the cowpea yogurt sample with the addition of guava can be seen in figure 2. It can be seen in figure 2 that sample P3 with the addition of 30% red guava juice is more attractive from the aspect of color, preferably from the aspect of taste, and overall preference. Aspects of texture and aftertaste in all samples of yogurt have almost the same characteristics, namely slightly firm and slightly strong. The aroma aspect of the yogurt sample with the addition of 20% guava tends not to have a beany flavor or smell.

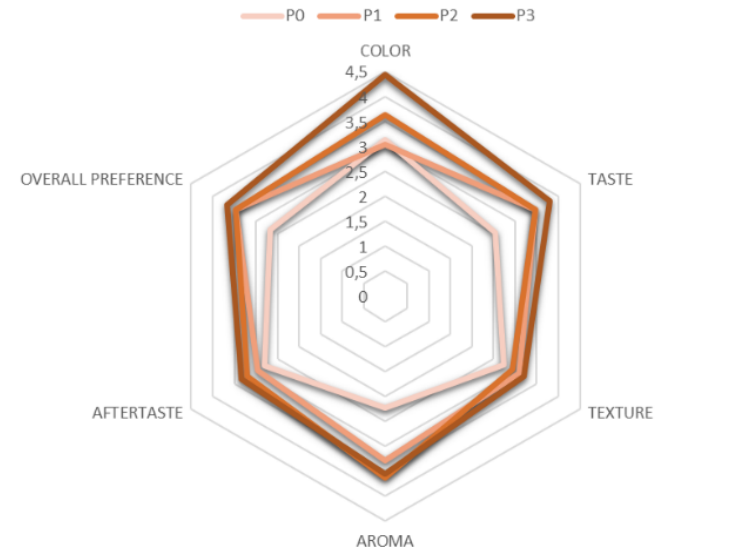

Figure 2. Spider Web Organoleptic Properties Test

Description: Color parameter preference scale (1= very unattractive, 2= unattractive, 3= slightly attractive, 4= attractive, 5= very attractive); taste and overall preference parameters (1= dislike very much, 2 don't like, 3= slightly like, 4= like, 5= like very much); texture parameter < 3 = tends to be runny, 3 = slightly thick, > 3 = thick; aroma parameter < 3 = beany, 3 = slightly beany, > 3 = not beany; after taste parameter < 3= strong, 3= slightly strong, > 3= not strong

Table 1. Organoleptic Properties Test of Yogurt

Parameter test	Treatments				p value
	P0	P1	P2	P3	
	mean±SD	mean±SD	mean±SD	mean±SD	
Color	3,13±0,94[a]	3,03±0,77[a]	3,63±0,72[b]	4,43±0,68[c]	0,000
Taste	2,53±0,90[a]	3,47±0,86[b]	3,47±1,01[b]	3,80±0,81[b]	0,000
Texture	2,73±1,02[a]	3,10±0,80[a]	2,93±0,83[a]	3,20±0,66[a]	0,128

Aroma	2,23±0,90[a]	3,30±0,95[b]	3,63±0,89[b]	3,57±0,97[b]	0,000
Aftertaste	2,80±1,06[a]	2,97±0,77[a]	3,20±0,93[a]	3,33±1,03[a]	0,060
Overall preference	2,67±0,99[a]	3,47±0,94[b]	3,47±0,97[b]	3,67±1,06[b]	0,000

Information : Numbers in the same row followed by the same letter show no significant effect (p >0.05)
P0 = Cowpea yogurt with the addition of 0% guava (control)
P1 = Cowpea yogurt with the addition of 10% guava
P2 = Cowpea yogurt with the addition of 20% guava
P3 = Cowpea yogurt with the addition of 30% guava

The average results of organoleptic properties tests on samples of control cowpea yogurt (P0) and cowpea yogurt with the addition of guava (P1, P2, P3) can be seen in table 1. It can be seen that from the color aspect it has a p value <0.05 then there is a significant effect between samples and the increasing addition of guava can increase the attractiveness of the color in the sample. Seen from the taste aspect, the p value < 0.05 so that it had a significant effect and the panelists preferred the sample with the addition of guava compared to the control cowpea yogurt sample. It can be seen from the aspect of texture between samples that there is no significant effect (p > 0.05) so that the addition of guava cannot increase the viscosity of cowpea yogurt.

The addition of guava in cowpea yogurt can cover the beany aroma in yogurt, it can be seen in table 1. that the p value < 0.05 so that there is a significant effect. It can be seen that the addition of guava in cowpea yogurt cannot cover the aftertaste in yogurt, because the p value >0.05, so there is no significant effect between samples. Overall preference of cowpea yogurt with the addition of guava was preferred by the panelists compared to control cowpea yogurt, this was due to the p value <0.05 so that there was a significant effect between samples.

pH Value

The data from the test results of the pH value of cowpea yogurt with the addition of guava can be seen in chart 1. It can be seen that the more the addition of guava, the lower the pH value and increase the degree of acidity in cowpea yogurt.

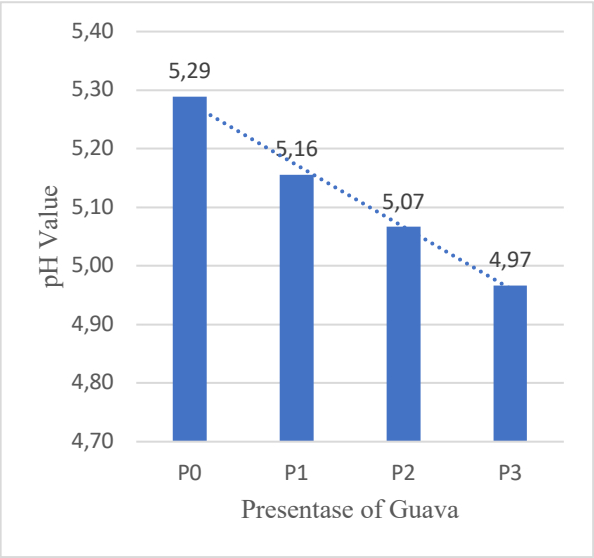

Chart 1. pH Value

Description:
P0 = Cowpea yogurt with the addition of 0% guava (control)
P1 = Cowpea yogurt with the addition of 10% guava
P2 = Cowpea yogurt with the addition of 20% guava
P3 = Cowpea yogurt with the addition of 30% guava

Vitamin C Level

The data from the test results of vitamin C levels in cowpea yogurt with the addition of guava can be seen in chart 2. From the test results, it is known that the increasing addition of guava in cowpea yogurt the lower the vitamin C content in cowpea yogurt.

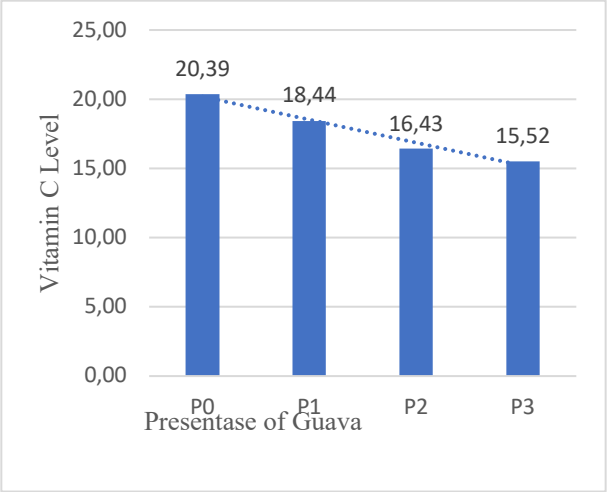

Chart 2. Vitamin C Level

Description:
P0 = Cowpea yogurt with the addition of 0% guava (control)
P1 = Cowpea yogurt with the addition of 10% guava
P2 = Cowpea yogurt with the addition of 20% guava
P3 = Cowpea yogurt with the addition of 30% guava

4. DISCUSSIONS

Organoleptic properties

The results of the organoleptic test from the color aspect showed that giving guava to cowpea yogurt could affect the color and increase the attractiveness of the panelists to the yogurt. The highest average value was cowpea yogurt with the addition 30% of guava, this is due to the characteristic red color of guava. The color of the guava is clarified by the presence of beta carotene (16), lycopene (17), and anthocyanins (18) which are red pigments. There was a previous study related to cow's milk yogurt with the addition of red guava by 15% the most preferred by the panelists, and the decreasing percentage of giving red guava to the yogurt further decreased the panelist's level of preference (19). There is also research on leather pulp from durian-red guava skin, it is known that the addition of red guava pulp as much as 40% is the most preferred by panelists (20).

Taste is an important factor to influence the acceptance of the sense of taste (tongue) in a product (21). It is known from the results of the study that the more the addition of guava to cowpea yogurt, the more preferred by the panelists from the aspect of taste. The taste that was acceptable to the panelists was caused by the taste of red guava which could cover the beany taste and sweet taste of the fruit. In a previous study, it was found that the Etawa goat's milk yogurt that was given red guava juice was 33.3% more preferred by the panelists compared to the control yogurt, and yogurt that was given red guava juice was 23% and 28.5%, this is due to the taste. Red guava can eliminate the distinctive taste of goat's milk and sweet yogurt (22).

The level of viscosity in yogurt can be seen with the sense of sight (23) in organoleptic properties testing. In this study, the addition of guave to cowpea yogurt did not affect the viscosity level. This is supported by previous studies with the addition of red guava by 5%, 10%, and 15% to tempeh yogurt, which did not increase the viscosity of yogurt (23). The viscosity of yogurt is influenced by the presence of protein in the form of casein because the bond between protein and fat in yogurt will increase the viscosity of yogurt (24). Casein protein is found in animal milk, one example is cow's milk (25) while plant products such as soy do not have casein-type protein (26).

The consistency of yogurt can also be affected by the pectin content. Pectin is a fiber that is useful for binding water because it can form a gel and as a stabilizer (20). In this study using guava, the fruit contains pectin of 705-804 mg/ 100 g (27). The amount of pectin in guava is still not enough so it cannot bind all the water to the maximum (20).

The beany smell of yogurt is caused by cowpeas, and the distinctive aroma of nuts is caused by the enzyme 229ipoxygenase (28). The addition of guava to cowpea yogurt can help reduce the beany aroma, this is because fruit juice can be a flavor enhancer and can be added as much as 20%-25% (23). In this study, the addition 10%, 20%, and 30% of guava can reduce the beany aroma of yogurt. In previous studies, it was found that giving more strawberry extract could produce a pleasant aroma in cowpea yogurt (29). Giving red guava juice increasing in cow's milk yogurt can reduce the aroma of cow's milk and panelists prefer it (19).

After taste is the taste left in the mouth that is not liked by the panelists (30;31). The addition of more guava cannot eliminate the aftertaste in cowpea yogurt, because there is still a lingering taste on the tongue and palate. This is not in line with research related

to soybean yogurt with the addition of fruit jam, namely strawberries and oranges, the jam from the two fruits can cover the aftertaste caused and is preferred by panelists compared to soy yogurt without fruit jam (32).

In the overall preference aspect, cowpea yogurt with the addition of guava was preferred by the panelists compared to cowpea yogurt without the addition of guava. Overall liking is influenced by several other factors such as color, taste, aroma, texture, or level of consistency in yogurt (23). Sensory evaluation and panelist acceptance of a food product is based on color or appearance parameters so the most priority when assessing a product is color and followed by taste (33). Humans judge food products by relying on the sense of sight and then the sense of taste and smell (smelling) (33). There was a previous study that giving 30% mango pulp in soybean yogurt was acceptable and preferred by the panelists (34).

pH Value

The results of the analysis of the pH value test can be seen that the higher the addition of guava the pH value decreases and the degree of acidity increases. The decrease in pH was caused by the activity of lactic acid bacteria (LAB) to form organic acids which were supported by the presence of fructose from guava. This study is in line with the results of previous studies that in goat's milk yogurt with the addition of more red guava, the pH value will decrease because the sugar in the form of fructose in the fruit is used by LAB to form lactic acid and lower the pH (35).

Cowpea yogurt with the addition of guava has not been able to reach the pH standard of 4.5. This is because the raw material for yogurt is vegetable, namely cowpeas which do not contain lactose, but cowpeas contain α- galactosides, one of which is raffinose, which is a trisaccharide containing the monomers of fructose, glucose, and galactose (36) which are useful as an energy source for intestinal bacteria (37). This is influenced by LAB requiring lactose to be metabolized into glucose and galactose which will be utilized for bacterial growth and produce lactic acid (38). Yogurt that has not been able to reach the standard pH (4.5) can also be caused by the administration of a low percentage of culture bacteria, in line with previous studies, it is known that giving 5% bacteria in mayonnaise produces a higher pH compared to give 10% to 15% of bacteria. The amount of lactic acid was lower at 5% compared to the 10% to 15% addition of Lactobacillus plantarum bacteria to mayonnaise (39).

According to the results of previous studies that the addition of culture bacteria to yogurt as much as 1%, 2%, and 3% and incubation times of 4 hours, 6 hours, and 8 hours affect the pH value of yogurt (40). The more the addition of culture bacteria and the length of incubation make the pH value lower. The decrease in pH value was also influenced by the low casein protein in cowpea yogurt with the addition of guava. The lower the addition of casein, the less protein is overhauled and less lactic acid is produced, so it will affect the pH value of yogurt (41).

Vitamin C Level

The content of vitamin C in guava is 87 mg/ 100 gram 8, from these data it can be estimated that 1 ml of guava produced contains vitamin C of 0.62 mg. In the 30% treatment sample, the addition of guava content of vitamin C in the sample contained 15.52 mg/100 ml of yogurt. Every 100 ml of cowpea yogurt with the addition of guava

by 30% can fulfill the adequacy of vitamin C by 21% of the total daily vitamin C adequacy.

The exact mechanism underlying the decrease after adding guava can not been fully elucidated. Decreased levels of vitamin C in a food and beverage product can occur which is influenced by several factors such as light, oxygen, iron, copper, and the type of packaging. The results of the test for vitamin C levels can be seen that the addition of guava is increasing, and the vitamin C levels in the cowpea yogurt sample are decreasing, this is possible due to the fermentation process that still occurs during sample distribution because the temperature increases and the sample is exposed to light because the sample packed in a clear jar.

There is a previous study related to milk fermentation, it is known that milk fermented with Lactobacillus rhamnosus and given various sources of vitamin C, such as rosehip, acerola and ascorbic acid in powder form stored for 1 day and 21 days decreased vitamin C (42). During the storage process, the addition of rosehip vitamin C decreased by 5.9%, the addition of vitamin C ascorbic acid decreased by 8.0%, the decrease in vitamin C in the sample was influenced by light, oxygen, and the type of packaging used (43). There are previous studies, it is known that milk fermentation can reduce vitamin C levels by 29-32%, which is due to the oxidation process during the milk fermentation process (44). The cold storage period of yogurt for 5 days can reduce the pH value, this is because the fermentation process is still going on in lactic acid bacteria (45). If there is still a fermentation process during storage, it is possible that there is an oxidation process in vitamin C in cowpea yogurt with the addition of guava.

This study is not the same as previous research, that the more the addition of red guava juice in cow's milk yogurt so the vitamin C levels will increase (19). In the sample of cow's milk yogurt with the addition of red guava juice by 5%, 10%, and 15%, the levels of vitamin C increased and the highest levels of vitamin C were at the addition of 15%, which was 20.69%. The results of previous studies, it is known that the addition of strawberry fruit extract to cowpea yogurt made the vitamin C level higher (29). In this study, the addition of 10%, 20%, and 30% strawberry extract in cowpea yogurt further increased vitamin C levels, and the highest levels of vitamin C in cowpea yogurt samples with the addition of 30% strawberry extract was 10,30 mg (29).

5. CONCLUSIONS

The results of the research that has been done can be concluded that the addition of guava by 30% can affect the organoleptic properties of cowpea yogurt from the aspect of color, taste, and overall preference. The addition of guava by 20% can affect the organoleptic quality of the aroma aspect, it can reduce the beany smell of cowpea yogurt, but the addition of 10%, 20%, and 30% guava can not affect the viscosity and after taste. The addition of guava in cowpea yogurt can reduce the pH value and the degree of acidity increases, but the level of vitamin C decreases.

The lack in this study is that the formulation in this study could not help increase the viscosity and could not cover the aftertaste of yogurt, so further formulation development was needed. The iodine titration method is considered less accurate because vitamin C levels can be influenced by other substances. Testing for vitamin C levels can be done by other methods that have a better level of accuracy. Future research can be considered to test vitamin C levels in guava before conducting research to ensure total vitamin C levels in guava. Research related to pectin levels in guava was carried out in order to determine more precisely the level of viscosity, and testing levels of lactic acid bacteria in yogurt samples. Test the levels of vitamin C with other methods such as titration of 2,6 (Dicloroindophenol) so that the test results are more accurate. Use yogurt packaging with no transparency, carry the yogurt sample in a good place and minimize the temperature increase.

ACKNOWLEDGEMENT

This research was made possible thanks to the support of my father, mother, brothers, and my friends. Thanks to parental financial support and a thesis scholarship from the Church of Saint John the Apostle Pringwulung, this research was carried out smoothly. Thank you for the support during the initial process of making the proposal, the research process to the preparation of this research

REFERENCES

1. Okur, Ö. D. (2021). Determination of Antioxidant Activity and Total Phenolic Contents In Yogurt Added with Black Cumin (*Nigella sativa L.*) Honey. *Ovidius University Annals of Chemistry*, *32*(1), 1–5. https://doi.org/10.2478/auoc-2021-0001
2. Widiyaningsih, E. N. (2011). PERAN PROBIOTIK UNTUK KESEHATAN. *Jurnal Kesehatan*, *4*(1), 14–20.
3. Shagti, I. (2017). Pengaruh Penambahan Sukrosa Terhadap Yoghurt Susu Kacang Tolo Menggunakan Kultur Campuran Bakteri Asam Laktat Sebagai Makanan Pokok. *Jurnal Info Kesehatan*, *15*(1), 137–145.
4. Shi, L. H., Balakrishnan, K., Thiagarajah, K., Ismail, N. I. M., & Yin, O. S. (2016). Beneficial properties of Probiotics. *Tropical Life Sciences Research*, *27*(2), 73–90. https://doi.org/10.21315/tlsr2016.27.2.6
5. Kementerian Pertanian Direktorat Jenderal Peternakan Dan Kesehatan Hewan. (2021). *Statistik Peternakan dan Kesehatan Hewan 2021*.
2. Septianti, E., Dewayani, W., & Syamsuri, R. (2020). The Effect of Starter Ccombination and Types of Milk Against Physicochemical Characteristics of Cow Milk Yoghurt. *Canrea Journal: Food Technology, Nutritions, and Culinary Journal*, *3*(2). https://doi.org/10.20956/canrea.v3i2.333
3. Kementerian Kesehatan Republik Indonesia. (2018). *Data Komposisi Pangan Indonesia*. Kementerian Kesehatan Republik Indonesia. https://www.panganku.org/id-ID/view

4. OECD. (2019). Safety Assessment of Foods and Feeds Derived from Transgenic Crops, Volume 3: Common bean, Rice, Cowpea and Apple Compositional Considerations. In *OECD Publishing* (Vol. 3). OECD Publishing. https://www.oecd-ilibrary.org/environment/safety-assessment-of-foods-and-feeds-derived-from-transgenic-crops-volume-3_f04f3c98-en
5. Menteri Kesehatan Republik Indonesia. (2019). *Angka Kecukupan Gizi yang Dianjurkan Untuk Masyarakat Indonesia*.
6. Mahan, L. Kathleen., Escott-Stump, Sylvia., & Raymond, J. L. (2021). *Krause's Food and The Nutrition Care Process 14th Edition* (13th ed.). Elsevier/Saunders.
7. Indiaresty, R. (2016). *Karakteristik Soyghurt Edamame (Glycine max L.) dengan Variasi Penambahan Sari Bengkuang (Pachyrhizus erosus) dan Susu Skim*. Universitas Jember.
8. Kartika, D. P., Permana, I. D. G. M., & Nocianitri, K. A. (2019). Pengaruh Penambahan Sari Buah Sirsak (*Annona muricata L.*) terhadap Karakteristik Yoghurt Edamame (*Glycine max L.*). *Jurnal Ilmu Dan Teknologi Pangan*, *8*(4), 378–389.
9. Rachmaniar, R., Kartamihardja, H., & Merry. (2016). Pemanfaatan Sari Buah Jambu Biji Merah (*Psidium guajava Linn*.) Sebagai Antioksidan Dalam Bentuk Granul Effervescent. *JSTFI Indonesian Journal of Pharmaceutical Science and Technology*, *5*(1).
10. Selibata, P. P., Smith, A., & Sinay, H. (2017). Perbedaan Kadar Vitamin C dan Lama Fermentasi Terhadap Yoghurt Dengan Penambahan Sari Buah Sirsak (*Annona Muricata L*). *Biopendix*, *4*(1).
11. Siman, A. R., Purwijantiningsih, L. M. E., & Swasti, Y. R. (2017). *Aktivitas Antioksidan dan Kualitas Yoghurt Dari Kombinasi Sari Kacang Tunggak (Vigna unguiculata) dan Sari Buah Markisa Kuning*. Universitas Atma Jaya Yogyakarta.
12. Yan, L. Y., Teng, L. T., & Jhi, T. J. (2006). Antioxidant Properties of Guava Fruit: Comparison with Some Local Fruits. *Sunway Academic Journal*, *3*, 9–20.
13. Siagian, A. (2005). Lycopene: Senyawa Fitokimia pada Tomat dan Semangka. *Info Kesehatan Masyarakat*, *9*(2), 121–124.
14. Moreno, M. A., Zampini, I. C., Costamagna, M., Sayago, J. E., Ordoñez, R. M., & Isla, M. I. (2014). Phytochemical Composition and Antioxidant Capacity of Psidium guajava Fresh Fruits and Flour. *Food and Nutrition Sciences*, *05*(08), 725–732. https://doi.org/10.4236/fns.2014.58082
15. Aufa, M. R., Putranto, W. S., & Balia, R. L. (2020). Pengaruh Penambahan Konsentrasi Jus Jambu Biji Merah (*Psidium guajava L.*) Terhadap Kadar Asam Laktat, Vitamin C, dan Akseptabilitas Set Yoghurt. *Jurnal Teknologi Hasil Peternakan*, *1*(1), 8–16. https://doi.org/10.24198/jthp.v1i1
16. Putro, S. C. A., Surjoseputro, S., & Setijawati, E. (2015). Pengaruh Konsentrasi Buah Jambu Biji Merah terhadap Sifat Fisikokimia dan Organoleptik Fruit Leather Plup Kulit Durian-Jambu Biji Merah. *Jurnal Teknologi Pangan Dan Gizi*, *14*(2).
17. Iyyah, I., Putriningtyas, N. D., & Wahyuningsih, S. (2019). Perbedaan Yogurt Kacang Merah (*Phaseolus Vulgaris L*) dengan Berbagai Starter Ditinjau Dari Sifat Organoleptic, Kadar Protein dan Lemak. *Sport and Nutrition Journal*, *1*(2), 40–47. https://journal.unnes.ac.id/sju/index.php/spnj/
18. Lediawati, W., Ainy, N. S., & Hadi, N. (2022). Uji Organoleptik Penambahan Jus Buah Jambu Biji Merah (*Psidium guajava Linn*) Terhadap Tingkat Kesukaan Responden Pada Yoghurt Susu Kambing Etawa. *INSOLOGI : Jurnal Sains Dan Teknologi*, *1*(1), 18–27. https://journal.literasisains.id/index.php/INSOLOGI
19. Ayuningtyas, C. E., Waluyo, & Susetyowati. (2018). Pengaruh Penambahan Sari Buah Jambu biji (*Psidium guajava L.*) Terhadap Sifat Organoleptik Yoghurt Tempe. *Jurnal Dunia Gizi*, *1*(2), 112–118. https://ejournal.helvetia.ac.id/jdg
20. Rohman, E., & Maharani, S. (2020). Peranan Warna, Viskositas, dan Sineresis terhadap Produk Yoghurt. *EDUFORTECH*, *5*(2). http://ejournal.upi.edu/index.php/edufortech

21. Copriady, J., Azmi, J., & Maharani. (2011). Isolasi Karakterisasi dan Penentuan Kadar Laktalbumin Susu Sapi Fries Holdstein dengan Metode Lowry. *Jurnal Natur Indonesia*, *13*(2), 134–137. http://www.ristek.go.id
22. Li, Q., Xia, Y., Zhou, L., & Xie, J. (2013). Evaluation of The Rheological, Textural, Microstructural and Sensory Properties of Soy Cheese Spreads. *ELSEVIER : Food and Bioproducts Processing*, *91*(4), 429–439. https://doi.org/10.1016/J.FBP.2013.03.001
23. Walter, R. H. (1991). The Chemistry and Technology of Pectin . Food Science and Technology. In *THE CHEMISTRY AND TECHNOLOGY OF PECTIN* (1st ed., pp. 165–188). ACADEMIC PRESS, INC. http://dx.doi.org/10.1016/B978-0-08-092644-5.50014-5
24. Tunjungsari, P., & Fathonah, S. (2019). Pengaruh Penggunaan Tepung Kacang Tunggak (*Vigna unguiculata*) terhadap Kualitas Organoleptik dan Kandungan Gizi Biskuit. *TEKNOBUGA*, *7*(2).
25. Chalimah, S., & Mayasari, D. (2014). Peran *Lactobacillus bulgaricus* dan *Streptococcus thermophilus* Dalam Pembuatan Yoghurt Canglo Dengan Penambahan Stroberi (*Fragaria x ananassa*). *Proceeding Biology Education Conference*, *11*(1).
26. Magdalena, S., Yogiara, & Yulandi, A. (2021). Profil Bakteri Asam Laktat dan Evaluasi Sensori dari Tempe Bungkus Daun Jati yang Disuplementasi dengan Daun Kelor. *Jurnal Aplikasi Teknologi Pangan*, *10*(1), 208–215. https://doi.org/10.17728/jatp.7330
27. Tarigan, E. B., Pranowo, D., & Iflah, T. (2015). Tingkat Kesukaan Konsumen Terhadap Kopi Campuran Robusta dengan Arabika. *Jurnal Teknologi Dan Industri Pertanian Indonesia*, *7*(1), 12–17. https://doi.org/10.17969/jtipi.v7i1.2828
28. Al-Nabulsi, A., Shaker, R., Osaili, T., Al-Taani, M., Olaimat, A., Awaisheh, S., Abushelaibi, A., & Holley, R. (2014). Sensory Evaluation of Flavored Soy Milk-Based Yogurt: A Comparison between Jordanian and Malaysian Consumers. *Journal of Food Science and Engineering*, *4*, 27–35.
29. Sharif, M. K., Butt, M. S., Sharif, H. R., & Nasir, M. (2017). Sensory Evaluation and Consumer Acceptability. In *Handbook of Food Science and Technology* (Vol. 14, pp. 362–386). https://www.researchgate.net/publication/320466080_Sensory_Evaluation_and_Consumer_Acceptability
30. V, J., AP, M., B, B., & A, E. (2015). Formulation of Value Enriched Yoghurt with Soy Milk and Mango Pulp. *Journal of Nutrition & Food Sciences*, *05*(06). https://doi.org/10.4172/2155-9600.1000427
31. Hikmah, L., Kentjonowaty, I., & Dinasari, I. (2020). Pengaruh Pemberian Sari Jambu Biji Merah (*Psidium guajava L*) Terhadap Nilai pH dan Kadar Asam Laktat Yoghurt Susu Kambing. *Jurnal Dinamika Rekasatwa*, *3*(2).
32. Kambuno, N. T., Amtaran, N. P. Y., Dewu, S., Nurdin, K. E., Susilawati, N. M., & Novicadlitha, Y. (2021). Pigeonpea (*Cajanus cajan L.*) and Cowpea (*Vigna unguiculata L.*) Water as Alternative Growth Medium for *Escherichia coli* and *Staphylococcus aureus* in Laboratory with Minimum Infrastructure. *Indonesian Journal of Medical Laboratory Science and Technology*, *3*(2), 109–121. https://doi.org/10.33086/ijmlst.v3i2.2076
33. da Silva, A. C., da Costa Santos, D., Junior, D. L. T., da Silva, P. B., Cavalcante, R. D. S., & Siviero, A. (2018). Cowpea: A Strategic Legume Species for Food Security and Health. *Legume Seed Nutraceutical Research*, 47–65. https://doi.org/10.5772/INTECHOPEN.79006
34. Chusniati, S., & Effendi, M. H. (2008). Peningkatan Cita Rasa dan Tekstur Yoghurt dari Susu Kambing dengan Penambahan Konsentrasi Inokulan. *Veterinaria Medika*, *1*(2), 23–28.
35. Usman, N. A., Suradi, K., & Gumilar, J. (2018). Pengaruh Konsentrasi Bakteri Asam Laktat *Lactobacillus Plantarum* dan *Lactobacillus Casei* terhadap Mutu Mikrobiologi dan Kimia Mayones Probiotik. *Jurnal Ilmu Ternak* , *18*(2). https://doi.org/10.24198/jit.v18i2.19771

36. Dibyanti, P., Radiati, L. E., & Rosyidi, D. (2014). *Effect of Addition of Various Concentrations of Culture and Incubation Period on pH, Acidity Levels, Viscosity and Syneresis Set Yoghurt*. Universitas Brawijaya.
37. Wanita, Y. P., & Kobarasih, M. (2016). *Pengaruh Perlakuan Filtrasi dan Penambahan Kasein terhadap Kadar Asam Laktat, Total Bakteri Asam Laktat, dan Penerimaan Konsumen terhadap Yoghurt Sawo (Achras Zapota L.)*.
38. Znamirowska, A., Szajnar, K., & Pawlos, M. (2021). Effect of Vitamin C Source on Its Stability during Storage and the Properties of Milk Fermented by Lactobacillus rhamnosus. *Molecules*, *26*(20). https://doi.org/10.3390/MOLECULES26206187
39. Dave, R. I., & Shah, N. P. (1997). Effectiveness Of Ascorbic Acid As an Oxygen Scavenger In Improving Viability of Probiotic Bacteria In Yoghurts Made With Commercial Starter Cultures. *International Diary Journal*, *7*(6–7), 435–443.
40. Urbeiene, S., & Mitkute, D. (2007). Changes of vitamin C during Milk Fermentation. *Milchwissenschaft*, *62*(2). https://www.researchgate.net/publication/286550987_Changes_of_vitamin_C_during_milk_fermentation
41. Oktaviana, A. Y., Arief, I. I., & Batubara, I. (2018). Potensi Yogurt Rosella Probiotik *Lactobacillus plantarum* IIA-1A5 atau *Lactobacillus fermentum* B111K dalam Mengasimilasi Kolesterol. *Jurnal Aplikasi Teknologi Pangan*, *7*(3). https://doi.org/10.17728/jatp.2760