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The Fruitghurt Formulations are a Combination of Red Guava and Pineapple Juice by using the Encapsulation Method, as an Alternative Source of Vitamin C

Formulasi Fruitghurt Kombinasi Sari Buah Jambu Biji Merah dan Nanas Menggunakan Metode Enkapsulasi, sebagai Alternatif Sumber Vitamin C

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ABSTRACT

Fruitghurt is a product of fermented fruit juice using Lactobacillus bulgaricus and Streptococcus thermophillus bacteria. This research was conducted on developing fruitghurt products that contain vitamin C with a combination of red guava and pineapple juice. The research method was carried out using a factorial completely randomized design method which consisted of two factors. Factor I: a combination of red guava and pineapple juice: JN_1=120%:80%; JN_2=130%:70%, JN_3=140%:60%, JN_4=150%:50%. Factor II: drying time L_1=1 hour, L_2=2 hours, L_3=3 hours, L_4=4 hours. The results showed that the concentration of red guava and pineapple juice had a very significant effect ($p<0.01$) on vitamin C levels, total dissolved solids, total acids, water content, total LAB, antioxidant activity and organoleptic. The interaction between the concentration of red guava and pineapple juice and the drying time had a very significant ($p<0.01$) effect on total lactic acid bacteria, antioxidant activity, vitamin C and total dissolved solids. The best fruitghurt quality was obtained in the JN_4L_1 treatment combined with a vitamin C 4.92 mg/100g, total dissolved solids 8.85°Brix, total acid 1.50%, moisture content 4.98% and total lactic acid bacteria 12.95 log CFU/ml. Fruitghurt a formulation of red guava and pineapple juice is recommended as an alternative source of vitamin C.

Keywords: *fruitghurt, vitamin C, encapsulation, red guava juice, pineapple juice.*

ABSTRAK

Fruitghurt merupakan produk hasil fermentasi dari sari buah-buahan dengan menggunakan bakteri Lactobacillus bulgaricus dan Streptococcus thermophillus. Penelitian ini dilakukan bertujuan untuk pengembangan produk fruitghurt yang memiliki kandungan vitamin C dengan kombinasi sari jambu biji merah dan nanas. Metode penelitian dilakukan dengan metode Rancangan Acak Lengkap (RAL) faktorial yang terdiri dari dua faktor yaitu, faktor I: Kombinasi Sari Jambu Biji Merah dan Sari Nanas, yaitu: JN_1=120%:80%; JN_2=130%:70%, JN_3=140%:60 %, JN_4=150%:50%. Faktor II yaitu lama pengeringan (L): L_1=1 Jam, L_2= 2 Jam, L_3= 3 Jam, L_4= 4 Jam. Hasil penelitian menunjukkan perlakuan perbandingan konsentrasi sari jambu biji merah dan nanas berpengaruh sangat nyata ($p<0,01$) terhadap kadar vitamin C, total padatan terlarut, total asam, kadar air, total BAL, aktivitas antioksidan dan hasil organoleptik. Interaksi perlakuan perbandingan konsentrasi sari jambu biji merah dengan nanas dan lama pengeringan berpengaruh sangat nyata ($p<0,01$) total BAL, aktivitas antikosidan, kadar vitamin C dan total padatan terlarut. Mutu fruitghurt terbaik diperoleh pada kombinasi perlakuan JN_4L_1 dengan kandungan vitamin C 4,92 mg/100g, total padatan terlarut 8,85 °Brix, total asam 1,50%, kadar air 4,98% dan total bakteri asam laktat 12,95 log CFU/ml. Fruitghurt formulasi sari jambu biji merah dan nanas ini direkomendasikan sebagai alternatif sumber vitamin C.

Kata Kunci: *fruitghurt, vitamin C, enkapsulasi, sari jambu biji merah, sari nenas.*

INTRODUCTION

Red guava and pineapple are local fruit commodities of North Sumatra, with red guava production reaching 10,049/ton and pineapple production 163504/ton during 2016 (BPS, 2016). Pineapple fruit besides being consumed fresh is also processed into snack products such as chips and *jam* (Astoko, 2019), meanwhile, red guava is not only

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consumed fresh, but is also used as processed food such as fruit juice, jam and jelly (Trimursito, *et al.*, 2015).

Based on the abundant harvest potential, it is necessary to diversify food preparations from red guava and pineapple, namely with a new variation of fruitghurt. Red guava and pineapple are rich in nutrients and have high vitamin C content. This is in line with the ongoing Covid-19 pandemic, where one of the important elements needed by the body is vitamin C (Anugrah, *et al.*, 2015). The role of vitamin C as an antioxidant can trigger more production of lymphocytes and phagocytes, which work effectively against pathogenic bacteria that cause infection. If the immunity is good, then the virus does not easily enter and attack the body (Seveline, 2015).

The problem to be studied is related to the significant need for vitamin C recently, triggering an increasing demand for products containing vitamin C. Vitamin C is one of the essential vitamins, meaning that humans cannot produce vitamin C in their own bodies, so they must be obtained from outside the body. Naturally, sources of vitamin C are obtained from vegetables and fruits, or through intake in supplement form. Currently in meeting the needs of vitamin C. Most people choose practical ones by buying in supplement form at drugstores or pharmacies. This phenomenon affects the high demand for vitamin C which causes the price of supplements to increase.

Based on the high demand for vitamin C at this time, for this reason, the specific purpose of this research was to make a fruitghurt formulation from red guava and pineapple juice and to analyze the vitamin C content in the product. This product is applied using encapsulation method, using maltodextrin as a coating.

This encapsulation technology is thought to be able to increase the stability of the resulting fruitghurt products. Currently research innovations on probiotic drinks are growing. Fruitghurt products that have been studied before, namely from watermelon peels, from the results of the study it was found that the lactic acid levels of watermelon peel fruitghurt met the quality standards for probiotic drinks (Mawarni and Fithriyah, 2015).

Subsequent research on the effect of cavendish banana fruitghurt fermentation time with L.bulgaricus and S.thermophilus starter, the results obtained fruitghurt with quality according to SNI standards (Rahmatullah and Mahmud, 2019).

It is hoped that this fruitghurt product in the future can help provide vitamin C which contributes to increasing the body's immunity. The formulation of red guava and pineapple juice will produce a new variant of fruitghurt with a unique blend of flavors because of the combination of the two. The resulting fruitgurt has a longer shelf life and can be stored at room temperature.

MATERIALS AND METHODS

This research was carried out from June 2022 to October 2022 at the Microbiology and Bioprocess Laboratory, Faculty of Agriculture, Saint Thomas Catholic University, Medan.

The main ingredients used in this study were red guava and pineapple obtained from Suka Maju Village, Deli Serdang Regency, skim milk, NA, maltodextrin, tween 80, *L.bulgaricus* and *S. thermophillus* starters are cultured from yogurt obtained from the Pondok Indah Fruit Market. DPPH, ethanol, H2SO4 0.325 N, NaOH 0.01 N, PP indicator, Methanol. The tools used are analytical scales (Ohaus), oven (Memert), blender (Philips), thermometer (Aicare), refractometer (atago), colony counter (SC6 plus), spectrophotometer, laminar air flow (Astecair), autoclave (Hirayama) , waterbath (Memmert), incubator (Memmert).

The research design was carried out using a factorial completely randomized design method which consisted of two factors, namely: Factor I: concentration of red guava juice: pineapple juice consisted of 4 levels. JN_1 = 120% : 80%, JN_2 = 130 % : 70%, JN_3 = 140 % : 60 %, JN_4 = 150 % : 50 %. Factor II: drying time (L) consists of 4 levels, namely: L_1 = 1 hour, L_2 = 2 hours, L_3 = 3 hours, L_4 = 4

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hours. The research scheme of the fruitghurt formulation combination of red guava and pineapple juice can be seen in Figure 1 below:

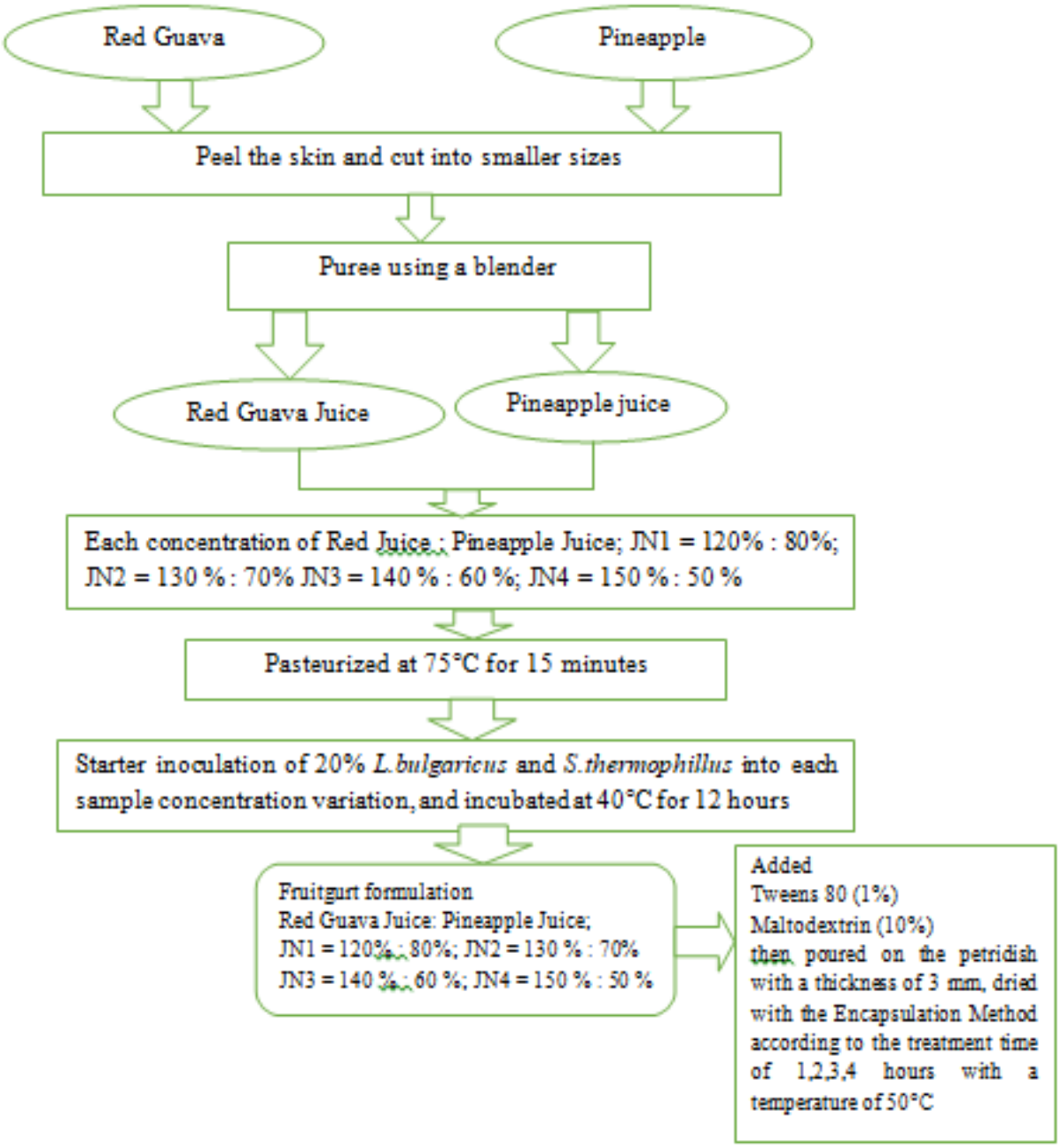

Figure 1. The Process of Making Fruitghurt Juice of Red Guava and Pineapple Using the Encapsulation Method

Vitamin C Level Test (AOAC, 2012)

Determination of Vitamin C levels was carried out using the UV Spectrophotometry Method. The steps taken were making a standard curve, stock solution of vitamin C 1 mg/ml. Accurately weighed approximately 50.0 mg, then put in a 50 ml measuring flask and dissolved with methanol p.a up to the mark. Preparation of 0.05 mg/ml vitamin C intermediate solution Take 2.5 ml of 1 mg/ml vitamin C stock solution. Put into a 50 ml measuring flask, dilute with methanol p.a up to the mark. To prepare a series of standard vitamin C solutions, 1.0, 2.0, 3.0, 4.0, and 5.0 ml of intermediate solution of vitamin C is taken.

Total Dissolved Solids (Zulaikhah and

Fitria, 2020)

Total dissolved solids of fruitghurt were measured with a hand-held refractometer (Master Refractometer ATAGO, Tokyo Japan) at 25 °C and calibrated using distilled water. As much as 1-2 drops of sample are placed on the prism of the refractometer, then the results can be read immediately. Total dissolved solids content is expressed as ^{0}Brix.

Testing for Total Lactic Acid Bacteria (Jannah, *et al.*, 2014)

The testing procedure for total fruitghurt lactic acid bacteria used in this study is as follows: Sterilize the instrument, diluent and MRSA using an autoclave at 121^{o}C, with a pressure of 2 atm for 15-20 minutes. Then a 10-^{1} dilution was carried out by transferring ml of fruitghurt set into 9 ml of 0.1% peptone water buffer solution.

After that it was homogenized and a 10^{-2} dilution was carried out by transferring 1 ml of the 10^{-1} suspension into 9 mL of 0.1% peptone water buffer in a 10^{-3} test tube. then homogenized again and carried out in the same way in a 10^{-4} - 10^{-6} test tube, then pipette dilution (10^{-4}, 10^{-5}, 10^{-6}) as much as 1 ml of sample solution in duplicate into a petri dish using a 1 ml sterile pipette. 8. Put 12-15 ml of MRSA media that has been cooled to 47-50^{o}C into the petri dish. Homogenize by following figure eight and let stand until solidified 10. Incubate the petri dish upside down at 37^{o}C for 24 hours. Then the number of bacteria was counted using the cup count method and the growing colonies were counted using the Standard Plate Count.

Antioxidant Activity Analysis (Thangaraj, 2016)

Analysis of antioxidant activity was carried out with the following procedure, namely: making a standard curve for DPPH solution, making DPPH solution and testing antioxidant activity by taking 4 ml of the sample into a vial, adding 2 ml of DPPH solution in methanol, then the mixture was incubated for 30 minutes at room temperature. The incubated mixture was put into a cuvette and then its absorbance was measured using a UV-Vis spectrophotometer at a wavelength of 517 nm.

Organoleptic Test (Agusman, 2013)

The organoleptic test of the panelists used the hedonic method, namely the preference level test for taste, aroma, texture and color. This test was carried out by 25 panelists. Each panelist will give an assessment of his level of liking and fill it into a questionnaire that has been given a number 1-4 with a hedonic scale as follows: really dislike (1), don't like (2), like (3), really like (4).

RESULT AND DISCUSSION

The results of the analysis of vitamin C levels in fruitghurt showed an increase and were very significantly different in each treatment, where the higher the percentage of red guava juice added, the higher the vitamin C content of fruitghurt. According to the Indonesian Ministry of Health (2017) that red guava contains 42,9 mg/100g of vitamin C, while pineapple contains 21,67 mg/100g of vitamin C. This shows that by adding more concentrations of red guava juice, the vitamin C content in fruitghurt will also be higher. The main factor affecting the vitamin C content is temperature. The length of drying time can affect the vitamin C content of fruitghurt. Vitamin C contains ascorbic acid which is easily oxidized to dehydroascorbic acid which plays a role in inhibiting excessive oxidation reactions. Different drying times can affect the vitamin C content of the ingredients (Rahmawati, *et al.*, 2012).

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Table 1. The Effect of Combination Concentration of Red Guava Juice and Pineapple Juice on the Observed Fruitghurt Parameters

Parameter	Concentration Formulation (Red Guava Juice: Pineapple juice)			
	JN_1	JN_2	JN_3	JN_4
Levels of Vitamin C (mg/100g)	4,67	4,77	4,80	4,92
Total Dissolved Solids (°Brix)	8,10	8,743	8,771	8,85
Total Lactic Acid Bacteria (log CFU/ml)	12,55	12,69	12,82	12,95
Antioxidant Activity (%)	8,61	8,74	8,77	8,85
Texture Organoleptic Value	2,20	2,49	2,83	2,85
Colour Organoleptic Value	2,43	2,91	3,01	3,21
Organoleptic Value Odor	1,94	2,75	3,03	3,23
Taste Organoleptic Value	1,49	2,61	2,66	2,90

Note : JN_1 : 120% : 80 %, JN_2 : 130% : 70%, JN_3 : 140% : 60%, JN_4 : 150% : 50%

Vitamin C dissolves easily in water and is easily damaged by heat. Based on this study, the highest levels of vitamin C were obtained in the JN_4 treatment, which was 4.92%. The content of vitamin C found in red guava is a natural antioxidant which is widely found in ripe fruit flesh.

Total Dissolved Solids is a measurement dissolved solids, in the form of ions, compounds, and colloids, which are analyzed using a hand-refractometer.

Total solids increased with increasing concentration of red guava juice. This is because red guava has a number of dissolved solids so that after being added to the manufacture of fruitghurt, the dissolved solids in the fermented product increase. Ismawati, et al., (2016) stated that the high sugar content from fruits or other things added to fermented drinks such as fruitghurt, will contribute to a higher dissolved solids component. In the total lactic acid bacteria test, the total LAB results were obtained in fruitghurt, namely $JN_{1=}$ 12,55 log cfu/ml, $JN_{2=}$ 12,69, JN_3=12,82 log cfu/ml and JN_4=12,95 log cfu/ml. The addition of red guava juice concentration in the JN_4 treatment had a significant effect on increasing the lactic acid levels in the resulting fruitghurt, and the average total lactic acid bacteria value in the fruitghurt formulation of red guava and pineapple juice for all treatments met the SNI 7552:2009 standard concerning The quality requirements for flavored fermented milk drinks are to contain a total lactic acid bacteria of at least 1 x 10^6 cfu/ml. The antioxidant activity of fruitghurt increases with increasing concentration of red guava juice. Red guava is a fruit that contains antioxidants. Antioxidants function to protect the body from cell damage caused by free radicals. Antioxidants such as carotenes found in red guava fruit are very beneficial for the health of the body.

The results of the organoleptic test by the panelists explained that the higher the concentration of red guava juice added, the panelist's score for the color of the fruitghurt increased. This shows that the high concentration of red guava juice can make the color of the fruitghurt more attractive so that it is preferred by the panelists. Winarno (2008) explained that carotenoids are one of the pigments that show orange and red colors on the fruit part which makes a product more preferred by panelists. The color organoleptic test also increased with increasing concentration of red guava juice added. The color that the panelists preferred was the JN_4 treatment with a value of 3.21%.

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Table 2. Organoleptic Test Results for the Combination of Red Guava and Pineapple Juice

Treatment	Formulation (Red Guava Juice: Pineapple Juice)	Average value			
		Texture	Color	Odor/Scent	Taste
JN_1	120 %:80%	2,20[a]	2,43[c]	1,94[a]	1,49[a]
JN_2	130%:70%	2,49[a]	2,91[b]	2,75[b]	2,61[b]
JN_3	140%:60%	2,83[b]	3,01[b]	3,03[bc]	2,66[b]
JN_4	150%;50%	2,85[b]	3,21[a]	3,23[c]	2,90[c]

Fruitghurt a combination of red guava and pineapple juice in the JN_4 treatment was pink. Color is an important factor in determining product acceptance because before consuming a product, color is usually the first sensory property seen by panelists.

According to Winarno (2004) the brighter the color produced, the more attractive the panelists will be to give the best judgement. The aroma that the panelists liked was also in the JN_4 treatment, namely 3.23%. The combination of red guava juice added with pineapple juice which contains methyl ester and ethyl ester groups, is an aroma carrier. on the resulting fruitgurt. The compounds that carry the aroma of pineapple fruit are methyl-3-hydroxybutyrate, methyl-3-hydroxyhexanoate, dimethyl malonate and acetoxyacetone. Taste is a determining factor for panelists' acceptance of fruitghurt products. Lactic acid bacteria in the manufacture of this fruitghurt produce lactic acid which can lower the pH so that the yogurt will taste sour. The panelists preferred the JN_4 concentration with a value of 2.90%.

CONCLUSION

Based on the research results of the fruitghurt formulation combination of red guava and pineapple juices using the encapsulation method, the following conclusions can be drawn: 1. The fruitghurt formulation combination of red guava and pineapple juices has a very significant ($p<0,01$) different effect on the parameters of vitamin C levels, namely in the JN_4 treatment = 4.92 mg/100g 2. The effect of the interaction between the concentrations of red guava and pineapple juice and the drying time had a significantly different effect ($p<0,01$). 3. The best research results were in the JN_4 treatment, namely the concentration of red guava juice: pineapple (150%:50%), with the respective results as follows: Vitamin C content 4.92 mg/100g, total dissolved solids 8.85 ^{0}Brix , total LAB 12.95 Log CFU/ml and antioxidant activity 12.95%. 4. The results of the organoleptic test showed that the panelists' preference for texture, color, aroma and taste was highest in fruitghurt formulai JN_4 with respective values namely texture 2,85%, color 3,21%, aroma 3,23% and taste 2,90%. 5. The formulation of red guava and pineapple juice will produce a new variant of fruitghurt with a unique blend of flavors because of the combination of the two. 6. Fruitghurt as a result of this study is recommended as a probiotic product that can be used as an alternative source of vitamin C.

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