Quality Analysis of Carrot and Tomato Juices Formula to Increase Local Resources Added Value

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Abstract

Citeko village is a potential carrot-producing village in Cisarua, this village has been able to produce seeds of local types that have good quality with the characteristics of red carrot color, not branching, straighter, and more extended. Processing carrots into syrup has a bright prospect because the taste is unique and the appearance of the natural color of carrots is beautiful. The business of processing carrots into fruit juice syrup has long been carried out. However, this business has not developed because the technology used is still simple and marketing is limited. In addition, the carrot and tomato juice syrup produced is not standard with low quality and is not stable continuously. This study aims to find the right formula for carrot and tomato juice syrup with a sugar concentration that suits consumers' desires. The best formula will be analyzed for quality standard parameters of carrot and tomato juice syrup on water content, carbohydrate content, vitamin A content, vitamin E content, and vitamin C content, fiber content, and total dissolved solids. These results are expected to be disseminated to the carrot syrup business group to improve the quality of the products produced to increase the added value of the product.

Keywords
Added value, local resources, carrot, tomato and syrup.

1. Introduction

Carrots (*Daucus carrota L*) and tomatoes (*Solanum lycopersicum*) are vegetables with the nickname of perfectly nutritious healthy intake, having a texture with the main content of water and carbohydrates (Febrihantana. 2014). Carrots and tomatoes are included in foods with a low glycemic index and do not cause blood sugar to spike. Vegetables are a very potential contributor of vitamin A to maintain eye health. Besides that, the antioxidant content functions as an antidote to cancer-causing free radicals. Consuming carrots regularly can increase immunity, lower cholesterol levels, and prevent cancer risk (Kumalaningsih. 2006).

Carrots and tomatoes are easily damaged vegetables, only able to last a few days if the storage is not good, then spoilage will occur. Vegetables with high water content are susceptible to fungus, which causes accelerated decay. At certain times there is over-production which results in a decrease in prices so that farmers suffer losses because they cannot cover production costs. Efforts to reduce farmers' losses in Citeko Village have made innovations in processing carrots into several types of products, lunkhead, crackers, and syrup. Processing carrots into syrup is an alternative product form from carrots that has a longer shelf life.

Carrots and tomatoes have similarities and differences in terms of the dominant phytochemical content. Tomatoes are rich in alpha-tocopherol, vitamin C, and lycophene, suitable for anticancer, while carrots are high in fiber, carotenoids, anthocyanins, and a unique combination of three flavonoids. The mixture of tomatoes and carrots that will be used as raw materials for fruit juice syrup provides a complementary effect so that the benefits for the body will be better. It is hoped that this carrot and tomato juice syrup will give the benefits of carrots and tomatoes with a delicious taste and practical help, where This fruit juice syrup will be processed from fresh and original fruit without the use of preservatives and artificial sweeteners.

Research Problem Formulation

1. How interaction effect of carrot and tomato juice formula with sugar concentration on carrot and tomato juice syrup quality.
2. How does the sari affect fruit on the quality of carrot and tomato juice syrup.

3. What is the effect of the right sugar concentration in the processing of carrot and tomato juice syrup that meets SNI syrup standards.

1.1 Objectives

1. Knowing the interaction of carrot and tomato juice formulas with sugar concentration on carrot and tomato juice syrup quality.
2. Knowing the effect of sari fruit on the quality of carrot and tomato juice syrup.
3. Knowing the effect of the right sugar concentration in carrot and tomato juice syrup processing that meets SNI syrup standards.

2. Literature Review

Carrot (*Daucus carota L.*)

Carrots are beneficial plants because they contain a lot of beta-carotene. The more orange the color, the higher the beta-carotene content. Harvesting carrots must be done carefully so as not to hurt the tubers. Wounds will cause bacteria, including bacteria from the Leuconostoc group, which proliferate and break down the sugar in carrots which will be converted into dextran, a mucus-shaped compound so that carrots are not suitable for consumption (Kumalaningsih, 2006).

Carrots are a type of annual tuber vegetable plant in the form of a shrub that grows upright with a height of between 30-100 cm or more, depending on the type or variety. Carrots are classified as annuals because they only produce once and then die. Carrot plants are short-lived, ranging from 70-120 days, depending on the variety (Cahyono, 2002). Carrots that are harvested early are still light orange because they don't contain much carotene. If the carrots are harvested too old, they will turn dark orange and the tubers will become stringy. Color development occurs quickly when carrots are planted in areas with a temperature of 15-20 ºC. The nutritional composition of carrots per 100 grams of material can be seen in the following table.

Table 1. Nutritional Composition of Carrots per 100 grams of Ingredients

Nutrient Components	Amount	Unit
Energy	calories	36.0
Protein	g	1.0
Fat	g	0.6
Carbohydrate	g	7.9
Fiber	mg	1.0
Calcium	mg	45.0
Posphor	mg	74.0
Iron	mg	1.0
Sodium	mg	70.0
Vitamin A	SI	7125
thiamine	mg	0.04
Riboflavin	mg	0.04
Niacin	mg	1.0
Vitamin C	mg	18.0
Water	g	89.9

Carrots are known as vitamin A. In addition, carrots also contain the minerals calcium (Ca), phosphorus (P), and potassium (K) and are a good source of fiber for the body. Every 100 grams of material contained energy of 42 calories (Febrihantana. 2014).

Carrots are rich in beta-carotene antioxidants, which can prevent free radicals from becoming cancerous. Carrots can reduce the risk of prostate cancer in men. Consuming carrots regularly can reduce the malignancy of free radicals. Should not drink too much because it will cause the skin to turn yellow. Besides being eaten fresh, carrots can also be steamed first and then consumed. Carrots are a source of detox food that can regulate imbalances in the body. Vegetables contain lots of beta-carotene, a precursor of vitamin A. Carrots as a source of vitamin A serves to help the process of vision.

Fresh carrots contain water, protein, carbohydrates, fat, fiber, ash, anticancer nutrients, natural sugars (fructose, sucrose, dextrose, lactose, and maltose), pectin, glutathione, minerals (calcium, phosphorus, iron, and sodium), vitamins (beta-carotene, B1 and C) and asparagine. Beta-carotene is an antioxidant that maintains health and inhibits the aging process. In addition, beta-carotene can prevent and suppress the growth of cancer cells and protect polyunsaturated fatty acids from the oxidation process. If the body requires vitamin A, beta-carotene in the liver will be converted into vitamin A. The function of vitamin A can prevent night blindness, accelerate wound healing and shorten the duration of measles. A medium-sized carrot contains about 12000 SI of beta-carotene.

Besides being used as food and medicine, carrot tubers can also be used for cosmetic purposes to treat facial and skin beauty, nourish hair, and others. Carotene in carrot tubers is useful for maintaining skin moisture and slowing the onset of wrinkles on the face so that the front always looks radiant (Cahyono, 2002).

Tomato (*Solanum lycopersicum*)
The tomato plant is one of the horticultural commodities with high economic value. Tomato is a vegetable commodity that is very important in supporting the community's food availability and nutritional adequacy. Many people love tomatoes because they taste good, are fresh and slightly sour, and contain many vitamins A, C, and a little vitamin B (Winarno. 2008).

Tomato plants are annual plants in shrubs or shrubs and are included in the flowering plant group (Angiospermae). The fruit is red and has a sweet, slightly sour taste. Tomatoes contain lots of vitamins and minerals. Tomato plants are toxic because they contain lycopersicin. However, the toxicity is low and will disappear by itself when the fruit is old or ripe. Perhaps it is because of this poison that young tomatoes taste bitter and smell bad. Tomato is one of the vegetables that can be grown all over the world. Tomatoes deserve the nickname as a commercial multi-benefit commodity.

Based on the shape, bunches, thickness of the flesh, and water content, there are 17 varieties of tomatoes. Each array has various variations, such as the shape of the tomatoes varies, some are round, round like apples, flat round, and some are like light bulbs.

Tomatoes contain vitamin A, vitamin C, potassium, phosphorus, magnesium, and calcium. Besides that, tomatoes also contain antioxidants that can reduce cancer attacks (Febrihantana. 2014). Tomatoes, like other vegetables and fruits, can be processed into a variety of food products. The nutritional composition of tomatoes in 100 grams is a protein (1 g), carbohydrates (4.2 g), fat (0.3 g), calcium (5 mg), phosphorus (27 mg), iron (0.5 mg).), vitamin A (carotene) 1500 SI, vitamin B (thiamine) 60 ug, vitamin C 40 mg. The body needs the vitamins contained in tomatoes for growth and health. Vitamin C is useful for preventing canker sores, maintaining healthy teeth and gums, and protecting against other diseases caused by vitamin C deficiency. Research in the United States shows that tomatoes can be used for cancer prevention, especially prostate cancer, if eaten regularly as five pieces per week. Based on the study results, it turns out that tomatoes have a relatively high nutritional value(Goel. 2005) as shown in the following table.

Table 2. Nutritional Value of Every 100 Grams Of Tomatoes

Nutrient content	Amount
Water	0.3 g
Protein	1 g
Fat	0.1 g
Carbohydrate	4 g
Fiber	0.6 g
Ash	1 g
Calorie	21 cal
Lime	15 mg
Phosphorus	30 mg
Iron	0.4 mg
VitaminA	100 IU
Vitamin B1	50 g
Vitamin B2	40 g

Niacin	0.7 mg
Vitamin C	25 mg

Tomatoes also contain phenolic compounds. Phenolic compounds, especially the flavonoids group, are known to have antioxidant properties that act as anticancer, anti-microbial, and have protective properties against heart disease (Febrihantana. 2014). How these compounds can act as antioxidants is a growing study material today. The group of phenolic acid compounds consists of two major groups, namely hydrobenzoic acid and hydrocinnamic acid. This group includes pyrulic acid, coumaric acid, and acid, which are naturally present in tiny amounts in plants, and d-quinic acid found in apples.

Damage to tomatoes can cause a decrease in the quality and economic value of the fruit commodity. Fruits are preferred to be consumed fresh, so various ways have been attempted to maintain the freshness of these fruits so that after harvesting, the fruit can last a long time (Qauliyah, 2008). Tomatoes are climacteric fruits, which are fruits that experience an increase in respiration after being harvested so that they can ripen completely after being harvested. The highest component of tomato fruit is water (26 - 93%).

Syrup Formulation and Manufacturing Process
The syrup is a solution of concentrated Sugar (sucrose) and or other inverted Sugar with or without the addition of food additives permitted by (SNI.01-35441994). According to Hidayat (2005), to add delicacy, aroma, and taste, flavor enhancers such as fruit juice, citric acid, and dyes can be added. According to Satuhu (2003), based on the primary raw material, the syrup is divided into 3 (three) namely: essence syrup, glucose syrup, and fruit syrup.

Fruit syrup taste and aroma are determined by the essential ingredients, namely fresh fruit. Fruit syrup is made by cooking sugar and filtered fruit juice until the sugar is completely dissolved and brought to a boil. Some ingredients such as citric acid and food coloring can add a sour taste and make the product look more attractive. Next, the cooked syrup is packaged in clean and sterile bottles. After the packaging process, the syrup product is re-sterilized to avoid contamination by microorganisms and other fruits (Khurniyati. 2015). Syrup can not be consumed directly. This is because the syrup has a very sweet and thick taste. The syrup has a sugar content of up to 55%. This is also what distinguishes syrup from fruit juice (Santosa, 2005).

Fruit that will be processed into syrup must be selected optimally ripe and healthy. Fully ripe fruit is needed so that the aroma of fruit syrup is strong and tastes good. The fruit that has been sorted is washed with clean water. The fruit is then cut or sliced into two or four parts, squeezed, and filtered to take the juice. In packing, you can use your hands or press or squeeze the fruit. The juice formed is filtered, then cooked with sugar, syrup that has been cooked, and then put in a sterile bottle. The bottle is then closed tightly. Sterilization is carried out to kill the disease, the bottle is boiled or steamed, and the product is re-sterilized for 15 - 30 minutes. The syrup quality requirements (SNI 01-3746-1995) are based on the Indonesian National Standard (SNI).

Table 3. Syrup Quality Requirements (SNI 01-3746-1995)

No	Test Criteria	Unit	Requirements
1.	state 1.1. Scent 1.2. Flavor	- -	 Normal Normal
2.	Sugar (counts as saccharose)	 % (w/w)	 Min 65
3.	Food Additives 3.1. Artificial sweeteners 3.2. Additional Dyes and Preservatives	 - -	 can't exist According to Regulation No. 722/MEN.KES/PER/IX/1998
4.	Metal Contaminants 4.1. Lead (Pb) 4.2. Copper (Cu) 4.3. Zinc (Zn)	 mg/kg mg/kg mg/kg	 Max 1.0 Max 10 Max 25
5.	Arsenic Contaminants (As)	Mg/kg	Max 0.5

6.	Microbial contamination		
	6.1. Total plate number	colony/ml	Max 5 x 10^2
	6.2. California	colony/ml	Max 20
	6.3. Escherichia coli	colony/ml	< 3
	6.4. Salmonella	colony/25 ml	Negative
	6.5. Staphylococcus aureus	colony/ml	0
	6.6. Vibrio cholerae	colony/ml	Negative
	6.7. when	colony/ml	Max 50
	6.8. Yeast	colony/ml	Max 50

In general, the syrup processing process consists of three stages: preparing ingredients, cooking, and filling or packing the syrup in an airtight container. The process of making syrup requires good control. This is because improper cooking will affect the shelf life. In general, the fruit to be processed into syrup must be selected optimally and healthy. Fully ripe fruit is needed so that the aroma of fruit syrup is strong and tastes good. Defective fruit contains microbes that are not good for processing into syrup.

Essential Factors in Making Syrup
In addition to carrots and tomatoes, the ingredients used in the syrup are sugar, citric acid, CMC, and mineral water. The use of these materials helps improve the process, improve the finished product's appearance and durability during storage. The composition of the fruit and the ingredients to be used in processing must be appropriate so that a final product with good quality can be produced.

Sugar is an indicator of quality in the preservation and manufacture of various food products. Common ones include jams, jellies, marmalades, concentrated fruit juices, fruit syrups, sugary fruits, tubers and skins, frozen fruits in syrup, sweet pickles, sweetened condensed milk, artificial honey, and so on. sugar is able to provide microbial stability in a food product if given in sufficient concentrations (above 50% dissolved solids are usually required), it is also common for sugar to be used as a combination of food preservation techniques.

Granulated sugar is one of the main components in making carrot and tomato syrup. Adding sugar in the manufacture of syrup is to obtain durability without affecting the cloudy appearance and ideal flavor because sugar is used as a preservative. At high sugar concentrations, the sugar solution can prevent the growth of bacteria, yeast, and mold. The mechanism is that sugar causes dehydration of microbial cells so that the cells undergo plasmolysis and inhibit their reproduction cycle. According to Almatsier (2009), the most crucial aspect of using sweeteners in beverages is to provide a sweet taste and provide caloric value to the drink. In addition, sweeteners also function in giving shape and flavor to the quality of the resulting beverage.

3. Methods
There were four levels of tomato and carrot juice formula in this study and two sugar concentration levels, namely 60% and 65%. The research flow chart can be seen in Figure 1.

Figure 1. Flowchart of Making Carrot Syrup

Experimental design
The design used in this study was a factorial randomized block design (RAK) with three replications. The treatment in this study is the difference in the ratio of carrot juice and tomato juice. There are eight treatment combinations with three replications, namely the first parameter there are four combinations of juice A1 = ratio of carrot juice and tomato juice (100: 0), A2 = ratio of carrot juice and tomato juice (75: 25) A3 = ratio of carrot juice and tomato juice (50:50) and A4 = ratio of carrot juice and tomato juice (25:75). The second parameter is the concentration of sugar (G), namely G1 = 60% and G2 = 65%.
The parameters tested in this study were total dissolved solids, pH, -carotene content, Vitamin C content, and entire sugar content. In addition, organoleptic tests were also carried out, including color, aroma, taste, and the level of full preference for carrot and tomato juice syrup.

4. Results and Discussion

The treatment in this study was the difference in carrot juice and tomato juice ratio, and there were eight treatment combinations with three replications.

Physicochemical Properties of Carrot and Tomato Extract
Total Dissolved Solids
Total dissolved solids analysis aims to measure the number of solids dissolved in water. The components contained in the fruit consist of water-soluble components such as glucose, fructose, sucrose, and pectin. The interaction between the ratio of carrot and tomato juice to the total soluble solids in carrot and tomato juice syrup can be seen in table 4.

Table 4. Interaction of Carrot and Tomato Extract Ratio with Sugar Concentration on Total Dissolved Solids (Brix)

The ratio of Carrot and	Sugar Concentration (%)

Tomato Juice (%)	G1 (60%)	G2 (65%)
A1 (100 : 0)	72.30b	72.42b
A2 (75 : 25)	73.41c	73.72c
A3 (50 : 50)	70,12a	70.31a
A4 (25 : 75)	69.93a	70.04a

Description: the same letter behind the number in the same column indicates no significantly different (P > 0.05).

The value of total dissolved solids increased and then decreased with increasing concentration of tomato addition above 25%. The cause of the decrease in the value of TPT in carrot and tomato juice syrup was a decrease in the amount of carrot flesh and also presumably due to an increase in the number of tomatoes. Carrot flesh contains a lot of sucrose, so that reducing the amount of carrot flesh in the syrup formulation will reduce the TPT value.

β-carotene levels

Table 5 shows that the increase in sugar concentration does not affect the beta-carotene content of carrot syrup because the source of beta carotene is from carrot pulp which is the raw material for carrot syrup. Boiling in the process of making carrot syrup can cause beta-carotene damage due to high temperatures. During boiling, beta-carotene color changes due to the cis-trans isomerization reaction, the oxidation forms carotenoid and apo-carotene epoxy (Rakhmawati,and Yunianta., 2015).

Table 5. Interaction of Carrot and Tomato Extract Ratio with Sugar Concentration on β-carotene (ppm) levels.

The ratio of Carrot and Tomato Juice (%)	Sugar Concentration (%)	
	G1 (60%)	G2 (65%)
A1 (100 : 0)	5.82c	5,68c
A2 (75 : 25)	5,01c	5,12c
A3 (50 : 50)	4,37b	4.25b
A4 (25 : 75)	3,54a	3,47a

Note: the same letter behind the numbers in the same column shows no significant difference (P > 0.05).

Total Sugar Level

The results of the total sugar of fruit syrup with the proportion of carrot juice with tomato juice can be seen in table 6.

Table 6. Interaction Ratio of Carrot and Tomato Extract with Sugar Concentration on Total Sugar Content (%) Carrot and Tomato Syrup

The ratio of Carrot and Tomato Juice (%)	Sugar Concentration (%)	
	G1 (60%)	G2 (65%)
A1 (100 : 0)	69.32a	71.12b
A2 (75 : 25)	69.39a	70.99b
A3 (50 : 50)	69.33a	71.14b
A4 (25 : 75)	69.21a	71.23b

Note: the same letter behind the numbers in the same column shows no significant difference (P > 0.05).

The statistical test results showed that the interaction of carrot juice with tomato juice had no significant effect on the total sugar content in fruit syrup. This is because the statistical results showed significance (P>0.05) for each treatment of the total sugar of fruit syrup. According to SNI 01-3544-1994 regarding fruit syrup, the minimum sugar content in fruit syrup is 65%. All medicines on this fruit syrup have met the requirements of SNI, where the sugar content of the fruit syrup produced in each treatment has a total sugar content ranging from 69.21% - 71.23%.

The pH of Carrot and Tomato Extract

The results of the pH analysis of the interaction of fruit syrup with the ratio of carrot juice to tomato juice can be seen in Table 7 and Figure 1.

Table 7. Interaction of Carrot and Tomato Extract Ratio with Sugar Concentration on pH of Carrot and Tomato Syrup

The ratio of Carrot and Tomato Juice (%)	Sugar Concentration (%)	
	G1 (60%)	G2 (65%)
A1 (100 : 0)	4.21a	4.19a
A2 (75 : 25)	3.96a	3.87a
A3 (50 : 50)	3.71a	3.79a
A4 (25 : 75)	3.69a	3.65a

Note: the same letter behind the numbers in the same column shows no significant difference (P > 0.05).

Adding tomato juice as much as 75% decreased the pH value significantly, although it did not significantly affect it. This is probably due to the pH value of fresh carrots of 5.07, which is higher than that of fresh tomatoes of 3.52.

Vitamin C Levels of Carrot and Tomato Extract

The statistical test results showed no interaction between the ratio of carrot juice and tomato juice with sugar concentration to vitamin C content in carrot and tomato syrup. This is because the statistical results showed significance (P>0.05) for each treatment of vitamin C syrup which can be seen in table 8.

Table 8. Interaction Ratio of Carrot and Tomato Extract with Sugar Concentration on Vitamin C Levels of Carrot and Tomato Syrup

The ratio of Carrot and Tomato Juice (%)	Sugar Concentration (%)	
	G1 (60%)	G2 (65%)
A1 (100 : 0)	5.91a	5.93a
A2 (75 : 25)	5.95a	6.12a
A3 (50 : 50)	6.03a	6.37a
A4 (25 : 75)	6.11a	6.39a

Note: the same letter behind the numbers in the same column shows no significant difference (P > 0.05).

Carrot and Tomato Extract Preferred Level

The level of preference for carrot and tomato syrup was tested using hedonic tests to determine the panelists' preference for syrup. The parameters used include color, taste, aroma, and overall pick. The scale used to test the level of choice for syrup is 1-5, 1 states 'very dislike' and five states 'very much likes.' Table 9 shows the score for the preference level of carrot and tomato syrup.

Table 9. Interaction between Ratip Fruit Juice and Sugar Concentration on the Average Hedonic Test Score of Color, Aroma, Taste and Overall Preference for Carrot and Tomato Syrup

Treatment	Color	Scent	Flavor	Whole
A1G1	4, 04a	3.12a	3.20a	3.45a
A1G2	4.12a	3.18a	3.12a	3.47a
A2G1	4.12a	4.12b	4.12b	4.12b
A2G2	4.18a	4.04b	4.02b	4.08b
A3G1	4.52b	4.36c	4.48c	4.45c
A3G2	4.48b	4.48c	4, 40c	4.45c
A4G1	4.12a	4.18b	4.20b	4.17b
A4G2	4.24a	4.20b	4.12b	4.17b

Note: the same letter behind the numbers in the same column shows no significant difference (P > 0.05).

The interaction between the ratio of fruit juice and sugar concentration to the average hedonic test score for color, aroma, taste, and overall preference for carrot and tomato syrup can be seen in Figure 2.

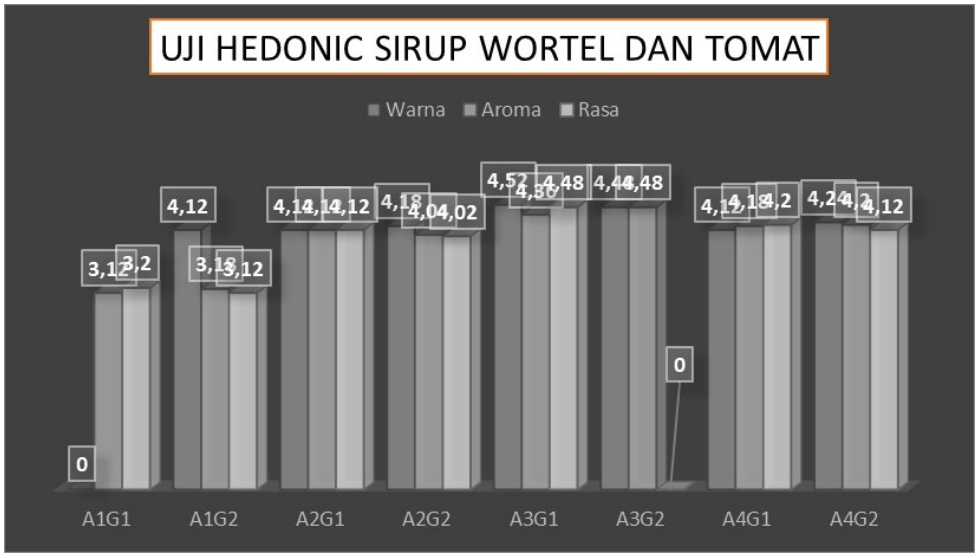

Figure 2. Interaction between Ratip Fruit Juice and Sugar Concentration on the Average Hedonic Test Score of Color, Aroma, Taste and Overall Preference for Carrot and Tomato Syrup

Physicochemical Properties of Carrot and Tomato Extract
Total Dissolved Solids
The value of total dissolved solids increased and then decreased with increasing concentration of tomato addition above 25%. The cause of the decrease in the value of TPT in carrot and tomato juice syrup was a decrease in the amount of carrot flesh and also presumably due to an increase in the number of tomatoes. Carrot flesh contains a lot of sucrose, so reducing the amount of carrot flesh in the syrup formulation will reduce the TPT value. In the refractometer, the refractive index value is equivalent to the total dissolved solids, calculated as the concentration of sucrose (BSN, 2008) and expressed in units of sucrose brix. Although there is a decrease in the albedo of carrots as a source of pectin, an increase in the number of tomatoes (source of pectin) added in syrup causes the pectin level to be at its optimal limit, making it difficult to dissolve. Hydrocolloids such as pectin and carrageenan can bind large amounts of water. Supposedly, decreasing the amount of pectin in the syrup can increase the value of TPT because the water-soluble components increase.

However, the results of studies that state otherwise indicate that apart from carrots, the pectin in syrup is sourced from tomatoes. Analysis of variance showed that the addition of tomatoes did not always significantly affect the total soluble solids value of carrot and tomato juice syrup. Furthermore, the addition of sugar concentration significantly affected the TPT value in each carrot and tomato juice syrup ratio. However, the results of studies that state otherwise indicate that apart from carrots, the pectin in syrup is sourced from tomatoes. Analysis of variance showed that the addition of tomatoes did not always significantly affect the total soluble solids value of carrot and tomato juice syrup.

Furthermore, the addition of sugar concentration significantly affected the TPT value in each carrot and tomato juice syrup ratio. However, the results of studies that state otherwise indicate that apart from carrots, the pectin in syrup is sourced from tomatoes. Analysis of variance showed that the addition of tomatoes did not always significantly affect the total soluble solids value of carrot and tomato juice syrup. Furthermore, the addition of sugar concentration significantly affected the TPT value in each carrot and tomato juice syrup ratio.

The addition of 0.2% CMC in each treatment in this study caused the total dissolved solids to increase because CMC is one of the stabilizers that can bind sugar, water, organic acids, and other components to become more stable. If all

elements such as water, sugar, organic acids, and other parts are well bound, the dissolved solids will be higher (Sulastri, 2008). The more particles are attached to the stabilizer, the total dissolved solids will also increase. The presence of a stabilizer means that the suspended particles will be trapped in the system and will not settle under the influence of gravity (Fitryaningtyas, and Widyaningsih., 2015).

β-carotene levels

Boiling in the process of making carrot syrup can cause beta-carotene damage due to high temperatures. During boiling, beta-carotene color changes due to the cis-trans isomerization reaction, the oxidation forms carotenoid and apo-carotene epoxy (Rakhmawati, and Yunianta., 2015). The addition of sugar concentration did not affect the increase in beta carotene levels, while the increasing ratio of carrot juice had a significant effect on increasing beta carotene levels. The results of the research by Fitri *et al*., (2017) showed that under pressure cooking conditions resulted in a lower beta-carotene retention level and vitamin A value than before cooking. This can happen to the carrot syrup studied because the manufacturing process goes through the boiling process for 20 minutes.

Total Sugar Level

Susanti's research (2016) the average total sugar in fruit syrup with the proportion of red dragon fruit with salak and the stabilizer type ranged from 73.33 %-74.66 % higher than the entire sugar content produced this study. However, this is influenced by the added raw materials and stabilizers. This is under the research of Fitri *et al.,* (2017). The difference in total sugar value is caused by different raw materials and additives used in making syrup. However, the proportion of red dragon fruit juice with carrot juice did not give a significant difference. This was because the total sugar content was more influenced by the addition of sugar from the outside. The more the concentration of sugar added, the more the whole sugar is present.

The pH of Carrot and Tomato Extract

There was no interaction between sugar concentration and the ratio of carrot juice to tomato juice. In contrast, the single effect of carrot and tomato juice percentage affected the pH of carrot and tomato syrup. The greater the concentration of tomato juice compared to carrot juice used, the lower the pH of the fruit syrup. Carrot juice tested without adding citric acid and sodium benzoate showed a pH of 5.9 (Triastuti *et al*., (2013). In this study, it was proven that the more addition of tomato juice, the pH of the carrot syrup produced would decrease according to the research of Triastuti et al. , (2013) that with the addition of soursop mixed fruit in carrot juice, the pH of carrot juice will decrease. The carrot and tomato syrup produced in this study had a pH ranging from 3.25 to 4.21.

Vitamin C Levels of Carrot and Tomato Extract

The results showed that there was no interaction between the two treatments in this study. However, the higher the added sugar concentration, the more vitamin C in the syrup will increase but not statistically significant. According to Puteri *et al.* (2015), increasing sugar levels in carrot and tomato syrup will cause the ingredients to become more stable, and vitamin C, which is easily soluble in water, can damage vitamin C will be smaller. The table shows that the ratio of carrot juice to tomato juice has no significant effect on vitamin C levels.

Carrot and Tomato Extract Preferred Level

The color of the syrup product will generally follow the natural color of the fruit used in making the syrup. As well as syrup from a mixture of carrot juice with tomato juice, both of which have exciting color textures. The red color is produced from the color of tomato juice which has a red color that is made from anthocyanin compounds. Anthocyanins are water-soluble pigments, producing colors from red to blue (Hidayah. 2013). This affects the color that appears in the fruit syrup so that the panelists can see it and judge it well.

The aroma of Carrot and Tomato Syrup produced ranges from 3.12 to 4.20 or scores in the like to very like category. The highest value was obtained from the treatment of the ratio of carrot and tomato juice 50%: 50% were in this ratio the unpleasant smell of carrots was no longer smelled, and the aroma of the syrup was very well-liked by the panelists where the distinctive aroma of carrots could still be maintained.

The taste of Carrot and Tomato Syrup showed an interaction between the carrot and tomato syrup flavors. The average score of panelists' preference for the taste of carrot syrup is 3.12 - 4.48, where this score is a category from liking to a very liking for all treatments. The highest score or the most preferred carrot syrup taste was syrup with a ratio of 50% carrot juice and 50% tomato juice. At the same time, the concentration of sugar does not affect the taste of carrot syrup. The dominant taste in the syrup from the mixture of carrot juice with tomato juice is the sweet taste

of sugar due to the addition of sugar in high concentrations, namely 60% and 65%. Fitriyono (2010) states that sucrose is a chemical compound with a sweet taste, white color, and soluble in water.

The total preference for carrot and tomato syrup showed no interaction effect between fruit juice and sugar concentration ratio to the total preference for carrot syrup with the addition of tomato juice. This effect indicates that the ratio A3 with sugar concentration G1 has the same score on the panelists' preference level on the ratio A3 treatment with sugar concentration G2. So it can be seen here that the single effect of the fruit juice ratio has a significant impact on the score of the syrup preference level. The average score of the panelists' preference for the overall parameters of the carrot syrup observation was 3.45 – 4.45. The highest overall preference score was in the A3G1 and A3G2 treatments, namely the ratio treatment of carrot juice to tomato juice = 50%: 50%.

5. Conclusion

1. The interaction of carrot and tomato juice formula with sugar concentration on the quality of carrot and tomato juice syrup has the best quality is the ratio formula for water juice and tomato juice 50%: 50% with a sugar concentration of 60%.
2. The effect of carrot juice on syrup quality is that the addition of carrot juice increases the beta-carotene content of the syrup. In contrast, the addition of tomato juice lowers the syrup's pH to meet the SNI syrup where the pH meets the standard maximum of 4.0.
3. The addition of sugar at a dose of 60% has met the SNI standard for syrup with a sugar content of at least 65%.

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Biography

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