

The Characteristics Of Physico-Chemical Quality And The Sensory Evaluation Of Kesambi Jam (*Schleichera Oleosa*, Merr)

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Abstract

Kesambi is one of the fruit plantations in Indonesia that almost extinct. This fruit has similar texture, colour, and sweet-sour taste with longan. However, there is still limited research on the ripe Kesambi in processed food products as the main ingredient of jam in order to obtain higher economic value. This research aims to examine the sensory evaluation and characterize the quality of kesambi jam with treatment cooking duration and sugar addition. The research was conducted at the Quality Management Laboratory, Pangkep State Agricultural Polytechnic and at the Nutrition Laboratory, Faculty of Animal Husbandry, Hasanuddin University. The duration of cooking conducted in 3 levels: 20 minutes, 25 minutes and 30 minutes; and the addition of sugar also with 3 levels of concentration: 20%, 25% and 30%. While testing the quality characteristics of kesambi jam included physical (viscosity), chemical (moisture content, total soluble solid, and vitamin C,) and organoleptic tests (color, flavour and taste). The results of the characterization showed that the viscosity of kesambi jam ranged from 68.91- 76.15 cP. The moisture content of kesambi jam decreases with increasing cooking time and sugar concentration. Total soluble solids range from 63.3 – 71.65 °brix. The average content of vitamin C. ranges from 16.74 – 18.25 mg / 100 g of ingredients. The panelists' acceptance of the color, flavour and taste of kesambi jam, on average, response with a favorable score range of 5.31 to 6.1. Based on the organoleptic test, the best treatment of this research was on the additional sugar of 30% with a cooking duration of 30 minutes.

Keywords: Kesambi, Jam, Sensory evaluation, Quality characteristics.



INTRODUCTION

Kesambi (*Schleichera oleosa*, Merr) is one of the forest plants grows in Java, Bali, Nusa Tenggara, Sulawesi, Maluku and Seram Island. It grows in the tropical areas and drought-resistant in dry season. This plant has many benefits (multi-purpose), economic value and high potential to be cultivated since almost all parts of the kesambi tree have benefits including wood, bark, leaves to fruits and seeds. Although it has sour taste, it is very popular with humans and animals. Its wood has dense structure, tight and heavier than iron wood. The one which grows in Bulukumba Regency, South Sulawesi is used as a basic material for making boats. It also used as fire wood for cooking and its liquid smoke as an anti-microbial material. Kesambi bark contains 6.1-14.3% tanning agent so that it can be used as a tanner (Bachli, 2007).

In South Sulawesi, kesambi plants used to grow in many areas but recently it is very rarely found, only remaining in a few districts such as in Gowa, Jeneponto and Bulukumba regencies. The role of local governments is needed to recultivate them through the use of production forests and critical land as targets for planting kesambi as the initial stage of industrial development in the forestry sector. Kesambi fruit in South Sulawesi is well-known as Bado (Makassar) and Ading (Bugis).

The potential for the development of kesambi products can be started by utilizing kesambi fruit. Its fruit at first look similar to longan fruit. The color of the young kesambi fruit is green, generally consumed fresh or pickled. Ripe kesambi fruits are yellow or reddish. Kesambi fruit has sweet and slightly sour taste, contains a lot of vitamin C which is good as an antioxidant (Suita, 2012). There is still limited research on the ripe Kesambi in processed food products as the main ingredient of jam in order to obtain higher economic value.

Kesambi jam is a semi-wet preserved product made by cooking crushed fruit flesh and then adding sugar or a mixture of sugar with dextrose or glucose, it can be with or without the addition of water. It has soft and elastic texture. Jam is very popular in our society. Its use, generally as spread or filling and topping ingredients in various cakes and desserts.

Some factors that influence making jam are cooking duration, amount of sugar addition, stirring, balance of sugar, pectin and acid. In making jam, 45% of the fruit flesh is required to meet the total dissolved solids of about 65% - 68% of the total dissolved (Codex Alimentarius Commission; Gałkowska et al., 2010).

The quality of fruit jam is determined by the balance of amount of kesambi pulp, acid and pectin. Citric acid is needed to form a tissue between sugar and pectin. The addition of granulated sugar is also needed to obtain a good texture, appearance, and flavor. Lack of



granulated sugar in jam making will result in a less strong gel at all acidity levels and requires more addition of acids to strengthen its structure (Winarno, 2004).

The use of sugar in jam is as a dehydrating agent to improve texture, appearance and flavor and form a good gel consistency. Homogenization of fruit pulp and pectin can be done by heating/ripening. Javanmard and Endan (2010) said that the use of pectin is expected to use as a thickener that will affect the texture of fruit jam. Heating/cooking can also evaporate some of the water so that a jam gel structure can be obtained. In this study is to evaluate the sensory and proximate content of kesambi fruit jam with different cooking duration and sugar concentrations. The results obtained from this study are expected to provide information to the community, especially farmers who cultivate kesambi plants to be able to utilize kesambi fruit into jam as one of the diversifications of processed food with higher economic value.

MATERIALS AND METHODS

- a. The preparation: Kesambi Fruit ingredients are obtained from Ara Village, Bontobahari District, Bulukumba Regency. Ripe kesambi is yellow and soft flesh. Granulated sugar and yellow food coloring "ORLIFE" are obtained from supermarkets.
- b. Research Design: this study was conducted using a Complete Randomized Design with 2 factors. The first factor is the cooking duration (P) which are 20 minutes, 25 minutes and 30 minutes. The second factor is the addition of sugar (G) with concentrations of 20%, 25% and 30%. In this study there were nine treatment combinations and each treatment combination was repeated 2 times, so that it became 18 experimental units.
- c. Research Procedure: Kesambi fruit is first separated from the skin and seeds, then washed thoroughly. After that kesambi fruit is weighed and mashed using a blender. Kesambi fruit pulp then is added sugar according to the research treatment and 3 drops of yellow food coloring. Each sample of kesambi fruit jam was cooked at 55°C (Suliman et al., 2013) with cooking duration of 20 minutes, 25 minutes and 30 minutes. Cooked Kesambi fruit jam then put into sterilized bottles.
- d. Observation Parameters of Kesambi fruit jam testing includes the quality and organoleptic characteristics tests.

1. Water Content

Testing the moisture content of kesambi fruit jam using the AOAC method (2007). The porcelain dish for the sample was previously coded as sample, then put into the oven to be heated to a temperature of 100 °C - 105 °C for 1 hour. The porcelain dish is cooled in a desiccator, then weighed in. A total of 2g of kesambi fruit jam samples were put

into porcelain (W1) and dried in an oven with temperature of 100 °C - 105 °C for 4-6 hours to constant weight (W2). The moisture content of kesambi fruit jam can be calculated by the formula: $\text{Water Content (\%)} = \frac{W1 - W2}{W1} \times 100\%$.

2. Total dissolved solids

The total dissolved solids are tested using a refractometer. A total of 1g of kesambi fruit jam is put into the centrifuge tube and added 10ml of aqua. It is centrifuged until homogeneous, the liquid is then dripped onto a glass surface of the refractometer until it covers the glass surface. The glass refractometer is then closed slowly so that no air bubbles are trapped. The degree of sweetness of kesambi fruit jam is further observed. The level of sweetness is indicated by °Brix (solids/100 g sample) which is proportional to the percentage of sucrose in the sample (Nielsen, 1988).

3. Vitamin C

The research test was conducted by AOAC method (2007). A total of 10g of jam samples were weighed and put into the Erlenmeyer flask, 100ml aqua was added and homogenized. The 25ml solution is then pipetted into the Erlenmeyer flask and added an indicator of 1 ml of 1% amylum, then titrated with a standard solution of iodine until it turned blue-black. The titration volume is recorded and calculated % vitamin C content. $\% \text{ Vitamin C} = \frac{V \times N \times 0.1 \times K}{W \times FP} \times 100\%$.

4. Viscosity (Hutauruk, 2021)

Viscosity can be stated in cP as known as centipoises, to see the viscosity of fruit jam using the Brookfield LV DV I Prime Viscometer. Shear stress is measured as a function of the shear rate at 25°C, where spindle no. S63 and 60-rpm speeds were used. The experimental data were adjusted to the legal model of law in which the actual viscosity μ_{app} at a shear voltage of 20 s^{-1} .

5. Evaluation of Sensory

Organoleptic assessment was conducted on the parameters of color, taste, flavour, and spreadability in kesambi fruit jam products. The method used is the hedonic (favorability) method. Organoleptic testing was conducted on the basis of hedonic tests with semi-trained panelists ± 30 people. The rating scale (hedonic score) used in this organoleptic test is a scale from 1 (completely dislike) to 7 (completely like). The scoring by the panellists shows how much the panelists like the kesambi jam product.

6. Data Analysis:

Data analysis is carried out using Complete Random Design. The test result was analysed statistically using ANOVA, the significance of the test results continued with Duncan's

Multiple Range Test (DMRT) test with a test level of 5% (Gomez and Gomez, 1995).

RESULTS AND DISCUSSION

Water Content

The water content of food products including jam has an important role in determining its shelf life (Fellows, 2000). The treatment of sugar concentration and cooking duration will affect the availability of water in foodstuff. The increase in shelf life is influenced by the low moisture content so that it stops microbial growth.

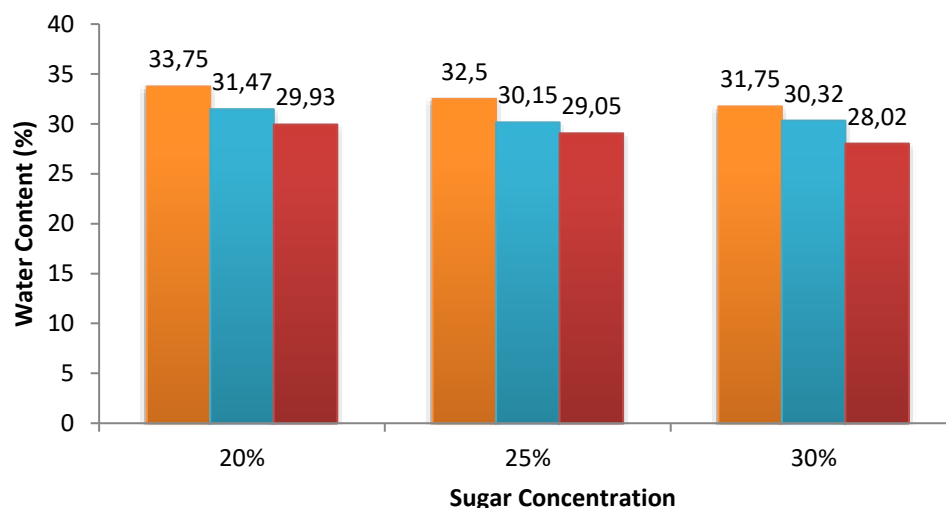


Figure 1. Histogram of the Effects of Cooking Duration and Sugar Concentration on the Water Content of Kesambi Fruit Jam

The Figure 1 shows that the water content of kesambi fruit jam obtained ranges from 28.02% - 33.75%. The higher the sugar concentration and the longer the cooking duration, the water content of kesambi fruit jam decreases. The range of water content of kesambi fruit jam obtained is still in quality requirements, which is maximum of 35% (SII. No. 173 of 1978)

- a. **Total Soluble Solids** or total dissolved solids plays an important role in inhibiting microbial growth. James (2002) found that total soluble solid 68.71 ° Brix can stop microbial activity in food products.

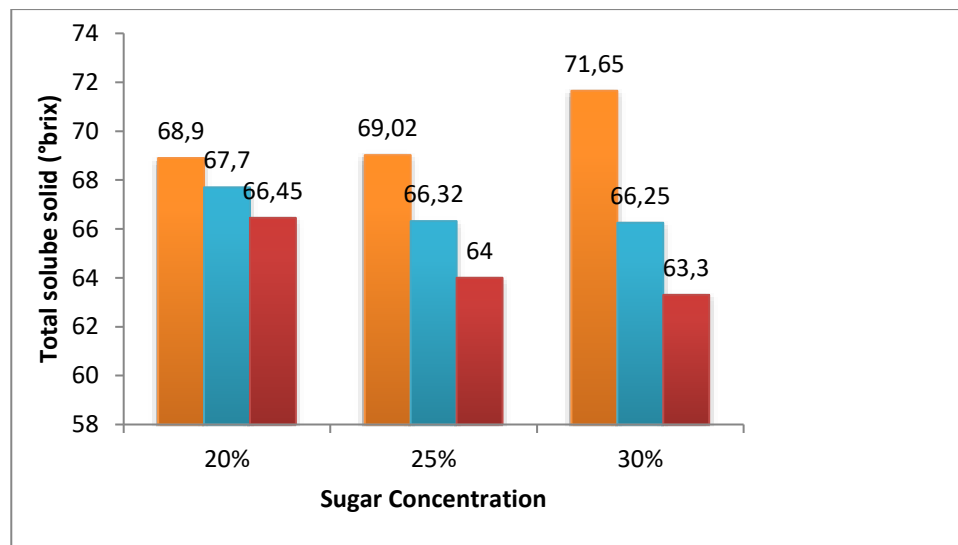


Figure 2. Histogram of the Effect of Cooking Duration and Sugar Concentration on Total soluble solids Kesambi fruit jam.

Figure 2 shows the cooking duration and sugar concentration results in the decrease in the total value of dissolved solids. Although there is a decrease in the total value of dissolved solids, it is still within the quality requirement of at least 65 ° brix (SNI 3746: 2008). Desrosier (1988) described that the total dissolved solids content of an ingredient includes reduction of sugar, non-reduced sugars, organic acids, pectin and protein. Winarno (2008) supported that the total dissolved solids in a food ingredient is strongly influenced by soluble pectin.

b. Vitamins

Vitamin C (ascorbic acid) has water-soluble characteristic and quickly decreases when heated to high temperatures. In order to stabilize vitamin C levels, the temperature of approximately 35-45°C cooking jam is applied with $\pm$ 30 minutes processing time. The average heating time and sugar concentration in each treatment can be seen in Figure 3. The analysis of vitamin C levels obtained different results. The longer the cooking duration, the value of vitamin C decreases but increases with the concentration of sugar. However the results of the variance test do not show significant effect.

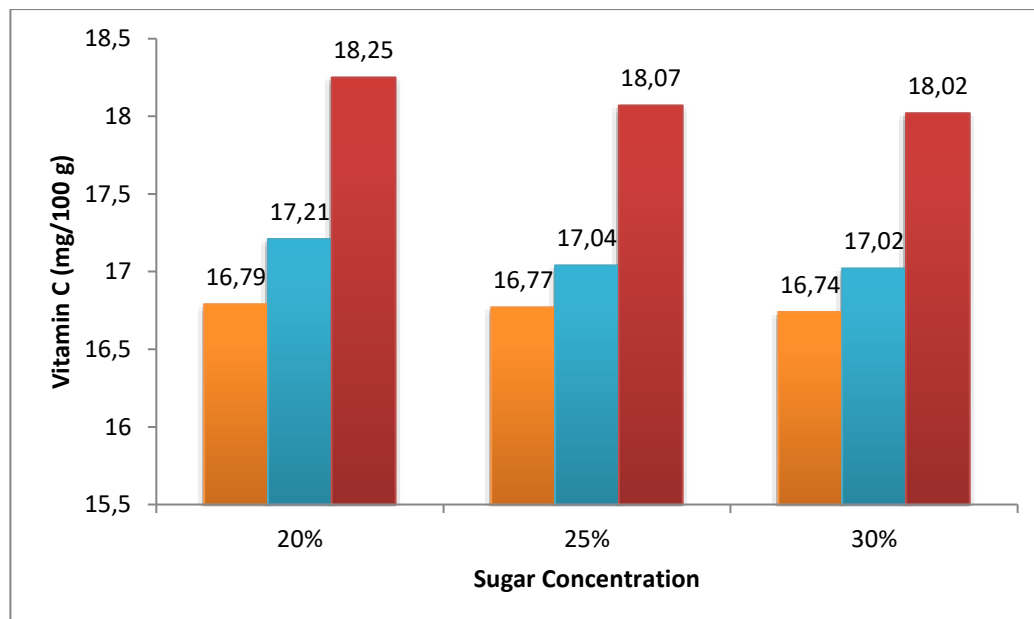


Figure 3. Histogram of the Effect of Cooking duration and Sugar Concentration on Vitamin C Kesambi Fruit Jam

The decrease in vitamin C levels during cooking is due to oxidation. According to Winarno (2008), vitamin C is easily oxidized can be caused by heat, alkali, oxidizer, enzymes, and iron and copper catalysts, causing a decrease in vitamin C content. This vitamin the form of L-ascorbic acid will then be oxidized with increasing temperature to produce the compound L-dehydroascorbic acid, which still has activity as vitamin C.

c. Viscosity

The viscosity of jam is highly influenced by cooking temperature, pectin content and addition of sugar. Previous studies have shown that the addition of sucrose can shape stiffest gel that makes product a better texture (Sawant and Patil, 2013). Changes in viscosity are caused by the addition of sugar which can increase the viscosity of pectin solution.

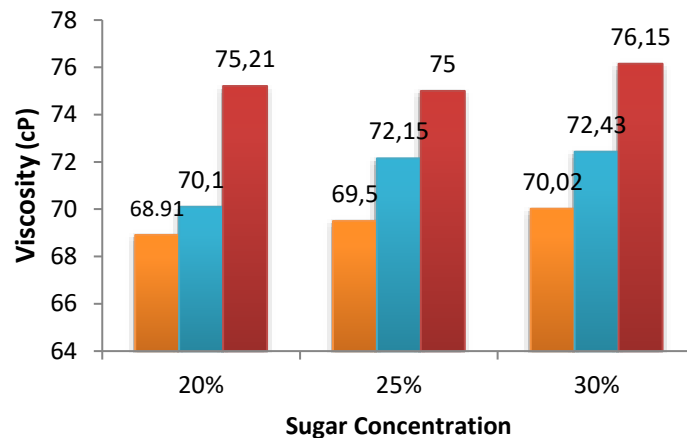


Figure 4. Histogram of the Effect of Cooking Duration and Sugar Concentration on the Viscosity of Kesambi Jam.

Figure 4 demonstrates that an increase in sugar concentration and cooking duration significantly affect the increase in viscosity of kesambi fruit jam. The viscosity range of kesambi fruit jam is from 68.91 cP to 76.15 cP. Ibrahim et al. (2015) explain that long cooking process can cause more water to evaporate. Evaporation of material-free water will bring implications to the lower moisture content of the material so that the percentage of total sugar increases. Cooking affects the amount of moisture content and total dissolved solids, so that when heating is done it is easier to change its structure and viscosity increases.

d. Organoleptic Test

The organoleptic test is aimed to determine the level of preference and acceptance of the panellists for kesambi jam. The organoleptic parameters tested on kesambi jam samples were color, flavour and taste.

1. Color

One of the organoleptic test parameters that influences the acceptance rate of panellists/consumers is color. The panelists' favorability test for color was conducted by observing the color of the jam and scoring it according to the level of favourable (hedonic value).

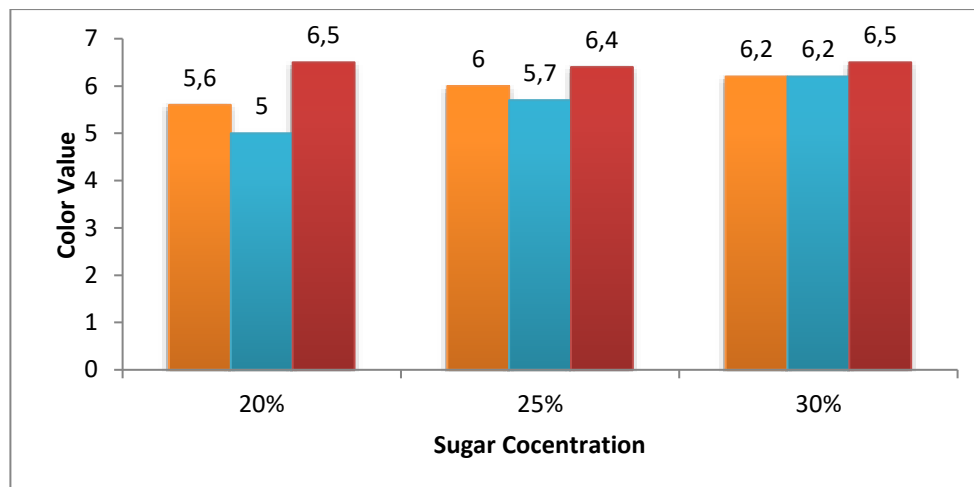


Figure 5. Histogram of the Effect of Cooking Duration and Sugar Concentration on the Color Value of Kesambi Jam

The results of the organoleptic testing on the kesambi jam color shows that most panellist scored it between 5 to 6.5 which means they it and somewhat like to completely like. In the 30% sugar addition treatment, the average panellist score completely like (average scoring score of 6.3), and the longer the cooking time the panellists' favourability score is the color of kesambi jam increased. The panellists' preference for kesambi jam color increased along with the increase of sugar concentration and cooking duration. This is due to the formation of brown color from the process of sugar caramelization at the time of cooking.

2. Flavour

The flavour is one of the most important factors that determine the deliciousness of a food product since it highly influences the level of acceptance of panellists /consumers to products. The results of the organoleptic testing of the flavour of kesambi jam can be seen in Figure 6.

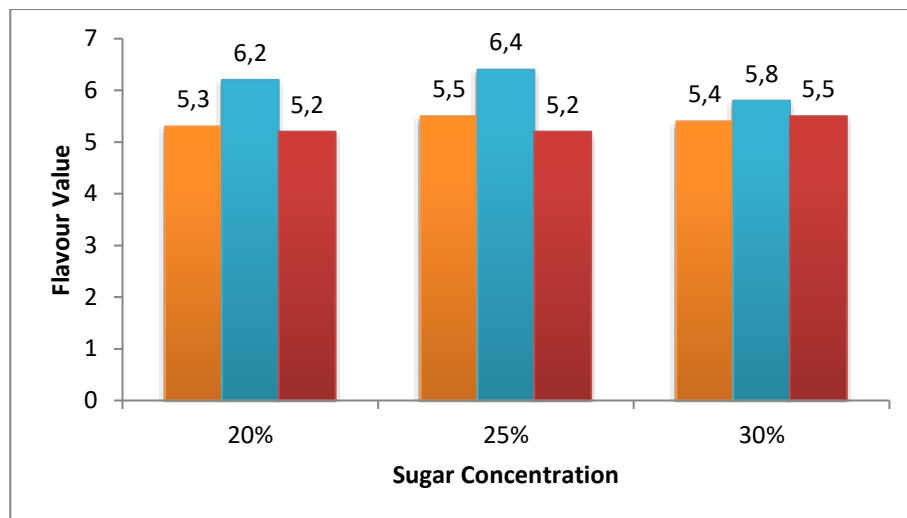


Figure 6. Histogram of the Effect of Cooking Duration and Sugar Concentration on the Flavour Value of Kesambi Jam

The expected flavour from kesambi fruit jam is a fresh original fruit without additional smell from others mildewed and burnt. The result of this research shows that kesambi fruit jam had an flavour that the panellists liked with an average hedonic value ranging from 5.2 to 6.4. Panellists' preference for kesambi fruit jam is considered can maintain the distinctive flavour, so that it can be differentiated from other fruit flavour.

3. Taste

The taste of jam in general is mostly determined by sugar addition. Proper additional sugar will produce sweetness and is suitable to spread on plain food. Sugar can also serve as a preservative that helps extend the shelf life of jam. However, if the sugar content is too high, the natural taste of the fruit can be dominated by the sweetness of sugar, which means the average panellist responds LIKE to the taste of kesambi fruit jam. This shows that in terms of taste, the quality of kesambi fruit jam is considered very good, because it has a sweet taste that is suitable for a spread and can still maintain the slightly sour and fresh taste of kesambi fruit.

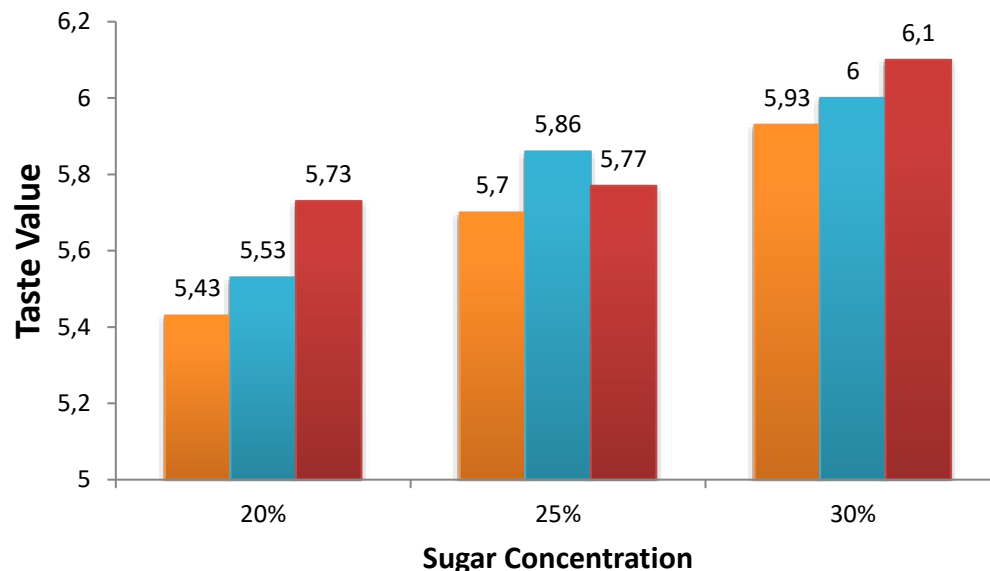


Figure 7. Histogram of the Effect of Cooking Duration and Sugar Concentration on the Taste Score of Kesambi Jam

Figure 7 shows the average score of panellists' favorability for the taste of kesambi fruit jam with a hedonic value range of 5.43 to 6.1 which means that the average panelists responded kind of like to like. The highest organoleptic test result score on the taste of kesambi fruit jam was gained from the treatment interaction of 30 minutes of cooking and 30% sugar concentration. However, the effect between treatments had no real effect.

CONCLUSION

- The characteristics of physico-chemical quality of kesambi fruit jam produced is the viscosity ranging from 68.91-76.15 cP. The water content of kesambi jam decreases by increasing cooking duration with an average score of 28.02% - 33.75%, total soluble solids ranging from 63.3 - 71.65 °brix. The average content of vitamin C. ranges from 16.74 to 18.25 mg / 100 g of ingredients.
- Based on organoleptic test, the best treatment of this research was on the addition of 30% sugar with cooking duration of 30 minutes.

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