Effect of comparison of roselle flower petals extract with passion fruit juice and konjac flour concentration on the quality of jelly drinks

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Abstract. Jelly drinks are practical and nutritious drinks. The use of roselle flower petals extract, passion fruit juice, and konjac flour in jelly drinks serves to increase the nutritional content of jelly drinks. This research was conducted to determine the effect of the ratio of roselle flower petals extract with passion fruit juice and konjac flour concentration used on chemical properties and organoleptic quality of jelly drinks. The results showed that the ratio of roselle flower petals extract to passion fruit juice had a very significant effect on pH, total acid, vitamin C levels, colour (°Hue), colour organoleptic values, aroma organoleptic values, and flavour organoleptic values. Konjac flour concentration had a very significant effect on total acid, vitamin C levels, and total dissolved solids. The interaction effect of the ratio of roselle flower petals extract with passion fruit juice and konjac flour concentration had a very significant effect on total acid and vitamin C levels. The ratio of roselle flower petals extract and passion fruit juice 80% : 20% and konjac flour concentration of 1.8% produced the best quality jelly drink.

1. Introduction
Jelly drinks are usually made from juice, sugar, and gelling materials. The juice used generally comes from various types of fruit such as grapes, oranges, guava, mango, passion fruit, roselle, strawberries and others. Roselle is widely used in the manufacture of drinks because of the content in it which is good for the body. Roselle (Hibiscus sabdariffa) is a plant that is often used in the food industry. The part that is often used from roselle is the petals. The use of roselle flower petals extract in jelly drinks is due to the nutritional content such as vitamin C, vitamin B12 (riboflavin), and vitamin B3 (niacin). Roselle flower petals also contain amino acids, iron, and water [1].

Passion fruit (Passiflora edulis) is one of the most famous fruits from North Sumatra. The part of passion fruit that usually consumed is the pulp, which are seeds coated with yellow fruit fibre. Passion fruit contains vitamins and minerals such as vitamin C, vitamin A, iron, magnesium, phosphorus, calcium, sodium, and potassium [2]. The use of passion fruit juice in the production of jelly drinks to provide a strong aroma in the drink. Purple passion fruit has a stronger aroma than yellow passion fruit because it has important volatile compounds, namely ethyl butanoate, ethyl hexanoate, and 2-heptyl acetate [3].

The gelling agent commonly used in the production of jelly drinks is carrageenan or konjac flour. Konjac flour is colourless, tasteless, and has a distinctive aroma. The use of konjac flour in the
production of jelly drinks as a gel-forming substitute for carrageenan. The advantages of konjac flour are that it is more elastic and has a higher viscosity compared to carrageenan. Carrageenan is brittle and less elastic [4]. The use of high concentrations of carrageenan causes low elasticity and the product tends to be tough and unacceptable [5].

2. Materials and methods

2.1. Equipment and materials
The ingredients used in the manufacture of jelly drinks are roselle flower petals, passion fruit konjac flour, sugar, and water. The tools used in this research are analytical scales, pH meter, hand refractometer, Minolta chromameter, Koehler penetrometer, VT-03E Rion Co viscometer, spectrophotometer, vacuum pump, laminar, autoclave, water bath, magnetic stirrer, vortex, oven, desiccator, incubator, colony counter, porcelain funnel, Whatman No. 41, glassware, dropper pipettes, spatulas, polyethylene, and aluminum foil. Chemical materials used in this study were distilled water, buffer solution pH 4 and pH 7, phenolphthalein 1%, NaOH, oxalic acid, L-ascorbic acid, HPO₃, 2,6-dichlorophenol indophenol, sodium bicarbonate. H₂SO₄, 95% alcohol, Plate Count Agar medium, NaCl 0.9%.

2.2. Method of making roselle flower petals and passion fruit juice
Roselle flower petals extract is obtained by placing 100 g of roselle flower petals in a pot containing 500 ml of water and then boiling over medium heat, stirring until the water turns red and the roselle flower petals are wilted. Then the solution is filtered to separate the roselle flower petals extract from the petals. The pulp of the passion fruit is taken and weighed as much as 100 g, then hot water is added 200 ml, then the passion fruit juice is stirred until dissolves. Then the solution is filtered to separate the passion fruit juice from the seeds.

2.3. Method of making jelly drinks
Roselle flower petals extract and passion fruit juice are mixed in a ratio of 80%: 20% (R1), 60%: 40% (R2), 40%: 60% (R3) and 20%: 80% (R4) by weight of fruit juice. Then sugar is added as much as 20% of the total fruit juice. Then konjac flour is added with a concentration of 1.4%; 1.6%; and 1.8% of the total fruit juice. After that, the mixture is heated in a stainless steel pan over medium heat to 90 °C for 2 minutes while stirring. Then the mixture is cooled down until the hot steam disappears while stirring slowly but put it in a plastic cup and cooled to room temperature. After that, the plastic cup is closed and then stored in the refrigerator at a temperature of 9-13 °C for 1 day. Analysis of quality parameters was carried out on jelly drinks, namely pH, total acid, vitamin C content, total dissolved solids, colour (° Hue), and organoleptic values for colour, aroma, and taste (hedonic). The best treatment results will be analysed for quality parameters, namely texture testing, crude fibre content, total plate count (TPC), total sugar, antioxidant activity, and viscosity.

3. Results and discussion
The effect of the comparison of roselle flower petals extract with passion fruit juice and konjac flour concentration on the quality of jelly drinks can be seen in Table 1 and Table 2.
Table 1. Effect of comparison of roselle flower petals extract with passion fruit juice on the quality of jelly drinks

| Parameter                        | Comparison of the extract of roselle flower petals with passion fruit juice (R) (%) |
|----------------------------------|----------------------------------------------------------------------------------|
|                                  | R₁ = 80: 20  | R₂ = 60: 40  | R₃ = 40: 60  | R₄ = 20: 80  |
| pH                               | 2.899cC    | 2.948cBC | 3.071bB    | 3.230aA    |
| Total acid (%)                   | 5.327aA    | 4.830bB  | 4.688cC    | 4.119dD    |
| Vitamin C levels (mg / g)        | 27.366aA   | 24.047bcB| 24.786bB   | 23.673cB   |
| Total dissolved solids (° Brix)   | 22.2409    | 22.631   | 22.518     | 23.078     |
| Colour (° Hue)                   | 30.702dD   | 34.721cC | 48.665bB   | 56.952aA   |
| Organoleptic value of colour     | 5.744aA    | 5.326bB  | 4.941cC    | 5.200bcBC  |
| Organoleptic value of aroma      | 5.207cC    | 5.310bcBC| 5.429bB    | 5.782aA    |
| Organoleptic value of taste      | 5.226cB    | 5.389bcB | 5.459bAB   | 5.759aA    |

Note: The differences of alphabet indicate the effect of real difference at 5% level and very real difference at 1% level. The test was repeated 3 times.

Table 2. Effect of konjac flour concentration on the quality of jelly drinks

| Parameter                        | Effect of konjac flour concentration (K) |
|----------------------------------|-----------------------------------------|
|                                  | K₁ = 1.4%    | K₂ = 1.6%    | K₃ = 1.8%    |
| pH                               | 2.994        | 3.030        | 3.087        |
| Total acid (%)                   | 4.153cC      | 4.528bB      | 5.061aA      |
| Vitamin C levels (mg / g)        | 23.441cC     | 24.412bB     | 26.635aA     |
| Total dissolved solids (° Brix)   | 20.966cC     | 22.547bB     | 24.464aA     |
| Colour (° Hue)                   | 42.621       | 42.760       | 42.899       |
| Organoleptic value of colour     | 5.306        | 5.264        | 5.339        |
| Organoleptic value of aroma      | 5.425        | 5.391        | 5.480        |
| Organoleptic value of taste      | 5.389        | 5.428        | 5.558        |

Note: The differences of alphabet indicate the effect of real difference at 5% level and very real difference at 1% level. The test was repeated 3 times.

3.1. pH

Table 1 showed that the smaller the ratio of the roselle flower petals extract used, the higher the pH value. This is because the extract of the roselle flower petals has a low pH. The previous research obtained the pH value of roselle petals extract was 2.34 [6].

3.2. Total acid

Figure 1 showed that the smaller the ratio of the extract of roselle flower petals used, the lower the total acid value. The use of passion fruit juice also affects the total acid value. Figure 2 showed that the more stabilizer is added means more hydroxyl groups that bind water and water-soluble components [7].
Figure 3 showed the interaction relations of roselle flower petals extract with passion fruit juice and konjac flour concentration to the total acidic jelly. The ratio of roselle flower petal extract with passion fruit juice and the greater concentration of konjac flour resulted in higher total acid. The reason is that there is more total acid in roselle flower petal extract than passion fruit juice. The nature of konyaku flour which is able to bind water and organic acids in the ingredients can maintain total acid in jelly drinks.

3.3. Vitamin C levels
Figure 4 showed that the highest vitamin C level was obtained in the treatment R₁ (80% : 20%) which is 27.37 mg/g and the lowest R₄ (20% : 80%) which is 23.49 mg/g. The smaller the ratio of the roselle flower petals extract used, the lower the value of vitamin C levels. Figure 5 showed that the highest vitamin C level was obtained in the treatment K₃ (1.8%) which is 26.63 mg/g and the lowest K₁ (1.4%) which is 23.44 mg/g. The more stabilizer that is added means more hydroxyl groups that bind water and water-soluble components [7].

Figure 6 shows the interaction of roselle flower petals extract with passion fruit juice and konjac flour concentration on vitamin C levels in jelly drinks. The ratio of roselle flower petal extract with passion fruit juice and the greater concentration of konjac flour resulted in higher vitamin C levels. The reason is that there is more vitamin C in roselle flower petal extract than passion fruit juice.
nature of konyaku flour which is able to bind water and organic acids in the ingredients can maintain vitamin C levels in jelly drinks.

Table 1 shows that the highest total dissolved solids were obtained in the treatment $K_3$ (1.8%) which is 24.464 °Brix and the lowest total dissolved solids in the treatment $K_1$ (1.4%) which is 20.996 °Brix. The higher the concentration of konjac flour used, the higher the total dissolved solids. The use of

![Figure 4](image)

**Figure 4.** The relations of roselle flower petals extract with passion fruit juice on vitamin C levels in jelly drinks

![Figure 5](image)

**Figure 5.** The relations of konjac flour concentration on vitamin C levels in jelly drinks

![Figure 6](image)

**Figure 6.** The relations of roselle flower petals extract with passion fruit juice and konjac flour concentration on vitamin C levels in jelly drinks

3.4. Total dissolved solids

Table 1 shows that the highest total dissolved solids were obtained in the treatment $K_3$ (1.8%) which is 24.464 °Brix and the lowest total dissolved solids in the treatment $K_1$ (1.4%) which is 20.996 °Brix. The higher the concentration of konjac flour used, the higher the total dissolved solids. The use of
hydrocolloids such as carrageenan and konjac flour which are gelling agents tends to increase the total dissolved solids because they have a high ability to bind water and water-soluble materials [8].

3.5. Colour (°Hue)
Table 1 showed that the highest colour (°Hue) was obtained in the treatment R4 (20%: 80%) which is 56.951 °Hue, the higher the passion fruit juice, the higher the colour (°Hue). The lowest colour (°Hue) was obtained in the treatment R1 (80%: 20%) which is 30.702 °Hue, the higher of the roselle flower petals extract, the lower the colour (°Hue). The advantage of roselle is the attractive colour of the extract due to the content of the anthocyanin pigment which produces a red or purple colour [5]. The reddish-yellow / orange discolouration in jelly drinks is caused by the carotenoid pigment content found in passion fruit juice. Passion fruit juice produces a yellow colour due to the carotenoid pigments present in it [9].

3.6. Organoleptic value of colour
Table 1 showed that the highest colour organoleptic value in the treatment R1 (80%: 20%) which is 5.744 and the lowest is in R3 treatment (40%: 60%) which is 4.941. The smaller the ratio of the roselle flower petals extract used, the lower the organoleptic value of the colour. This is because the red colour of the roselle flower petals extract is reduced. The anthocyanin content in roselle flower petals will give the extract a red colour [10].

3.7. Organoleptic value of aroma
Table 1 showed that the highest organoleptic value of aroma in the treatment R4 (20%: 80%) which is 5.782 and the lowest in R1 treatment (40%: 60%) which is 5.207. The greater the ratio of passion fruit juice used, the organoleptic value of the aroma increases. This is because passion fruit has a strong aroma, so the panelists like the aroma of jelly drinks. The strong and distinctive aroma of passion fruit is due to the content of volatile compounds in passion fruit, namely ethyl butanoate, ethyl hexanoate, and 2-heptyl acetate [3].

3.8. Organoleptic value of taste
Table 1 showed that the highest taste organoleptic value was obtained in the treatment R4 (20%: 80%) which is 5.759 and the lowest is in the R1 treatment (80%: 20%) which is 5.226. The greater the ratio of passion fruit juice used, the organoleptic value of the taste increases. This is because passion fruit has a distinctive flavour that the panelists like. The advantage of passion fruit is that it has a thick juice and strong flavour [11].

| Parameter                                    | Analysis results |
|----------------------------------------------|------------------|
| Texture (mm / g)                             | 2,955.556        |
| Crude fibre content (%)                      | 0.472            |
| Total plate count (CFU / g)                  | 1.259 x 103      |
| Total sugar (%)                              | 15.753           |
| Antioxidant activity (IC50) (µg / ml)        | 68.046           |
| Viscosity (Pa.s)                             | 25.333           |

Note: Comparison of the roselle flower petals extract with passion fruit juice (80%: 20%) and concentration konjac flour (1,8%). The test was repeated 3 times.

Based on the results of the research, the best quality product was obtained in the R1K3 treatment, which is jelly drink with a ratio of roselle flower petals extract with passion fruit juice of 80%: 20% and a concentration of konjac flour of 1,8%. This best quality product is tested with several parameters
such as texture test, crude fibre content, total plate count, total sugar, antioxidant activity, and viscosity. The results of the analysis of jelly drinks with the best quality can be seen in Table 3.

4. Conclusions

The best quality of jelly drink was obtained in the comparison of roselle flower petals extract with passion fruit juice 80%: 20% and the best concentration of konjac flour was 1.8%. This is obtained based on the nutritional content and organoleptic value.

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