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The Effect of Comparison of Starfruit and Carrot Porridge on Characteristics of Sheet Jam

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***Abstract*- Sheet jam was a modification of semi-solid topical jam made from fruits or vegetables, then concentrated with the aimed of forming solids or sheets. Jam generally used ripe fruit that was not too ripe and had a slightly sour taste. The purpose of this studyto determine the effect of starfruit and carrot porridge on the characteristics of sheet jam and to get a comparison of starfruit and carrot porridge on the characteristics of sheet jam. This study used a Completely Randomized Design (CRD) with 5 treatments, the comparisoned of starfruit porridge carrot were 0%: 100%, 25%: 75%, 50%: 50%, 75%: 25%, and 100%: 0% . Each treatment was repeated 3 times to obtain 15 experimental units. The parameters were observed in making sheet jam were water content, vitamin C content, total dissolved solids (TPT), acidity (pH), degree of color, and organoleptic testing. The data obtained were analyzed with a variety of tests at the level of 1% and 5%. If the data obtained had a significant effect, then the data would be continued with DNMRT (Duncan's New Multiple Range Test) at the 5% level. The research resultsof starfruit and carrot porridge treatment to the best sheet jams was 25%:75% with water content (36,53%), vitamin C (44,00 mg / 100 g of material), Total Dissolved Solids (42,20^{o}Brix), pH (4,03), and degree of color (L=33,09, a=+9,31, b=+24,10 and^{0}Hue=68,88). The best parameter of organoleptic test of sheet jam were the texture was soft, slightly dense (2,92), color was orange (4,32), plasticity was not easily broken (4.24), taste (3,60), overall acceptance (3,64) and aroma(3,60) according to panelists' judgment, which was somewhat preferred.**

***Keywords* - Carrots; sheet jam; starfruit.**

I. INTRODUCTION

Sheet jam is a modification of semi-solid topical jam made from fruits or vegetables, then concentrated with the aim of forming solids or sheets. Sliced jam can be used as the main alternative for food products that are consumed generally along with bread for breakfast. The advantage of sheet jam is practicality without the need for basting like topical jam [1]. This is also supported by the statement of Solechan and Susanti (2005) stating the superiority of sheet jams that is fast and easy to serve. Good jam and spread jam products are sheet shaped jams that are not liquid, not too stiff and are brightly colored, and have a genuine fruit flavor [2].

The stages of making sheet jam are almost the same as making topical jam namely fruit sorting, fruit stripping, fruit immersion, fruit crushing, mixing sugar, pectin and citric acid followed by the cooking process [3]. The difference between topical jams and sheet jams is the addition of additives such as agar in the cooking process so that the jams become stiff and can be cut [3]. According to Buckle et al. (2009) good jam contains 0.75% -1.5% pectin, 65% -70% sucrose and pH 3.2-3.4. Components that can be added (besides the main components: pectin, acid, and sugar) to form sheets so that they are not too liquid or soft, but also not too rigid are additional ingredients in the form of hydrocolloids as a texture enhancer, one of which is seaweed derivative hydrocolloids, namely agar. Utilization of agar as an additional ingredient for jam is expected to be able to change the texture, helping the process of forming the preferred sheet of jam gel [4].

Starfruit plant (*Averrhoa carambola L.*) is one of the garden plants that produces fruit continuously every year for four times, so that many starfruit are underutilized. In addition, to increase the sale value and shelf life, starfruit can be processed into sheet jam products that have added value. Starfruit is rich in vitamin C which is 34.4 mg/100 g of ingredients and vitamin A found in starfruit is 61 IU. A high water content of 90 g/100 g of material makes starfruit easily damaged which can not be stored for a long time. Other ingredients that starfruit's have are fiber which is 0.90 g/100 g material [5] and pectin obtained naturally as much as 6.61% [6].

The combination of making starfruit and carrot comparison jams is done as food diversification aimed at obtaining new products that are beneficial to consumers as well as carrot diversity. The unpleasant aroma results in carrots

rarely being consumed directly [7]. Carrots contain natural dyes which are carotenoids where are a group of pigments that are yellow, orange and orange red [8]. The pigment will produce a bright and shiny color on products other than that, carrots are rich in vitamin A content of 835 IU/100 g of ingredients [7] and carrot vitamin C of 5.9 mg/100 g of ingredients [9]. According to Baker (1997) in Solikha (2016), carrots contain pectin of 0.72-1.01%. High carrot water content is 88.29 g/100 g of material, causing carrots to be easily damaged so that post-harvest handling must be optimal [10], and carrots also have a fiber content of 2.8 g/100 g [38].

The use of carrots as an ingredient in making sheet jams due to the type of vegetables known as high vitamin A content that contains carotenoid pigments produce attractive jam colors so that they can be used as natural dyes and improve the color of the product and add nutritional value to food, especially on processed carrot products [11].

In the research of Sitanggang, et al (2015) about the effect of the comparison of papaya and starfruit porridge with carrageenan concentration on sheet jams, the best fruit porridge ratio was 80%:20% with observations of 9.78% water content, total dissolved solids 60,688 ^{o}Brix, vitamin C levels 92.275 mg, color levels are 3.149, and organoleptic reception is 3.24, aroma 3.22, taste 3.17 and texture 3.00. The purpose of this study was to determine the effect of the comparison of starfruit and carrot porridge on the characteristics of the jam and to get a comparison of starfruit and carrot porridge on the characteristics of the sheet jam.

II. MATERIAL AND METHODS

A. Material

The material used in this study was starfruit (*Averrhoa carambola L.*) which used was index 2 with green starfruit, slightly yellow and starfruit already said to be ripe fruit, while carrots (*Daucus carota L.*) used were type of chantenay carrots which had a sweet and elliptic shape with a non-pointed tip, the length of this type of carrot ranges from 15-20 cm, granulated sugar, agar, pectin, citric acid, margarine, aquadest, 0.01 N iodine solution, starch indicator and 7.0 and 4.0 buffer solutions.

The tools used for making sheet jam and chemical quality analysis of sheet jam in this study were stoves, pans, spatulas, thermometers, ovens, baking molds (25x30 cm), blenders, dishes, desiccators, erlenmeyers, refractometers, pH meters, and color readers.

B. Methods

a. Research design and Statistical Analiysis

This study used a Completely Randomized Design (CRD) with 5 treatments, namely the ratio of starfruit and carrot porridge 0%:100%, 25%: 75%, 50%: 50%, 75%: 25%, and 100%: 0% . Each treatment was repeated 3 times to obtain 15 experimental units.

b. Research Procedure

Material Preparation

Starfruit (*Averrhoa carambola L.*) with index 2, green starfruit with a little yellow and starfruit was said that ripe fruit sorted first, then the skin and seeds were cleaned. Starfruit had been clean soaked to prevent the browning process. Then the crushing process was carried out using a blender at the ratio of ingredients and water which was 1:1 to facilitate the crushing process. The result of the crushing process wasstarfruit porridge.

Further more, carrots (*Daucus carota L.*) with the type of chantenay were carrots that have a sweet taste and are elliptical with non-pointed tips were sorted first and then cleansed from the skin. Carrots that had been cleaned from the skin then soaked to prevent browning. Then the crushing process was carried out using a blender at the ratio of ingredients and water that was 1: 1 to facilitate the crushing process.

Jam Making (modified from Sitanggang et al, 2015)

The result of crushing the material was called fruit porridge. The porridge was grouped according to the treatment that had been determined. Each treatment amount of starfruit and carrot porridge was 200 g which were added and mixed with additional ingredients namely sugar (50%), agar (3%), pectin (0.25%), citric acid (0.4%) and margarine (3%).

All materials of each treatment were put together into a container then homogenized. After homogeneity, the fruit porridge was cooked at 85^{o}C for 15 minutes. Jam could be said to be successful by using the spoontest method. After the fruit porridge had become jam, it wasput into a baking sheet and then printed / flattened the surface with a thickness of approximately 3 mm, so that it formed a sheet of jam and cooled down at room temperature. The sheet jam then organoleptic tested on hedonic and hedonic quality on panelists and other tests such as water content, vitamin C content, Total Dissolved Solids (TDS), acidity (pH) and color.

C. Parameter Analysis

Moisture content of the Oven Method (Sudarmadji et al, 1997)

The sample (sheet of jam) to be analyzed was weighed in advance by 2 g and put into a porcelain cup. The cup was previously dried in the oven at 105^{o}C for 30 minutes. The cup containing

the sample then dried in an oven at 105°C for 4 hours then cooled into the desiccator for 15-20 minutes and weighed. Then the sample and the cup were dried again in the oven for 30 minutes and cooled again in a desiccator and then weighed. This treatment was repeated until a constant weight was obtained. Water content could be calculated by the formula:

$$\% \text{ Water content} = \frac{\text{Weight of starting material} - \text{Weight of final material}}{\text{Weight of starting material}} x100\%$$

Vitamin C (Sulaeman, 1995)

Testing of vitamin C using the titrimetry method with iodine. Samples were taken 10 g and crushed with the addition of aquadest to 100 mL. Then filtered using filter paper and then taken 5 mL of filtrate into the erlenmeyer and added 20 mL of distilled water. Added 2-3 mL of starch indicator. Then titrated with 0.01 N iodine solution until it turns into a stable color (blue and purple). Vitamin C levels in sheet jams could be calculated using the formula:

$$\text{Vitamin C} = \frac{\text{ml Iod 0,01 N x 0,88 x FP x 100}}{\text{W}}$$

Information:
FP = Dilution factor
W = The weight / volume of the sample used for determination
0,88 = Iodine

Acidity (pH) (Muchtadi et al, 2010)

The degree of acidity (pH) was determined using a pH meter. Before measuring the pH meter must be calibrated using a buffer solution of 7.0 and 4.0. A sample of 1 g was crushed and 3 mL of distilled water was added, stirring until homogeneous. The electrodes were dipped into the crushed sample and left until a stable reading was obtained. Then the pH value could be read directly on the pH meter scale.

Color Degrees, Hunter Method (Andarwulan et al, 2011)

Analysis was done by using a color reader. Basically the color reader worked by using measurements obtained from the surface of the sample with a color difference test. The measurement was done by placing the sample on a cup with even number of samples, then turning on the power switch and the Lab button on the color reader, then the sample was pasted to the sensor then pressed the measuring button and then measuring was carried out covering the brightness with a value of 0 (black) to 100 (white) with L* notation, chromatic color (hue) mixed red with a* notation, and chromatic color (hue) mixed blue and yellow with b* notation.

Organoleptic Testing (Soekarto, 1985)

Organoleptic testing wasthe test that used five human senses such as the sense of sight, the sense of taste, the sense of smell, and the sense of touch used in assessing the quality of a product. The panelists used were semi-trained, amounting to 25 people consisting of students of the Agricultural Product Technology study program at the University of Jambi.

Data analysis

Data that has been obtained from observations are then analyzed using Analysis of variance at 1% and 5% levels. If the data obtained are significantly different, then proceed with the DNMRT test (Duncan's New Multiple Range Test) at a level of 5%.

TABLE 1.
AVERAGE VALUES OF WATER CONTENT, VITAMIN C, TOTAL DISSOLVED SOLIDS AND ACIDITY OF SHEET JAM WITH COMPARATIVE TREATMENT OF STAR FRUIT PULP AND CARROT

Star Fruit Comparison: Carrots (%)	Water content (%)	Vitamin C (mg / 100 g ingredients)	Total Dissolved Solids (°brix)	Acidity (pH)
(0 : 100)	34,98±4,84	29,30±5,08^{a}	39,77±7,51	4,09±0,10^{d}
(25 : 75)	36,53±2,15	44,00±0,00^{b}	42,20±1,82	4,03±0,07^{cd}
(50 : 50)	38,41±4,68	52,80±8,80^{b}	39,97±8,08	3,92±0,05^{c}
(75 : 25)	37,61±2,91	67,50±5,08^{c}	44,90±1,91	3,78±0,07^{b}
(100 : 0)	42,31±2,41	70,40±0,00^{c}	47,10±7,04	3,58±0,07^{a}

Note: Numbers followed by the same letter indicate no significant effect at the 5% level based on the DNMRT test

III. RESULT AND DISCUSSION

Water Content

Based on the analysis results of the comparative treatment of starfruit and carrot

porridge to the sheet jam moisture content showed that it did not have significant effect. The average value of the water content of the sheet jam with a comparative treatment of starfruit and carrot porridge could be seen in **Table 1**.

Water content was the amount of water contained in food which was expressed in units of percent. Water content of sheet jam that made from the comparison of starfruit and carrot porridge ranging from 34.98%-42.31% wb (wet basis) had been included in the standard jam water content sheet which was a maximum of 45% wb (wet basis) [12]. Water content in foods tuffs such as jam plays an important role in maintaining the consistency of the texture, appearance and taste of food ingredients such as sheet jam products. Comparison of starfruit and carrot porridge did not significantly affect the water content of the resultingsheet jam. The increased in water content was thought to be due to the high water content of starfruit and carrot porridge. The water content in the material that would be used in making sheet jams, among others, starfruit 93% and 92% carrots and supported based on research Rachmayati, et al (2017) stated the results of the analysis of raw materials of water content in starfruit was 90.65% and based on research Hutagalung, et al (2016) carrot water content of 83,347%.

Vitamin C

Based on the analysis results of the comparative treatment of starfruit and carrot porridge to the vitamin C content of the resulting sheet jam showed that it had very significant effect. The average value of vitamin C levels of jam with comparative treatment of starfruit and carrots porridge could be seen in **Table 1**.

The level of vitamin C produced by the sheet jam was higher than the range of the vitamin C content of each ingredient. Based on Table 1, more starfruit porridge added would increased vitamin C in the sheet jam product. From the list of food ingredients released by the Nutrition Directorate of the Indonesian Ministry of Health (1981) starfruit had a vitamin C content of 34.4 mg/100 g of material. The content of carrot vitamin C was 5.9 mg/100 g of ingredients [13]. The amount of starfruit porridge which was added more and more would increased the levels of vitamin C in the resulting sheet jam products.

Vitamin C levels in the treatment of 100%: 0% (starfruit dominant) of 70.40 mg/100 g of material, while in the treatment of 0%: 100% (dominant carrot) of 29.30 mg/100 g of material. According to Winarno (2008), the amount of vitamin C needed in adults to avoid a license was 10 mg/day.

Total Dissolved Solids (TPT)

Based on the analysis results of the comparative treatment of starfruit and carrot porridge to the total dissolved solids of sheet jams showed that there was not significant effect. The average value of total dissolved solids of jam with comparative treatment of starfruit and carrots porridge could be seen in **Table 1**.

The total Dissolved Solids (TDS) measured in this study were sugar in the form of sucrose (^{o}Brix sucrose). Based on Table 1, the comparison of starfruit and carrot porridge did not have significant effect. Total dissolved solids in all treatments were not in accordance with the standard of total dissolved solids based on SNI 01-3746-1995, which is a minimum of 65% w/w or 65^{o}Brix [14], this was because during cooking sucrose undergoes hydrolysis into invert sugar in the form of glucose and fructose [15].

According to Putri et al (2013) that the total dissolved solids produced by a product was very dependent on the raw material (fruit) used for its manufacture. The total dissolved solid was related to the amount of material added to making sheet jams. The total content of dissolved solids of an ingredient includes reducing sugars, non-reducing sugars, organic acids, pectin and proteins [16]. Mahmud (2013) stated that the higher pectin contained, the higher total dissolved solids, this was because of pectin a constituent component of the total dissolved solids. The content of pectin produced by starfruit is 6.61%, therefore the total dissolved solids would increased if the starfruit ratio gets higher. Making sheet jams used ingredients such as sugar (sucrose) and pectin. The total dissolved solid was a measure of the combined content of all inorganic and organic substances contained in a food ingredient [17].

Acidity (pH)

Based on the results of the analysis of various treatments comparative starfruit and carrot porridge to the degree of acidity of the sheet jam showed that the effect was very significant. The average value of the acidity of sheet jam with comparative treatment of starfruit and carrot porridge could be seen in **Table 1.**

Based on Table 1, the acidity (pH) indicated the acidity and basicity of a product. Comparison of starfruit and carrot porridge resulted in acidity ranging from 3.58-4.09 and was in accordance with U.S. standards. Food and Drug Administration (2007), namely the value of the acidity of the sheet jams ranging from 3.5 to 4.5.

The value of the acidity tended to be acidic along with the increasing number of starfruit porridge and decreasing the amount of carrot porridge used. Starfruit porridge was thought to have a higher acidity compared to carrots. The results of starfruit porridge analysis had a degree of

acidity of 3.58 while carrots had a value of acidity of 4.09. The degree of acidity that had an effect on the characteristics of the sheet jam was produced mainly in the gel formation and prevented the crystallization of sugars [18]. The degree of acidity could also maintained the product's resistance to damage.

Research Buckle et al, (2007) stated that the degree of acidity affects the durability of a product because of acidic conditions would made it difficult for spoilage microorganisms to grow and developed. Fahrizal and Fadhil's research (2014) produced sheet jams with acid tendency were suspected because at the time of making sheet jams were influenced by acids found in natural ingredients and citric acid.

Color Degrees

Based on the results of the analysis of various treatments comparative starfruit and carrot porridge to the degree of color of the sheet of jam sheet jam with a comparison treatment of starfruit and carrots porridge could be seen in **Table 2**.

Based on Table 2, color testing was done using the Color Reader. The color measurement results were divided into four parameters namely L(Lightness), a*(redness), b*(yellowness), and °Hue. The results of color testing on the resulting sheet jam showed L values ranging between (32.12-33.12), a* values (6.54-10.17), b* values (21.84-24.30), and °Hue values with a range between (67,30-73,31).

The resulting color of the same piece of jam was shown based on the color description of Yellow Red (YR). This was becaused the comparative treatment of starfruit and carrot porridge in making sheet jams did not affect the color results in the sheet jams. The higher carrot ratio and the lower starfruit ratio added to the sheet jam, the value of L (brightness) had increased, the value +a (positive) indicated that the higher the carrot ratio and the lower starfruit ratio on the sheet jam the value decreased, while the value +b (positive) indicated that the yellow was decreasing.

TABEL 2.
THE AVERAGE VALUE OF THE DEGREE OF COLOR OF THE SHEET JAM WITH A COMPARISON TREATMENT OF STAR FRUIT PULP AND CARROTS

Treatment (%)	Nilai			°Hue	Color Description
	L	a	b		
(0 : 100)	32.12±0,32	+10.17±0,33^{d}	+24.30±0,17^{b}	67.30±0,52	*Yellow Red* (YR)
(25 : 75)	33.09±1,98	+9.31±0,64^{c}	+24.10±0,84^{b}	68.88±1,12	*Yellow Red* (YR)
(50 : 50)	32.88±0,19	+9.19±0,23^{c}	+23.90±0,43^{b}	68.96±0,17	*Yellow Red* (YR)
(75 : 25)	33.11±0,18	+8.40±0,45^{b}	+24.29±0,45^{b}	70.94±0,62	*Yellow Red* (YR)

showed that L did not show significant effect, while a, b and °hue had a very significant effect. The average value of the degree of color of the

(100 : 0)	33.12±1,15	+6.54±0,22[a]	+21.84±0,47[a]	73.31±0,70	*Yellow Red* (YR)

Note: Numbers followed by the same letter indicate no significant effect at the 5% level based on the DNMRT test.

Comparison of carrots on a sheet jam with an increasingly large number results in a darker color. Testing the color of sheet jam with comparative treatment of starfruit and carrots porridge was suspected to show a reddish-yellow color. Yellow, orange, and red carotenoid pigments in starfruit and carrots caused the color of the yellow-red on the sheet jam [19]

Organoleptic Testing
Hedonic Quality
a. Color

Based on the analysis results of the starfruit and carrot porridge treatments to the color of sheet jam showed that the effect was very significant. The average value of the color of the sheet jam with a comparative treatment of starfruit and carrot porridge could be seen in **Table 3**.

Panelists assessment of the sheet jams color ranged from 1.92 to 4.68 (slightly yellow to orange to orange). The color of the sheet jam in the comparative treatment of starfruit and carrot porridge 25%:75% produced orange color on the sheet jam, this was becaused the number of carrots was usedless than starfruit.

Color was the first organoleptic test that could be seen directly by panelists, determining the quality of foodstuffs generally depended on the color they had. Panelists liked the bright orange sheet jams than the sheet jams with the used of a higher number of carrots. The color orange was produced from carrots which contained carotenoidin them. Carotenoids were a group of pigments that were yellow, orange, red and orange red [20].

TABLE 3.
THE AVERAGE VALUE OF HEDONIC QUALITY OF COLOR, TEXTURE AND PLASTICITY OF THE JAM SHEET WITH COMPARATIVE TREATMENT OF STAR FRUIT PULP AND CARROT

Star Fruit Comparison: Carrots (%)	Color	Texture	Plasticity
(0 : 100)	4,68±0,69[d]	2,52±0,92	4.28±0,68[c]
(25 : 75)	4,32±0,69[d]	2,92±0,91	4.24±0,88[c]
(50 : 50)	3,84±0,55[c]	2,96±0,73	4.16±0,80[c]
(75 : 25)	2,68±0,85[b]	2,80±0,87	2.48±0,51[b]
(100 : 0)	1,92±0,57[a]	2,52±0,92	1.92±0,76[a]

Note: Numbers followed by the same letter indicate no significant effect at the 5% level based on the DNMRT test.
Color scores: (5) very orange, (4) orange, (3) yellowish orange, (2) slightly yellow, (1) slightly yellow, slightly orange.
Texture scores: (5) very soft, (4) soft, (3) soft slightly dense, (2) slightly dense, (1) slightly dense slightly soft.
Plasticity scores: (5) not broken, (4) not easily broken, (3) somewhat broken, (2) easily broken, (1) very easily broken.

This was in line with the research of Hutagalung et al (2016), stated that the sheet jam comparison of pineapple and carrot porridge produced the orange color of product which containing carotenoid pigments that made the colors shiny and more contrasting.

b.Texture

Based on the analysis results of the starfruit and carrot porridge treatments to the hedonic quality of the sheet jam texture showed that it did not have significant effect. The average value of thesheet jam texturewith a comparative treatment of starfruit and carrot pulp could be seen in **Table 3**.

Texture was one of the most important components that determine the final quality of jam [21]. The average value of the texture of the sheet jam ranges from 2.52-2.96 (slightly dense to soft slightly dense). The results of the assessment showed that the comparison of starfruit and carrot porridge contained fiber content including starfruit fiber 0.90 g / 100 g material and carrot 2.83 g / 100 gmaterial. The addition of more carrot porridge compared to starfruit porridge would made the texture of the sheet jam sturdy and elastic. Winarno

(2007) stated that agricultural products in the presence of fiber content would had a sturdy and elastic texture.

c. Plasticity

Based on the results of the analysis of the starfruit and carrot porridge comparative treatment to the hedonic quality of the sheet jam plasticitys howed the very significant effect. The averrage plasticity value of sheet jam with comparative treatment of starfruit and carrot porridge was shown in **Table 3**.

Yenrina et al (2009) stated that the sheet jam was said to be of good quality if it had a soft, consistent texture, had flavor and natural fruit color. Good jam was also characterized by being able to lift the entire surface of the jam without breaking.

The panelists' assessment of the plasticity of sheet jams ranged from 1.92 to 4.28 (easily broken to non-breakable). Panelists assess the plasticity of the sheet jam the more used of starfruit produced a broken sheet jam, while the more additions made the sheet jamwas not easily broken. It was suspected that carrots made the surface of the sheet jam solid and compact. The pectin content of each ingredient and commercial pectin added to the sheet jam, which was thought to provide increased plasticity values.

Margarine was one of the additional ingredients used in making sheet jams, the nature of margarine at room temperature (25^{o}C) was plastic so that it could be used as a food polishing agent [22]. Plastic properties could be formed if the margarine was cooled immediately after mixing. The cooling process (chilling) would formed fine crystals that bind margarine which was still liquid so that it formed a stable bond and was difficult to separate [23]. The purposed of adding margarine was to improve the appearance and changed the physical structure of food and a rather liquid form into sheets [3]. Margarine was generally plastic, solid at room temperature, rather hard at low temperatures, and immediately thawed in the mouth which was good to be added in process of making sheet jams.

Hedonic

a. Taste

Based on the analysis results of the starfruit and carrot porridge comparative treatment to the quality of the hedonic sheet jam flavored showed that it did not have significant effect. The average value of the sheet jam taste with comparative treatment of starfruit and carrots porridge was seen in **Table 4**.

The panelists' assessment of the taste of sheet jams ranged from 3.24 to 3.68 (rather like). The results obtained showed that in each treatment the comparison of starfruit and carrot porridge was declared no significant effect. The more amount of starfruit porridge that dominates the sour taste and the less amount of carrot with sweet taste added to sugar which allegedly made panelists said the resulting flavor was the same. According to Setianingsih, et al (2010) several factors that influenced panelists on taste were: panelist adaptation and fatigue, smoking habits.

b. The scent

Based on the analysis results of the starfruit and carrot porridge comparative treatment to the hedonic quality of the sheet jams aroma showed that there was not significant effect. The average value of the aroma of sheet jam with comparative treatment of starfruit and carrots porridge was seen in **Table 4**.

TABEL 4.
THE AVERAGE VALUE OF HEDONIC TASTE, AROMA AND OVERALL ACCEPTANCE OF JAM SHEET WITH COMPARATIVE TREATMENT OF STAR FRUIT AND CARROT PORRIDGE

Star Fruit Comparison: Carrots (%)	Taste	The scent	Overall Reception
(0 : 100)	3,32±0,90	3,64±0,70	3,64±0,70
(25 : 75)	3,60±0,82	3,60±0,76	3,64±0,70
(50 : 50)	3,28±0,74	3,48±0,59	3,64±0,70
(75 : 25)	3,68±0,56	3,44±0,82	3,72±0,61
(100 : 0)	3,24±0,60	3,24±0,78	3,12±0,78

Note: Numbers followed by the same letter indicate no significant effect at the 5% level based on the DNMRT test.
Overall taste, aroma and acceptance scores: (5) like it very much, (4) like it, (3) like it a little, (2) like it a little, (1) dislike it.

The result sheet jam had a distinctive aroma according to the raw material used. According to Suryani et al (2004), jams in general had good quality that was attractive color, soft texture, natural fruit flavor, did not undergo syneresis, and

crystallize during storage. According to Winarno (2004), the aroma arising from a food was a determining factor for food delicacy. Sheet jam with a comparative range of starfruit and carrot porridge slightly made the panelists unable to distinguished the aroma of sheet jam in each treatment becaused the comparative range of starfruit and carrot porridge was relatively small.

Panelist assessment of the aroma of jam ranged from 3.24 to 3.64 (some what like) with the highest average value in the comparison of starfruit and carrot porridge 0%: 100%, which was rather like. The results obtained showed that in each treatment the comparison of starfruit and carrot porridge was declared no significant effect.

The aroma obtained on the sheet jam was dominated by carrots with a characteristic unpleasant scent, so that the highest score obtained was 3.64, which was rather preferred by panelists. According to Sayekti (2014) carrots in food had a pleasant aroma. According to the statement of Darwindra (2008) carrots with large amounts would produced a scent for the product, carrots also did not have a meaningful taste, but the scent of carrots was commonly called the word langu. Factors that caused unpleasant scent was the presence of isocoumarin in fresh carrots [24]. The jam produced was normal and could be accepted by the panelists in accordance with SNI 3746 (2008).

c.Overall Reception

Based on the analysis results of the starfruit and carrot porridge comparative treatment to the hedonic quality of the overall reception of the sheet showed that it had a significant effect. The average value of overall acceptance of sheet jam with a comparative treatment of starfruit and carrot porridge was shown in **Table 4**.

Based on Table 4, it could be seen that the averrage score of the panelists' assessment of the overall acceptance of the resulting sheet jams ranged from 3.12 to 3.72 (rather like). Yenrina et al (2009) said that good jam was also characterized by being able to lift the whole without breaking, could be rolled up, was not easily torn texture, plastic, sturdy. The sheet jam in this study was assessed by the panelists as a whole as seen from each parameter with taste and aroma rather like, orange in color, and having a soft, slightly dense texture.

IV. CONCLUSIONS

Based on the results of research conducted it could be concluded as follows:

1. Comparison of starfruit and carrot porridge treatment on the characteristics of the sheet jam had a significant effect on vitamin C, acidity (pH), degree of color (value a, value b, and ^{o}Hue), and organoleptic testing (color, plasticity and overall acceptance), but did not have significant effect on water content, Total Dissolved Solids (TDS), degree of color (L value), and organoleptic testing (taste, aroma, and texture).
2. Comparison of starfruit and carrot porridge treatment on the characteristics of the sheet jam that was at the ratio of starfruit and carrot porridge treatment 25%:75%. The results obtained were water content (36.53%), vitamin C levels (44.00 mg / 100 g material), Total Dissolved Solids (TDS) (42.20^{o}Brix), degrees of acidity (pH) (4.03) and degree of color (L = 33.09, a = +9.31, b = +24.10 and ^{o}Hue = 68.88). Organoleptic test parameters of the best concentration on texture were soft, slightly dense (2.92), color was orange (4.32), plasticity was not easily broken (4.24), taste (3.60), overall acceptance.

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