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Utilization of Papaya and Tomatoes in Making Jelly Drinks Source of Vitamin C

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ABSTRAK

Introduction: Papaya and tomatoes are local food ingredients that are easily found in the community and contain vitamin C to be developed into functional foods, one of which is as a jelly drink. This research aims to use papaya and tomatoes as raw materials for making jelly drinks as a source of vitamin C. **Method**: This research used a Completely Randomized Design (CRD) with two repetitions. The factors in the study are the comparison of papaya and tomato juice, which consists of 3 levels, namely F1 (60%: 40%), F2 (70%: 30%), F3 (80%: 20%), and F0 (0%:0%) as control. The organoleptic test uses hedonic and hedonic quality tests with 50 untrained panelists. The chemical analysis carried out includes water content, ash content, protein, fat, carbohydrates, and vitamin C in the entire formula. Data analysis was carried out using the ANOVA test and Kruskal Wallis test, followed by the Duncan and Mann-Whitney tests at a significance level of 95%. **Result**: The results of the organoleptic test showed that each formulation treatment had a significant effect on the level of preference and hedonic quality of color, aroma, texture, and taste ($p<0.05$). The results of the chemical analysis show that papaya and tomatoes in making jelly drinks have a significant effect on the levels of water, ash, protein, fat, carbohydrates, and vitamin C. **Conclusion**: Jelly drink was selected based on the results of hedonic test analysis and hedonic quality using weighting based on the Exponential Comparison Method (MPE), namely F2 (papaya 360 g and tomato 240 g) with nutritional content per serving size of 170 mL having energy of 60 kcal, protein 0.12 g, fat 0.002 g, carbohydrates 14 g, and vitamin C 12 mg.

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INTRODUCTION

Functional food is processed food that has physiological functions such as strengthening the body's immunity, processing the rhythm of physical conditions, delaying aging, and preventing several diseases (Suarni & Yasin 2015). Functional drinks are one type of functional food. Several things must be met to make functional drinks, including sensory properties of taste, color, aroma, product texture, good nutritional content, and a good effect on the body's physiological functions (Nuraini & Kuswanto 2020). One of the biological sources of plantation products that can be used as raw materials for functional food is papaya and tomatoes.

Humans can use papaya in fresh form or as processed products because papaya has good nutrients and is needed by the body. Papaya has vitamin C of 78 mg/100 g (Kemenkes 2018). Research has proven that consuming fruit containing vitamin C will affect the health of the body. In a study conducted by Ilohuna *et al*. (2023), subjects who were given papaya juice for five days experienced a decrease in blood pressure, with an average systolic blood pressure of 126 mmHg and a diastolic blood pressure of 82 mmHg. In addition, research by Kasumayanti (2017) proved that systolic and diastolic blood pressure would decrease by 130 mmHg and 80 mmHg if papaya juice were consumed for five consecutive days.

Tomatoes are considered one of the fruits with a reasonably high vitamin C content, namely 34 mg/100 g (Kemenkes 2018), 43.56 mg/100 g (Dewi 2019), and 40 mg/100 g (Putri *et al*. 2022). In addition, other nutritional content contained in 100g of tomatoes is 24 kcal of energy, 1.3 g of protein, and 0.5 g of fat (Kemenkes, 2018). Vitamin C contained in tomatoes has various benefits for the human body, including accelerating the wound-healing process, accelerating the metabolism process, and acting as an antioxidant in the body (Lase, 2022). Vitamin C deficiency has some impact on health, such as fatigue, bleeding gums, and mouth ulcers.

When the body lacks vitamin C, it will affect its health, causing it to feel tired quickly, bleeding gums easily, and also being prone to mouth ulcers. One of the diseases caused by vitamin C deficiency is scurvy (Putri *et al*., 2022). Based on a literature review study by Putri *et al*., (2022) tomatoes have the potential to prevent scurvy because tomatoes contain vitamin C in an amount of 40 mg/100 g of tomatoes. Meanwhile, research by Supriadi *et al*., (2022) found that 50% of the 12 respondents who did not have sufficient vitamin C suffered from anemia. Another study stated that there was a decrease in systolic and diastolic blood pressure after giving tomato juice for seven consecutive days in people with hypertension of 15.7 mmHg and 7.86 mmHg (Luthfiya *et al*. 2021). Papaya and tomatoes can be used as functional drinks, namely jelly drinks, because of the nutritional content in both types of food.

A jelly drink is a semi-solid drink made from fruit juice and cooked with added sugar. Jelly drink has a texture that is easy to suck because it has a weak gel consistency (Marin *et al.,* 2016). Gel-forming materials such as agar, pectin, carrageenan, and locust bean gum are needed to make jelly drink products. The gel-forming material used in this study is carrageenan. Carrageenan is used because it has a better gel-forming ability compared to other hydrocolloids (Qolsum, 2020).

Papaya and tomato fruit-juice jelly-drink products do not use synthetic additives that are harmful to health. The coloring agents used in jelly drinks are natural dyes derived from carotenoids in papaya and tomatoes. In commercial jelly drink products, the manufacturer of these products uses synthetic additives, including sweeteners, colorings, preservatives, and flavorings. If additives are consumed excessively and for an extended period, they will be harmful to health. In addition, a preliminary study conducted by researchers on fifty random individuals showed that some individuals did not like papaya and tomatoes. Some people do not like papaya because of its unpleasant aroma and soft texture. At the same time, some other people do not like tomatoes because of their rather unpleasant aroma.

Based on the above considerations, researchers are interested in conducting a jelly-drink product development study by utilizing papaya and tomatoes as alternative sources of vitamin C that are organoleptically acceptable.

LITERATURE REVIEW

Papaya

One of the horticultural products in Indonesia is Carica papaya L or known as papaya fruit. Based on botanical classification, papaya is part of the Caricaceae family, which has 24 species. In scientific language, papaya plants have the name Carica papaya L, genus Carica, and family Caricaceae (Hamzah, 2014). Table 1 shows the nutritional content of papaya fruit per 100 g.

Tabel 1. Nutritional Content of Papaya per 100 g

Nutrients	Weight/100 g
Energy (kkal)	46
Ash (g)	0.6
Water (g)	86.7
Protein (g)	0.5
Fat (g)	12
Carbohydrate (g)	12.2
Vitamin C (mg)	78

Source: Kemenkes, (2018)

Various types of papaya-based food products can be seen in Table 2.

Tabel 2. Processed Products from Papaya

Material	Product	Result	Reference
California Papaya	Fruit juice jelly drink	The selected formula is formula 1 with a texture similar to jelly drink, has an IC50 antioxidant activity value of 82 ppm and a vitamin C content of jelly drink of 5.75 mg/100 mL.	Miranti *et al.*, (2016)
Papaya	*Jelly drink*	The best jelly drink formulas are formula 2 and formula 3 with carrageenan concentrations of 1% and 1.2%. The results of the nutritional content obtained are crude fiber content of 7.07% and 7.81%, vitamin C content of 9.6 mg / 100 g and 10.4 mg / 100 g papaya jelly drink.	Apriani *et al.*, (2018)
California Papaya	Jelly Candy	The vitamin C content of papaya juice and papaya fruit juice jelly candy is 0.0467% and 0.0103%. The IC50 antioxidant activity value of papaya fruit juice was 33.537 ppm, formula 1 jelly candy was 75.296 ppm, formula 2 73.901 ppm, and formula 3 70.698 ppm.	Miranti *et al.*, (2017)

Tomato

Tomato plants are known in Latin as Lycopersicon esculentun Miil (Andrian and Maretta 2017). World tomato production in 2020 increased by around 36.8 million tons from 2018 (Kaboré et al. 2022). The nutritional content of tomatoes per 100 g can be seen in Table 3.

Tabel 3. Nutritional Content Tomato per 100 g

Nutrients	Weight/100 g
Energy (kkal)	24
Ash (g)	0,6
Water (g)	92,9
Protein (g)	1,3
Fat (g)	0,5
Carbohydrate (g)	4,7
Vitamin C (mg)	34

Source: Kemenkes (2018)

Various types of papaya-based food products can be seen in Table 4.

Tabel 4. Processed Products from Tomat

Material	Product	Result	Reference
Tomatoes and ginger	Jelly drink	The results of the organoleptic test of this product are that there is an effect of adding tomato juice on the viscosity of the jelly drink product with a significance level of 0.004 (a<0.05). The best jelly drink product is (70:50), which means the amount of tomato juice added is 70, the amount of temulawak juice added is 50, with the characteristics of being orange in color with the aroma of tomatoes and temulawak, having a sweet taste and the taste of tomatoes and temulawak, and also easy to suck.	Utami, (2016)
Tomatoes, watermelon flesh, and watermelon albedo.	Jelly drink	The addition of carrageenan and flour will affect the quality, texture, ease of suction, water content and also affect the level of panelist preference for hedonic texture. The selected jelly drink product has a concentration treatment of carrageenan and porang flour of 0.20%, has a water content of 88.92%, a dietary fiber content of 4.09% and the activity of antioxidants has an IC50 value of 130.47%.	Novidahlia *et al.*, (2019)

Jelly Drink

A good jelly drink has criteria that include a firm and transparent texture, a natural fruit aroma, and taste. When the jelly is consumed using a straw, the jelly texture will quickly disintegrate, but the gel form can still be felt in the mouth (Widjaja *et al.,* 2019). Jelly drinks are made with the main ingredient in the form of hydrocolloids, which produce a chewy structure when mixed with water. Hydrocolloids are polymers that are soluble in water, able to form colloids, and able to thicken solutions or form gels from the solution. Agar and carrageenan are types of colloids that can be used to make jelly drinks. Jelly drinks made from agar have a very fragile texture, are easily disintegrated, and do not last long in the mouth.

Meanwhile, jelly drinks made from carrageenan have a softer and more tender texture than those made from agar (Zusar 2019). According to BPOM RI (2019), jelly drinks have distinctive characteristics, namely a semi-solid gel consistency and a hydrocolloid content of not less than 0.1%. To form a good and easy-to-suck gel structure, a gelling agent must be added; the correct type of gelling agent is carrageenan. Carrageenan can form a gel structure that tends to be elastic and chewy. So, there is a need for research on making fruit juice drinks in the form of jelly drinks using carrageenan (Widawati and Hardiyanto 2016).

Vitamin C

Vitamin C is a nutrient needed by the body and is found in various types of foods, such as citrus fruits, green vegetables, tomatoes, and potatoes (De Nuccio et al. 2021). Vitamin C is water-soluble and stable in dry conditions. However, due to reactions with air (oxidation), especially in hot conditions, this vitamin is easily damaged. This vitamin is a nutrient that is actively absorbed and diffused in the upper part of the small intestine, which then enters the bloodstream through the portal vein. Vitamin C in the body is absorbed by an average of 90% if consumed in an amount of 20-120 mg per day. The functions of vitamin C vary, including collagen synthesis, metabolism, and absorption of iron and calcium, preventing infection, cancer, and heart disease (Apriani *et al*. 2018). The recommended adequacy of vitamin C can be seen in Table 5.

Tabel 5. Recommended Adequate Intake of Vitamin C

Nutrients	Unit	Age 0-6 months	Age 7-11 months	Age 1-3 months	Age	Pregnant mother	Breastfeeding mothers
Vitamin C	mg	40	50	40	90	90	100

Source: (BPOM RI 2016)

METHOD

Tools

The study used digital scales for food ingredients, stoves, stainless steel pans, spoons, stirrers, sieves, plastic cups, plastic containers, porcelain cups, basins, stainless steel ladles, desiccators, ovens, Kjeltec tubes, digestion blocks, filter paper, soxhlet, fat flasks, measuring flasks, 100 mesh sieves, pipettes, and organoleptic test forms.

Materials

The materials used in the study were California papaya, potato tomatoes, water, granulated sugar, carrageenan and jelly powder, lemon juice, HCl, hexane, nitric acid, selenium, iodine, starch, concentrated H2SO4, research product samples (jelly drinks) and mineral water.

Papaya Juice Production

The making of papaya juice refers to the research of Efiyanti *et al.*, (2022) with a modification of the addition of water which previously used a ratio of 1: 1 modified to 1: 0.5 addition of water to papaya. The process of making papaya juice is carried out by selecting papaya fruit obtained in the market. The papaya used is ripe California papaya with an average weight of 1000 g. After the selection is complete, the papaya is weighed as much as 480 g, and then the papaya is cleaned so that there is no more dirt. After that, the papaya is separated from the flesh and skin, and then the flesh is taken. Next, the papaya is cut into cubes and pureed using a blender at medium-high speed. The pureed papaya is filtered using a 100-mesh sieve. The flow diagram of the papaya juice-making process can be seen in Figure 1.

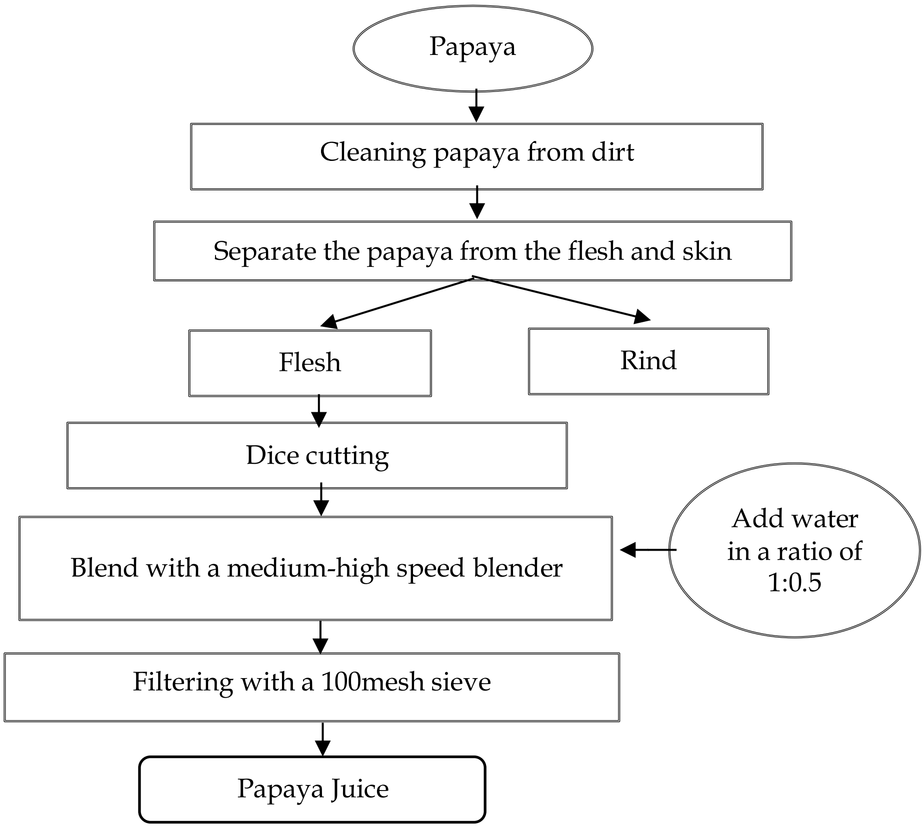

Figure 1. Papaya Juice Making Process
(Source: Efiyanti et al., (2022) with modifications)

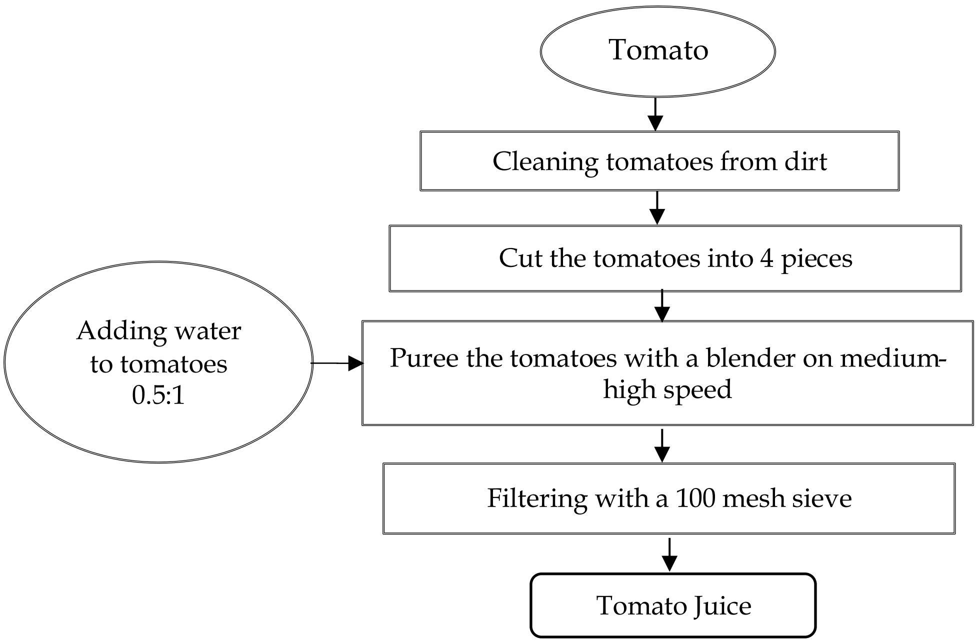

Figure 2. Making Tomato Juice
(Source: Novidahlia et al (2019) with modifcations)

Tomato Juice Production

The making of tomato juice refers to the research of Novidahlia *et al*., (2019) with the modification of the addition of water, which previously used a ratio of 1:1 modified to 0.5:1 addition of water to tomatoes. The process of making tomato juice is carried out by selecting tomatoes obtained from the market. The tomatoes used are ripe potato tomatoes, the same size (not too small and not too big with an average weight of 70 g) and red. After the selection is complete, the tomatoes are weighed at as much as 120 g, and then the tomatoes are cleaned so that there is no more dirt. After that, the tomatoes are cut into four parts and then pureed with a blender at medium-high speed. They were then filtered with a 100-mesh sieve. The flow diagram of the tomato juice-making process can be seen in Figure 2.

Jelly Drink Production

The making of this jelly drink refers to Sari *et al*., (2018) with modifications. Table 6 shows the jelly drink formula.

Table 6. Formula for Using Ingredients for Making Jelly Drink

Ingredients	**Weight (g)**			
	F0	**F1**	**F2**	**F3**
Water (ml)	600	0	0	0
Papaya (g)	0	360	420	480
Tomato (g)	0	240	180	120
Carrageenan (g)	0.6	0.6	0.6	0.6
Jelly Powder (g)	1	1	1	1
Sugar (g)	50	50	50	50
Lemon Juice	25	25	25	25
Total	676.6			

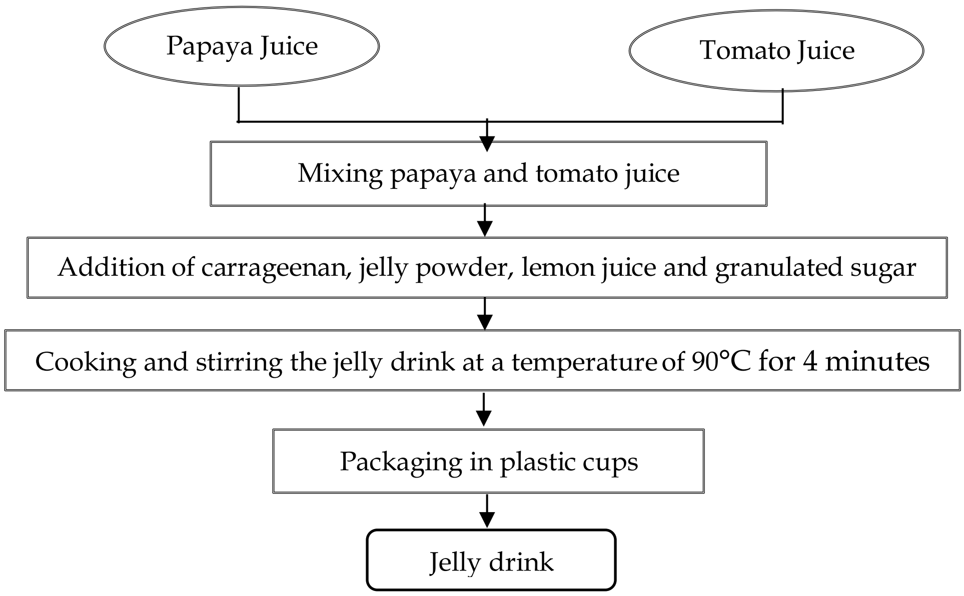

Figure 3. Making Jelly Drink
Source: Sari *et al* (2018) with modifications

The making of jelly drink begins with weighing papaya juice, tomato juice, and other ingredients. Then, the papaya and tomato juices are mixed. After mixing, carrageenan, jelly powder, lemon juice, and granulated sugar are added. Next, cooking is carried out at a temperature of 90°C, and stirring is carried out for 4 minutes. The cooked jelly drink is then placed in a heat-resistant container; wait until the texture of the jelly drink changes, and then store it in the refrigerator at a temperature below 4°C. The flow diagram of the jelly drink-making process can be seen in Figure 3.

Organoleptic Test

This study used a hedonic test and a hedonic quality test. The number of panelists in this study was 50 untrained panelists. The criteria for panelists in this study were:

1. Have an interest in sensory organoleptic testing.
2. Have time to complete the assessment.
3. Physically and mentally healthy.
4. Not hungry, complete, or stressed.

The hedonic test was applied by asking panelists to give their responses about likes or dislikes. Measurements were made using a numeric scale, and assessments were made using five scales: score 1 for the category of very dislike, score 2 for the category of dislike, score 3 for the category of somewhat like, score 4 for the category of like, and score 5 for the category of very like. The assessment scale can be seen in Table 7.

Table 7. Hedonic Test Assessment Scale

Mark	**Rating Scale**			
	Taste	**Aroma**	**Texsture**	**Color**
1	Very Dislike	Very Dislike	Very Dislike	Very Dislike
2	Dislike	Dislike	Dislike	Dislike
3	Somewhat Dislike	Somewhat Dislike	Somewhat Dislike	Somewhat Dislike
4	Like	Like	Like	Like
5	Very Like	Very Like	Very Like	Very Like

Hedonic quality test is a test to state the good or bad impression of a product. The hedonic quality test form is attached. Panelists' assessment of each variable uses 5 scales. The assessment scale can be seen in Table 8.

Table 8. Hedonic Quality Test Assessment Scale

Mark	**Rating Scale**			
	Taste	**Aroma**	**Texsture**	**Color**
1	Very No Papaya Flavor	Not Very Fragnant	Very Hard to Suck	Not Red
2	No Papaya Flavor	Not Fragnant	Not Easy to Suck	Very Red
3	Somewhat Papaya Flavor	Somewhat Fragnant	Somewhat Easy to Suck	Red
4	Somewhat Papaya Flavor and Somewhat Tomato Flavor	Fragnant	Easy to Suck	Red Slightly Orange
5	Very Flavorful and Tomato Flavor	Very Fragnant	Very Easy to Suck	Orange

Chemical Analysis

The nutritional value of papaya and tomato jelly drink is analyzed based on water content (SNI 01-2891-1992), ash content (SNI 01-2891-1992), fat content (SNI 01-2891-1992), protein content (AOAC 2001.11. 2005 and SNI 01-2891-1992), carbohydrate content (by difference), and vitamin C content (AOAC 2012.21.2012).

Data Analysis

This study used a Completely Randomized Design (CRD). The treatment was a comparison of the addition of papaya and tomatoes in the formulation consisting of 3 levels, namely F1 (60%: 40%), F2 (70%: 30%), F3 (80%: 20%) and F0 (0%: 0%) as a control. Furthermore, hedonic test data and hedonic quality test were analyzed using SPSS version 22. Proximate test data, total energy, and vitamin C were analyzed using ANOVA, followed by the Duncan test at a 95% significance level. Organoleptic test data were analyzed using the Kruskal Wallis test and Mann-Whitney test at a 95% significance level. The Exponential Comparison Method (MPE) was used to determine the selected formulation.

RESULTS AND DISCUSSION

Papaya Juice

Papaya was obtained from traders at Pos Duri Market, Tambora, West Jakarta. The process of making papaya juice begins with selecting papaya, cleaning, cutting, smoothing with a blender, and filtering. The finished papaya juice is placed in an airtight container or plastic and stored at room temperature. Table 9 shows the results of the analysis of proximate levels, energy, and vitamin C of papaya juice.

Table 9. Proximate, Energy, and Vitamin C Levels of Papaya Juice

Nutritional Content	Mark
Water (%)	95.88
Ash (%)	0.75
Protein (%)	0.41
Fat (%)	0.01
Carbohydrate (%)	2.97
Energy (kkal)	13.5
Vitamin C (mg/100 g)	14.26

Table 9 proves that the vitamin C content in papaya juice is relatively high, at 14.26 mg/100 g. This finding is different from the research of Miranti *et al.*, (2016), which stated that the vitamin C content in papaya juice is 7.94 mg/100 g. The difference in vitamin C in papaya juice is due to the addition of different water. In the research of Miranti *et al.*, (2016), the water used was 150 mL, while in this study, the water used was 50 mL.

Tomato Juice

Tomatoes were obtained from traders at the Pos Duri market, Tambora, West Jakarta. The process of making tomato juice begins with selecting tomatoes, cleaning, cutting, smoothing with a blender, and filtering. The finished tomato juice is placed in an airtight container or plastic and stored at room temperature. Table 10. shows the results of the analysis of energy, vitamin C, and proximate levels of tomato juice.

Table 10. Proximate, Energy, and Vitamin C Levels of Tomato Juice

Nutritional Content	Mark
Water (%)	98,13
Ash (%)	0,24
Protein (%)	0,42
Fat (%)	0,01
Carbohydrate (%)	1,22
Energy (kkal)	6,54
Vitamin C (mg/100 g)	2,76

Based on Table 10, the vitamin C content in tomato juice is 2.76 mg. This is different from the research of Wibowo *et al.*, (2014), which stated that tomato juice contains 1.97 mg of vitamin C. During the processing process, in the research of Wibowo *et al*., (2014), tomatoes were blanched, and 100 mL of water was added, while in this study, tomatoes were added with 50 mL of water.

Proximate Content and Energy of Jelly Drink

This study used chemical analysis of proximate tests (water content, ash, protein, fat, carbohydrates), energy, and vitamin C in a jelly drink mixed with papaya and tomato juice. The results of the data normality test using Shapiro-Wilk showed that the water, energy, carbohydrate, and vitamin C content were normally distributed, so the Anova test and Duncan test were used. However, ash, protein, and fat were not normally distributed, so the Kruskal-Walls test was used. Based on the analysis results in Table 11. the average difference in proximate content and energy of papaya and tomato jelly drinks was obtained.

The results of the analysis of the water content of papaya and tomato jelly drinks showed an average amount of F0 (91.63 g), F1 (87.41 g), F2 (90.73 g), and F3 (85.01 g). The results of the ANOVA test in Table 11 showed P <0.05. Based on Table 11. The water content will decrease if more papaya juice is used. This result is because tomato juice has more water than papaya juice. Proximate analysis showed that the water content in papaya juice was 95.87 g, while tomato juice was 98.13 g.

Table 11. Proximate and Energy Levels of Papaya and Tomato Jelly Drink

Parameter	Average			
	F0 (0% : 0%)	**F1 (60% : 40%)**	**F2 (70% : 30%)**	**F3 (80% : 20%)**
Water content (g)	91,63 ± 0,296[a]	87,41 ± 0,240[b]	90,73 ± 0,480[a]	85,01± 0,509[c]
Ash content (g)	0,10 ± 0,007[a]	0,41 ± 0,014[a]	0,44 ± 0,021[a]	0,40 ± 0,014[a]
Protein (g)	0,29 ± 0,015[a]	0,72 ± 0,375[a]	0,46 ± 0,007[a]	0,47 ± 0,071[a]
Fat (g)	0,01 ± 0,000[a]	0,01 ± 0,000[a]	0,01 ± 0,000[a]	0,01 ± 0,000[a]
Carbohydrate (g)	8,00 ± 0,325[a]	11,48 ±0,594[b]	8,39 ± 0,502[a]	14,13 ± 0,424[c]
Energy (kkal)	33,11 ± 1,230[a]	48,76 ± 0,905[b]	35,36 ± 2,036[a]	58,84 ± 1,357[c]

Note: Differences in letters after the numbers in the same row indicate that there is a significant difference at the 5% level.

The results of the study of the ash content of papaya and tomato jelly drinks showed an average amount of F0 (0.10 g), F1 (0.41 g), F2 (0.44 g), and F3 (0.40 g). The results of the Kruskal Wallis test for the ash content parameter showed P>0.05. This result is contrary to the research of Neswati (2014), which states that the ash content increases when papaya juice is added to beef gelatin. The ash content in papaya and tomato juice is 0.75% and 0.24%, respectively. The higher the ash content in food ingredients, the more minerals there will be (Susanti, Lubis, and Meilidayani 2017).

The results of the analysis of the protein content of papaya and tomato jelly drinks showed an average of F0 (0.29 g), F1 (0.72 g), F2 (0.46 g), and F3 (0.47 g). The results of the Kruskal Wallis test of protein parameters showed P> 0.05, which means there was no significant difference in treatment (F0, F1, F2, and F3) on the protein content of papaya and tomato jelly drinks. This finding is not in line with the research of Anggiya PS (2014), which stated that there was an increase in the protein content of cassava tape due to the addition of papaya juice. This difference is due to the protein content obtained in papaya juice and tomato juice which is small, namely 0.41% and 0.42%.

The results of the analysis of the fat content of papaya and tomato jelly drinks show an average amount of F0 (0.01 g), F1 (0.01 g), F2 (0.01 g), and F3 (0.01 g). The results of the Kruskal Wallis test for fat parameters showed P> 0.05, which means there is no significant difference in treatment (F0, F1, F2, and F3) on the fat content of papaya and tomato jelly drinks. Based on Table 11. there is no difference in fat content between formulations. This condition is because the fat content in papaya and tomato jelly drinks is minimal, namely 0.01 g. According to laboratory analysis, papaya juice contains 0.01 g of fat, and tomato juice contains 0.01 g of water.

The results of the analysis of the carbohydrate content of papaya and tomato jelly drinks showed an average amount of F0 (8.00 g), F1 (11.08 g), F2 (8.39 g), and F3 (14.13 g). The results of the ANOVA test showed P <0.05. Based on Table 11. the carbohydrate content will increase if more papaya juice is used. This result is because the carbohydrate content in papaya and tomato juice is small. According to proximate analysis, papaya juice has a carbohydrate content of 2.97%, and tomato juice has a carbohydrate content of 1.22%. Based on research by Fatkurahman *et al.*, (2012), the amount of carbohydrates is calculated using the by-difference method, which is influenced by several nutritional elements, namely water, ash, protein, and fat. So, the high dietary components (protein and fat) will make the carbohydrate content low, and vice versa. If the nutritional components are low, the carbohydrate content will be prominent. The results of the analysis of the energy content of papaya and tomato jelly drinks showed an average of F0 (33.11 g), F1 (48.76), F2 (35.36), and F3 (58.84). The results of the ANOVA test showed P <0.05. Based on Table 11. the energy content will increase if the amount of papaya juice used is more significant. This finding is because the energy content in papaya juice is greater than that of tomato juice. According to proximate analysis, papaya juice has an energy content of 13.5 kcal and tomato juice 6.54 kcal. Meanwhile, the F0 jelly drink has the lowest energy content because it is not added to papaya juice and tomato juice.

Vitamin C Level

The results of the analysis of vitamin C levels in papaya and tomato jelly drinks showed an average of F0 (0.00 mg), F1 (6.82 mg), F2 (7.12 mg), and F3 (7.91 mg). Jelly drinks that were added with papaya and tomato juice had higher vitamin C levels compared to those that were not added with papaya and tomato juice.

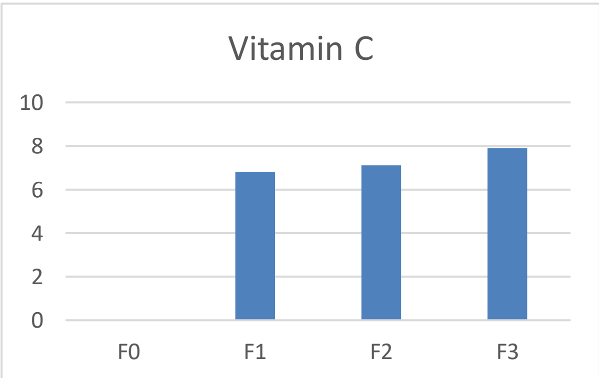

Figure 4. Vitamin C Levels

The results of the ANOVA test showed P <0.05. Based on Figure 4. the vitamin C content will decrease if the tomato juice used increases. This result is because tomato juice has a lower amount of vitamin C compared to papaya juice. According to proximate analysis, papaya juice contains 14.26 mg of vitamin C, while tomato juice contains 2.76 mg of vitamin C. This finding is contrary to the study of Miranti *et al.*, (2016), which stated that the vitamin C content of papaya juice jelly drink is 5.67 mg/100 mL. This difference in vitamin C content occurs because the temperature and time used are different in processing the product, so vitamin C is damaged due to the oxidation process, especially during the processing process (Miranti *et al.* 2016).

Organoleptic Characteristics

The jelly drink is then tested using an organoleptic test. The organoleptic test aims to determine the panelists' acceptance of the product. Based on the analysis results in Table 12, there were differences between the hedonic test and the average hedonic quality of the papaya and tomato jelly drinks of the four formulations.

Table 12. Average Results of Hedonic Tests and Hedonic Quality of Papaya and Tomato Jelly Drink for the Four Formulations (F0, F1, F2, and F3)

Parameter	F0 (0% : 0%)	F1 (60% : 40%)	F2 (70% : 30%)	F3 (80% : 20%)
Hedonic Test				
Texture	$3,08 \pm 1,084^{a}$	$3,78 \pm 0,581^{b}$	$4,04 \pm 0,493^{c}$	$3,64 \pm 0,631^{b}$
Color	$2,66 \pm 0,871^{a}$	$3,56 \pm 0,732^{b}$	$3,88 \pm 0,520^{c}$	$3,66 \pm 0,592^{c}$
Aroma	$2,66 \pm 1,153^{a}$	$4,12 \pm 0,718^{b}$	$3,64 \pm 0,749^{c}$	$3,82 \pm 0,719^{b}$
Taste	$2,70 \pm 0,994^{a}$	$3,44 \pm 0,643^{b}$	$3,88 \pm 0,520^{c}$	$3,94 \pm 0,651^{c}$
Hedonic Quality Test				
Texture	$4,50 \pm 0,788^{a}$	$3,94 \pm 0,373^{b}$	$4,06 \pm 0,313^{b}$	$3,86 \pm 0,639^{bc}$
Color	$1,66 \pm 0,772^{a}$	$3,72 \pm 0,757^{b}$	$3,64 \pm 0,692^{c}$	$3,58 \pm 0,730^{c}$
Aroma	$1,00 \pm 0,000^{a}$	$3,96 \pm 0,902^{b}$	$4,36 \pm 0,898^{b}$	$4,20 \pm 0,815^{b}$
Taste	$1,34 \pm 0,592^{a}$	$3,78 \pm 1,148^{b}$	$3,70 \pm 0,814^{b}$	$4,18 \pm 0,873^{bc}$

Note: Differences in letters after the numbers in the same row indicate that there is a significant difference at the 5% level.

Hedonic Test and Hedonic Quality Test

Texture

Table 12 shows the results of the organoleptic texture test of papaya and tomato juice jelly drinks. The hedonic texture test shows the average values of F0 (3.08), F1 (3.78), F2 (4.04), and F3 (3.64). Based on the hedonic test, the highest average hedonic texture value is owned by F2, so F2 is the product most preferred by panelists when compared to F0, F1, and F3 because its texture is easy to suck, namely, not too liquid or solid. The results of the Kruskal Wallis test show that the addition of papaya and tomatoes in making jelly drinks has a significant effect on the hedonic texture of jelly drinks ($p < 0.05$).

The results of the hedonic quality test of papaya and tomato juice texture for jelly drinks show that the average value of F0 is 4.50, F1 is 3.94, F2 is 4.06, and F3 is 3.86, respectively. Based on the hedonic quality test, F0 is the product with the highest hedonic texture value compared to F1, F2, and F3. The results of the Kruskal Wallis test show that adding papaya and tomatoes to jelly drinks is really Carrageenan, and shelf life also affects the texture of jelly drinks. This result is in line with research conducted by Vania *et al.*, (2017), which shows that the more papaya juice added, the easier it is to suck the texture of the jelly drink.

Color

The results of the organoleptic color test of papaya and tomato juice jelly drinks are shown in Table 12 with the average values of F0 (2.66), F1 (3.56), F2 (3.88), and F3 (3.66). Based on the hedonic test, the highest average hedonic color value is owned by F2, so F2 is the product that is most preferred by panelists when compared to F0, F1, and F3 because it has a slightly orange-red color. The results of the Kruskal Wallis test showed that the addition of papaya and tomatoes in making jelly drinks had a significant effect on the hedonic texture of each jelly drink formula (p<0.05).

The results of the hedonic color quality test of jelly drinks containing papaya and tomato juice showed an average value of F0 of 1.66, F1 of 3.72, F2 of 3.64, and F3 of 3.58, respectively. The results of the Kruskal Wallis test showed that when compared to F0, F1, and F3, the addition of papaya and tomatoes to jelly drinks really had an impact on the hedonic quality of their texture. The difference can influence this result when papaya and tomatoes are added to each formulation. The more papaya is given, the more orange the color of the jelly drink produced will be. This result is in line with research conducted by Maulana *et al.*, (2018), which showed that the color of yogurt becomes more orange when more papaya juice is added. Papaya juice has an orange color that contains pigment compounds in the form of carotenoids as a color giver.

Aroma

The results of the organoleptic aroma test of papaya and tomato juice jelly drinks are shown in Table 12. The average hedonic value of F0 was 2.66, F1 was 4.12, F2 was 3.64, and F3 was 3.82, respectively. Based on the hedonic test, product F1 was most preferred by panelists compared to F0, F2, and F3 because it had a fragrant aroma (a fruity aroma was smelled). The results of the Kruskal Wallis test showed that the addition of papaya and tomato to the jelly drink really affected the hedonic aroma in each formula (p<0.05).

The results of the hedonic quality test of papaya and tomato juice aroma for jelly drinks showed the average hedonic aroma value of F0 (1.00), F1 (3.96), F2 (4.36), and F3 (4.20). The results of the Kruskal Wallis test showed that when compared to F0, F1, and F3, the addition of papaya and tomatoes to jelly drinks affected the hedonic quality of the aroma. This finding is in line with the research of Maulana *et al.*, (2018), which found that the more papaya juice added, the more intense the distinctive aroma produced. Lemon juice was added to the making of jelly drinks and neutralized the characteristic aroma of papaya. This process aims to increase sensory acceptance, which is expected to minimize the smell of papaya. According to Zusar (2019), lemon is often added as a freshener, flavoring, and decoration in the management of food ingredients.

Taste

The results of the organoleptic test of the taste of papaya and tomato juice jelly drinks are presented in Table 12. The results of the hedonic taste test show that the average value of F0 (2.70), F1 (3.44), F2 (3.88), F3 (3.94). Based on the hedonic test, the highest average hedonic value of taste was owned by F3, so F3 became the product most preferred by panelists when compared to F0, F1, and F2 because, based on the panelists' assessment, it has a distinctive taste of papaya and tomato. The results of the Kruskal Wallis test showed that the addition of papaya and tomato in making jelly drinks had a significant effect on the hedonic taste of each jelly drink formula (p<0.05).

The results of the organoleptic test of the taste of papaya and tomato jelly drinks are shown in Table 12. The average hedonic value of F0 was 2.70, F1 was 3.44, F2 was 3.88, and F3 was 3.94 so F3 became the product most preferred by panelists when compared to F0, F1, and F2. Based on the panelists' assessment, F3 has a distinctive taste of papaya and tomato. The results of the Kruskal Wallis test showed that adding papaya and tomato to jelly drinks increased the hedonic taste of each formula (p<0.05). This finding is because there is a difference in the addition of papaya and tomato juice in each treatment. The more papaya juice added, the more the jelly-drink taste preference value will increase, and the more papaya will be felt. This condition is different from the research of Gabriela *et al.*,

(2018) in making instant papaya and nutmeg powder drinks because the papaya juice used in the treatment has the exact measurement. In addition, the taste of jelly drinks is different because of different responses to the same stimulus. There is a difference in the sensation received in the sensitivity of the sensory organs or a lack of training to convey what the panelists feel in words or numbers (Setyaningsih *et al.,* 2014).

Selected Jelly Drink

Based on the weighting results of the organoleptic test using MPE, jelly drink F2 (360 g: 240 g) became the selected jelly drink with a total score of 19.66. The chemical composition of the chosen jelly drink is a water content of 90.73 g, ash content of 0.44 g, protein of 0.46 g, fat of 0.01 g, carbohydrate of 8.34 g, energy of 35.36 kcal, and vitamin C 7.12 mg/100 g. In the nutritional information, one serving of the selected jelly drink is set at 170 mL. In one serving, the total energy obtained is 60 kcal, protein 0.12 g, fat 0.002 g, carbohydrate 14 g, and vitamin C 12 mg.

CONCLUSION

The use of papaya and tomatoes in making jelly drinks has been proven to increase nutritional value, especially vitamin C levels. Jelly drink formulation with the addition of papaya and tomatoes by 70%: 30% became the selected jelly drink product. This finding proves that the characteristics of papaya and tomato jelly drinks are acceptable to the panelists.

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REFERENCES

Andrian, Rizki Fajar, and Gres Maretta. 2017. "Keanekaragaman Serangga Pollinator Pada Bunga Tanaman Tomat (Solanum Lycopersicum) Di Kecamatan Gisting Kabupaten Tanggamus." *Biosfer: Jurnal Tadris Biologi* 8(1):105–13. doi: 10.24042/biosf.v8i1.1269.

Anggiya PS, Sofi. 2012. "Uji Kadar Protein Dan Organoleptik Tape Singkong (Manihot Utilissima) Dengan Penambahan Sari Buah Pepaya (Carica Papaya L.) Ddan Dosis Ragi Yang Berbeda." *Jurnal Pendidikan Biologi FKIP UMS*.

Apriani, Wulan, Amir Musaddad M, and DIar Herawati E. 2018. "Analisis Kandungan Makro Dan Mikro Nutrisi Pada Jelly Drinks (Minuman Jeli) Berbahan Dasar Pepaya (Carica Papaya L) Sebagai Alternatif Pangan Fungsional." 68–72.

BPOM RI. 2016. "Peraturan Kepala Badan Pengawas Obat Dan Makanan Republik Indonesia Nomor 9 Tahun 2016 Tentang Acuan Label Gizi." *BPOM RI* 1–9.

BPOM RI. 2019. "Peraturan Badan Pengawas Obat Dan Makanan Nomor 34 Tahun 2019 Tentang Kategori Pangan." *Badan Pengawas Obat Dan Makanan* 1–308.

Dewi, Asiska Permata. 2019. "Penetapan Kadar Vitamin C Dengan Spektrofotometri UV-Vis Pada Berbagai Variasi Buah Tomat." *JOPS (Journal Of Pharmacy and Science)* 2(1):9–13. doi: 10.36341/jops.v2i1.1015.

Efiyanti, Iis, Yenni Okfianti, and Okdi Natan. 2022. "Pengaruh Penambahan Sari Pepaya Pada Yoghurt Susu Sapi Terhadap Daya Terima Organoleptik, PH, Dan Total Bakteri Asam Laktat (BAL)." 33(1):1–12.

Fatkurahman, Rifa, Windi Atmaka, and Basito. 2012. "Karakteristik Sensoris Dan Sifat Fisikokimia Cookies Dengan Subtitusi Bekatul Beras Hitam (Oryza Sativa L.) Dan

Tepung Jagung (Zea Mays L.).” *Jurnal Teknosains Pangan* 1(1):49–57.

Gabriela, Michella C., Dekie Rawung, and Maya M. Ludong. 2018. “Pengaruh Penambahan Maltodekstrin Pada Pembuatan Minuman Instan Serbuk Buah Pepaya (Carica Papaya L.) Dan Buah Pala (Myristica Fragrans H.).”

Hamzah, A. 2014. *9 Jurus Sukses Bertanam Pepaya California*. 1st ed. PT Agromedia Pustaka.

Ilohuna, Sulistiani A., Fadli Syamsuddin, Sabirin B. Syukur, Program Studi, Ilmu Keperawatan, Universitas Muhammadiyah, and Kabupaten Gorontalo. 2023. “Pengaruh Pemberian Jus Buah Pepaya Terhadap Penurunan Tekanan Darah Pada Penderita Hipertensi Di Wilayah Kerja Puskesmas Bilato.” 1(1):129–38.

Kaboré, Kabakdé, Abdoudramane Sanou Kiéssoun Konaté, Roger Dakuyo, Hemayoro Sama, Balamoussa Santara, and Ella Wendinpuikondo Rakèta Compaoré 1. and Mamoudou Hama Dicko. 2022. “Tomato by Products, a Source of Nutrients for the Prevention and Reduction of Malnutrition.” *Nutrients*.

Kasumayanti, Erma. 2017. “Efektivitas Pemberian Terapi Jus Pepaya Dalam Menurunkan Tekanan Darah Pasien Hipertensi Di Wilayah Kerja Puskesmas Sungai Piring Kabupaten Indragiri Hilir Tahun 2016.” *Jurnal Ners Universitas Pahlawan Tuanku Tambusai* 1(1):89–97.

Kementerian Kesehatan. 2018. *Tabel Komposisi Pangan Indonesia*. Jakarta.

Krisnanda, Restu. 2020. “Vitamin C Membantu Dalam Absorpsi Zat Besi Pada Anemia Defisiensi Besi.” *Jurnal Penelitian Perawat Profesional* 2(3):279–86.

Lase, Meiyanti. 2022. “Gambaran Tingkat Pengetahuan Mahasiswa/i Fakultas Kedokteran Universitas HKBP Nommensen Medan Tentang Peran Vitamin C Untuk Kesehatan Kulit Tahun 2021.” *Repository Universitas HKBP* 4(1):88–100.

Luthfiya, Lulu’, Durrotun Nafisah, Kartika Pibriyanti, Zid Amalia Khusniyati, Sayidatu Ulinuha, Lola Zahro, Laila Sari Mawadati, and Nuryuni Ekawidya Widodo. 2021. “Pengaruh Pemberian Jus Tomat Terhadap Tekanan Darah Pada Remaja Putri.” *Jurnal Kesehatan* 14(2):178–83. doi: 10.23917/jk.v14i2.14787.

Marin, Susi Merry, Desniar, and Joko Santoso. 2016. “Karakterisasi Minuman Jelly Probiotik Dengan Penambahan Lactobacillus Plantarum (SK5) Asal Bekasam Selama Penyimpanan.” *Jurnal Pengolahan Hasil Perikanan Indonesia* 19:288–98. doi: 10.17844/jphpi.2016.19.3.288.

Maulana, Ade Sukti, Mohammad Abbas Zaini, and Nazaruddin. 2018. “Pengaruh Proporsi Sari Buah Pepaya (Carica Papaya L.) Dan Susu Sapi Terhadap Aktivitas Antioksidan Dan Sifat Organoleptik Yoghurt.” 1–11.

Miranti, Mira, Bina Lohitasari, and Desy Rizky Amalia. 2017. “Formulasi Dan Aktivitas Antioksidan Permen Jelly Sari Buah Pepaya California (Carica Papaya L.).” *BMC Public Health* 5(1):1–8.

Miranti, Mira, Sri Wardatun, and Andi Fauzi. 2016. “Aktivitas Antioksidan Minuman Jeli Sari Buah Pepaya California (Carica Papaya L.).” *FITOFARMAKA: Jurnal Ilmiah Farmasi* 6(1):39–51. doi: 10.33751/jf.v6i1.753.

Neswati. 2013. “Karakteristik Permen Jelly Pepaya (Carica Papaya L .) Dengan Penambahan Gelatin Sapi.” *Jurnal Agroindustri* 3(2).

Novidahlia, Noli, Titi Rohmayanti, and Yuni Nurmilasari. 2019. “Karakteristik Fisikokimia Jelly Drink Daging Semangka, Albedo Semangka, Dan Tomat Dengan Penambahan Karagenan Dan Tepung Porang (Amorphophallus Muelleri Blume).” *Jurnal Agroindustri Halal* 5(1):057–066. doi: 10.30997/jah.v5i1.1694.

De Nuccio, Francesco, Antonia Cianciulli, Chiara Porro, Marianna Kashyrina, Melania Ruggiero, Rosa Calvello, Alessandro Miraglia, Giuseppe Nicolardi, Dario Domenico Lofrumento, and Maria Antonietta Panaro. 2021. “Inflammatory Response

Modulation by Vitamin C in an MPTP Mouse Model of Parkinson's Disease." *Biology* 10(11). doi: 10.3390/biology10111155.

Nuraini, Vivi, and Kapti Rahayu Kuswanto. 2020. "Kampanye Pemanfaatan Pangan Fungsional Untuk Meningkatkan Imunitas Tubuh Dalam Menghadapi Pandemi Di Kabupaten Boyolali." *JMM (Jurnal Masyarakat Mandiri)* 4(5):922–29.

Putri, Karina Aulia, Tia Novita, Zhafirah Hanin, and Sudana Fatahillah Pasaribu. 2022. "Potensi Kandungan Vitamin C Pada Buah Tomat Terhadap Penyakit Scurvy." *Jurnal Menara Medika* 5(1):66–73.

Qolsum, Noven Nindya. 2020. "Variasi Bahan Pengikat Terhadap Sifat Fisikokimia Dan Sensori Jelly Drink Buah Kawista." 21(1):1–9.

Sari, Vibrian Mustika, Sri Haryati, and Aldila Sagitaning Putri. 2018. "Variasi Konsentrasi Karagenan Pada Pembuatan Jelly Drink Mangga Pakel (Mangifera Foetida) Terhadap Sifat Fisikokimia Dan Uji Organoleptik." *Teknologi Pertanian: Universitas Semarang* 1–15.

Setyaningsih, Dwi, Anton Apriyantono, and Maya Puspita Sari. 2014. *Analisis Sensori Untuk Industri Pangan Dan Agro*. edited by D. S. Sardin. PT Penerbit IPB Press.

Suarni, and Yasin. 2015. "Jagung Sebagai Sumber Pangan Fungsional." *Iptek Tanaman Pangan* 6(1):41–56.

Supriadi, Dedi, Teguh Akbar Budiana, Galih Jantika, and Suharjiman. 2022. "Kejadian Anemia Berdasarkan Asupan Energi, Vitamin B6, Vitamin B12, Vitamin C, Dan Keragaman Makanan Pada Anak Sekolah Dasar Di MI PUI Kota Cimahi." *Jurnal Ilmu Kesehatan Bakti Husada : Health Sciences Journal* 13. doi: 10.34305/jikbh.v13i1.467.

Susanti, Irma, Enny Hawani Lubis, and Shilvi Meilidayani. 2017. "Flakes Sarapan Pagi Berbasis Mocaf Dan Tepung Jagung." *Journal of Agro-Based Industry* 34(1):44–52.

Utami, Larasati Setyo. 2016. "Pengaruh Penambahan Jumlah Sari Tomat (Lycopersicum Esculentum Mill) Dan Sari Temulawak (Curcuma Xanthorhiza) Terhadap Sifat Organoleptik Jelly Drink." *Jurnal Boga* 5(1):158–67.

Vania, Jovica, Adrianus Rulianto Utomo, and Chatarina Yayuk Trisnawati. 2017. "Pengaruh Perbedaan Konsentrasi Karagenan Terhadap Karakteristik Fisikokimia Dan Organoleptik Jelly Drink Pepaya." *Jurnal Teknologi Pangan Dan Gizi* 16(1):8–3.

Wibowo, Riyan Arip, Fibra &. Nurainy, and Ribut Sugiharto. 2014. "Pengaruh Penambahan Sari Buah Tertentu Terhadap Karakteristik Fisik, Kimia, Dan Sensori Sari Tomat." *Jurnal Teknologi Industri Dan Hasil Pertanian* 19(1):11–27.

Widawati, Lina, and Hendri Hardiyanto. 2016. "Pengaruh Konsentrasi Karagenan Terhadap Sifat Fisik, Kimia, Dan Organoleptik Minuman Jeli Nanas (Ananas Comosus L. Merr)." *ARGITEPA* II(2):157–78.

Widjaja, Willy Pranata, Sumartini, and K. .. Salim. 2019. "Karakterististik Minuman Jeli Ikan Lele (Clarias Sp.) Yang Dipengaruhi Oleh Pemanis Dan Karagenan." *Pasundan Food Technology Journal* 6(1):73. doi: 10.23969/pftj.v6i1.1544.

Zusar, Nelshinta Maria. 2019. "Pembuatan Jelly Drink Berbasis Buah Bit (Beta Vulgaris) Sebagai Minuman Fungsional." 8(5):55.