

**Original Research/Systematic Review****Formulation and Physical Evaluation of the Combination Syrup of Rosella (*Hibiscus sabdariffa* L.) and Lemongrass (*Cymbopogon citratus*)****Putri Nata Sari<sup>1</sup>, Pramita Yuli Pratiwi<sup>2\*</sup>, Indarto Indarto<sup>3</sup>, Agus Kirwanto<sup>4</sup>**<sup>1,2,3,4</sup> Department of Traditional Medicine, Poltekkes Kemenkes Surakarta, Indonesia**ABSTRACT**

**Background:** Rosella flowers and lemon grass are combined into one formulation, namely syrup. The syrup is a concentrated preparation made from a mixture of water and sugar with a minimum sugar solution content of 65%. Previous research has never examined the formulation and physical evaluation of rosella and lemongrass syrup. The benefits of this rosella and lemongrass combination syrup are to maintain the body's immune system, reduce high blood pressure, as a source of body antioxidants. The purpose of this study was to determine the formulation and evaluation test of formulation one and formulation two on rosella (*Hibiscus sabdariffa* L.) and lemon grass (*Cymbopogon citratus*) combination syrup preparations.

**Methods:** The type of research used is quantitative with a descriptive design. The syrup was made with two formulations using the boiling method with the composition of rosella, lemon grass, sucrose, and distilled water. The physical test for the syrup included the viscosity test, the pH test, the organoleptic test, and then the hedonic test which included color, smell, taste, and aroma. The research was conducted at the Laboratory of Indonesia Traditional Herbs Department, Surakarta Health Polytechnic.

**Results:** The results of the viscosity test on the combination of rosella and lemon grass syrup were that in formula one it was 1.39 mPas and in formula two it was 1.27 mPas. The results of the pH test on formula one were 2.47 and on formula two 2.48. The results of the organoleptic syrup test for the combination of rosella and lemongrass in Formula One had a deep brown-red color, a distinctive smell of rosella and lemongrass, and a sweet and sour taste. Formula two has a red-brown color with a distinctive rosella odor and has a sweet-sour taste. The hedonic test which has the most favorable results is the formula for two aromas 67%, taste 74%, color 80%, and texture 77%.

**Conclusion:** The viscosity value of the two formulas is quite low and the pH of the two formulas is also low, which is less than pH 4. The taste, aroma, and texture of Formula 2 are preferred. While the colors of the two formulas produce the same percentage of preference. Recommendations for this study need to be carried out further research by changing the composition variations of rosella and lemongrass in order to obtain a pH that is in accordance with the standard equations.

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syrup; rosella; lemongrass; physical evaluation; hedonic test

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## INTRODUCTION

Indonesia as a tropical country has a wide variety of plants that can be used as a source of food and medicine. Along with the development of science and human lifestyle, it has caused people to think that food not only provides benefits as a source of nutrients but also must be beneficial for health. Since the emergence of the Covid-19 virus, people have realized the importance of maintaining health. Many drinks are in demand by the public because they are believed to be able to maintain health. Some of the trending drinks are made from traditional spices which are believed to be able to maintain the body's immunity and body health.

Rosella (*Hibiscus sabdariffa* L.) on the petals of fresh rosella flowers are used for coloring and flavoring in the manufacture of wine, syrup, gelatin, and pudding. Dried rosella flower petals are often used to make tea, jelly, and syrup. The syrup is one type of drink that is much liked by the public so it has a very guaranteed market potential. The syrup is a kind of soft drink in the form of a thick sugar solution with various flavors (Eslaminejad and Zakaria, 2011).

Lemongrass is a plant that belongs to the grass family. This plant is known as lemongrass because it has a strong smell like lemon, often found growing naturally in tropical countries. Lemongrass can be used to lower high blood pressure, boost the immune system, maintain the digestive system, and relieve flu symptoms (Sutik and Pangestuti, 2022).

Rosella flowers and lemon grass are combined into one formulation, namely syrup. The syrup is a syrup which is a concentrated preparation made from a mixture of water and sugar with a minimum sugar solution content of 65% (SNI, 2013). Syrup cannot be drunk immediately, unlike ready-made drinks or other fruit juices, because the syrup must first be diluted with water. To add flavor to the syrup, coloring and citric acid can be added.

Syrup preparations must have quality standards, so after the formulation is made, physical tests need to be carried out. A physical test is a test in which product quality is measured objectively based on physical things that appear on a product. The physical test aims to determine whether the syrup preparations made are suitable for consumption or meet the standards (Husen, et al., 2015). Apart from the physical test, a hedonic test was also carried out. The hedonic test or hedonism test is a syrup test that is carried out using several random respondents. The extract syrup preparation was given to the respondent to try after that the questionnaire was filled in by the respondent. To determine the hedonic test or preference test on rosella and lemongrass combination syrup. The level of preference of respondents can be seen based on the aroma, texture, and taste parameters. The scale used is a numerical scale, namely 1 to rate strongly disagree, 2 to disagree, 3 to agree, and 4 to strongly agree (Sayuti and Agus, 2015).

There have been many studies on rosella syrup preparations, but research on the combination formulation of rosella syrup and lemongrass has not been available. Therefore, the authors are interested in researching the formulation and physical evaluation of a combination of rosella syrup (*Hibiscus sabdariffa* L.) and lemongrass (*Cymbopogon citratus*). Physical tests on syrup preparations consist of organoleptic tests, pH tests, and viscosity tests. In addition to physical evaluation of syrup

preparations, hedonic tests can also be carried out. The hedonic test comes from the response of respondents who carry out tests consisting of color, taste, and smell tests (Fitriana, et al., 2022). This syrup preparation is useful for maintaining the body's immune system, lowering high blood pressure, and as a source of body antioxidants (Ministry of Health RI, 2011).

## MATERIALS AND METHOD

This type of research is quantitative research. Quantitative research is a research method used to examine certain populations or samples. Data collection uses research instruments, and data analysis that have a quantitative or statistical nature (Sugiyono, 2015). The design in this study uses a descriptive design. Descriptive research is research that provides a detailed description of a symptom based on existing data, presents data, analyzes, and interprets it (Narbuko and Achmadi, 2003). Data was collected using observation and questionnaires.

The main ingredients for making this syrup are dry simplicia of rosella flowers and wet simplicia of lemon grass stalks. Additional ingredients used for syrup formulation are sucrose and distilled water.

The tools used for the syrup formula are stoves, stainless steel pans, knives, stainless filters, basins, stirrers, scales, bottles, funnels, and temperature thermometers. The tool used to test the viscosity is the VT-03F rion viscometer. The tool used for organoleptic testing is to use the five senses. The tool used to test the pH is a pH meter. The tool used for hedonic testing is to use the five senses.

### Extraction by boiling

150 grams of rosella flower simplicia in Formula One was extracted using the boiling method. Method of boiling method by heating distilled water in a stainless pan at 97°C until it boils. Then put the simplicia into a stainless pot containing 500 ml of distilled water. The extract obtained was then filtered using a stainless filter. After that, save the decoction of the rosella flower simplicia in a bottle and close it tightly when it's cold.

**Table 1.** Rosella and Lemongrass Extract Syrup Formula

No	Component	Unit	Formula 1	Formula 2
1.	Rosella extract	gram	150	100
2.	Lemongrass extract	tree trunk	10	5
3.	Aquadest	mL	12000	12000
4.	Sucrose	gram	850	850

The formula for two rosella flower simplicia as much as 100 grams was extracted using the boiling method. The method of boiling with distilled water is heated in a stainless pan at 97°C until it boils. Then put the simplicia into a stainless pot containing 500 ml of distilled water. The extract obtained was then filtered using a stainless filter. After that, save the decoction of the rosella flower simplicia in a bottle and close it tightly when it's cold. Formula one takes as many as 10 stalks of lemongrass and is then extracted by heating distilled water in a stainless pan at 97°C until it boils. After boiling, add the lemongrass extract into 500 ml of distilled water. The extract obtained was then filtered using filter paper. Then store it in a bottle. The formula for two lemongrass was as many as 5 sticks and was then extracted by heating distilled water in a stainless pan at 97°C until it boiled. After boiling, add the lemongrass extract into 500 ml of distilled water. The extract obtained is then filtered using filter paper, then stored in a bottle (Dirjen POM, 2011)

1. Syrup making

Formula one Heat 200 ml of distilled water in a saucepan until it boils, then add 850 grams of sucrose, and stir until homogeneous. After that, put 625 ml of rosella flower extract and lemongrass stem extract in a stainless steel pot while stirring until homogeneous, then filter and put it in a glass bottle. Formula two Heat 200 ml of distilled water in a saucepan until it boils, then add 850 grams of sucrose, and stir until homogeneous. After that, add 625 ml of rosella flower extract and lemongrass stem extract into a stainless pot while stirring until homogeneous, then filter and put into a glass bottle.

2. Physical Evaluation

a. Viscosity or viscosity test

Performed using a viscometer VT-03F rion. The combination of rosella and lemon grass syrup formula in formula one and formula two to be tested was put into a 250 ml beaker glass. Run the viscometer and record the viscometer reading results displayed on the display in the form of speed viscosity, viscosity data, and percent viscosity

b. pH test

The pH meter is immersed in a combination of rosella and lemon grass syrup. Performed on formula one and formula two as much as 50 ml then let stand a few minutes and after seeing the results.

c. Organoleptic test

The test was carried out using observations of the shape, color, taste, and smell of 50 ml of formula one and formula two syrup combination of rosella and lemongrass.

3. Hedonic test

Research using 30 respondents at random. Respondents will be given examples of rosella and lemongrass combination syrup formulations to try then questionnaires filled out by respondents to see the level of respondents' preference for syrup formula preparations based on parameters of shape, color, taste, and smell. by using a numerical scale, namely 1 to rate strongly disagree, 2 to assess disagree, 3 to agree, and 4 to strongly agree (Sayuti and Agus, 2015).

4. Data analysis

The data analysis used in this study was univariate. Univariate analysis is an analysis performed for one variable or per variable. which aims to describe the results of the distribution and presentation of each variable (Notoatmojo, 2010).

## RESULTS

### Rosella and Lemongrass Extract Results

Dried rosella flowers in formula one as much as 150 grams when boiling produces 270 ml of rosella flower extract. In formula two, 100 grams of dried rosella flowers when boiled produce 270 ml of extract. The rosella flower extract obtained in formula one was dark brownish red in color and viscous, then for formula two the rosella extract obtained was brownish red in color and liquid. This extract will be used as the main ingredient for making syrup.

Wet lemongrass stems in formula one as many as 10 stems when boiling produces 350 ml of extract. In formula two, 5 stalks of wet lemon grass when boiled produce 350 ml of extract. The lemongrass stem extract obtained in formula one is green and liquid, then in formula two it is green and liquid. The extract obtained will be used as the main ingredient in making syrup.

### Physical Test of Syrup from Rosella and Lemongrass Ingredients

The syrup property test was carried out on two formulas which included a viscosity test, an organoleptic test, and a pH test.

#### 1. Viscosity (Viscosity)

The results of testing the viscosity of the rosella and lemon grass combination syrup in formula one was 1.39 mPas and in formula two was 1.27 mPas

#### 2. Organoleptic

Organoleptic tests included observing the shape, color, smell, and taste of the combined rosella and lemon grass extract syrup using the five senses. The results of the organoleptic test are as follows:

Table 2. Organoleptic test results

Organoleptic test	Formula I	Formula II
Form	Thick	Liquid thick
Color	Dark brown red	Red-brown
Smell	Typical of rosella and lemongrass	Typical of rosella and lemongrass
Flavor	Sweet and sour	Sweet acidity

#### 3. pH test

Based on the results of the degree of acidity (pH) test in formula one 2.47 and in formula two 2.48

### Hedonic Test

The hedonic test was carried out by describing the panelists' preference for syrup which included (parameters of taste, aroma, color, and texture) using 30 respondents. The results of the hedonic test can be seen in Table 3.

Table 3. Formula I and II hedonic test results

Hedonic test	Formula I		Formula II	
	Very like	Like	Very like	Like
Flavor	50%	50%	74%	26%
Smell	60%	40%	67%	33%
Color	80%	20%	80%	20%
Form	60%	40%	77%	33%

## DISCUSSION

This rosella and lemon grass combination syrup uses two formulas. Formula One uses 150 grams of rosella flower extract, 10 stalks of lemon grass extract with additional ingredients of 1200 ml of distilled water, and 850 grams of sucrose. Then for formula two use 100 grams of rosella flower extract, 5 stalks of lemongrass extract, with additional ingredients of 1200 ml of distilled water and 850 sucrose. Using this formula is based on a modification from Palimbong (2020). The way to make this syrup is different from making Palimbong 2020 because the way the syrup is made is the ingredients are macerated for 48 hours before making the syrup. Then when making boiling syrup, it was done with variations of 60 minutes, 90 minutes, and 120 minutes. The formula used in this journal is different from that made.

According to Palimbong (2020), the ingredients used are 250 grams of ginger, 100 grams of secang wood, 1 cinnamon stick, 5 lemongrass sticks, and 7 cloves. Meanwhile, the syrup formula made is different because the method of making rosella and lemongrass combination syrup uses the method of boiling for 15 minutes. With the ingredient formula, formula one uses 150 grams of rosella flowers and 10 stalks of lemongrass, then in formula two, 100 grams of rosella flowers and 5 stalks of lemongrass. How to make a combination of rosella and lemon grass syrup using the boiling method. This syrup uses the non-intrusive method of boiling so that people can also make this syrup. In making this syrup using additional ingredients 1200 ml of distilled water and 850 grams of sucrose. Using sucrose 850 because the syrup must contain 55-65% sugar (SNI, 2013), this syrup already contains 65% sugar in it.

Making this syrup uses a temperature of 97°C, this temperature is based on the Palimbong. So that the temperature is maintained, Place the thermometer in the syrup during the manufacturing process, and always pay attention to the size of the fire so that the temperature is maintained properly. Boil using a stainlesssteel pan. Use a stainlesssteel pan because the metal material used does not react with the material being boiled (Suharmiati, 2005). Of all the main ingredients and additional ingredients, the result is a combination of rosella and lemongrass syrup, which is 1250 ml.

Physical Test in the form of Viscosity test on formula one syrup has a value of 1.39 mPas and on formula two has a value of 1.27 mPas. The results of the viscosity of this syrup are different because it is influenced by the ingredients used, namely rosella. Formula one with 150 grams of rosella produces a thick extract then formula two with 100 grams of rosella produces a liquid extract. Based on these results, SNI has not determined the normal value of syrup viscosity. According to the journal from Palimbong (2020), the results of the viscosity test carried out were that Formula 1 had a value of 163.33, Formula 2 had 170, and Formula Three had 26.67. The results of the average value of the Secang syrup above are affected by the boiling time. The results of the syrup viscosity can be affected by the addition of CMC ingredients to the syrup which aims to thicken. However, in making this syrup CMC is not used, only sugar is used as a thickener in the syrup. The minimum sugar solution level in syrup is 65% (SNI, 2013). In addition to being used as a sweetener, sugar is also used as a source of solids so that it can increase the viscosity of the syrup (Hasni, et al. 2017). In this study, the sugar contained in the syrup complied with SNI, namely 65%.

The pH of the syrup resulted in formula one of 2.47 and formula two had a pH of 2.48. In the rosella and lemongrass combination syrup, the pH obtained is not by the SNI, because the syrup has a pH value that ranges from 4-7 (Ministry of Health RI, 1995). This syrup has a low pH because of the high acid content (low pH) accompanied by

high total dissolved solids, this can be said to be a food preservative (Prichard, et al 1985). In addition, low pH also occurs because rosella contains a very large anthocyanin pigment, especially in determining color, at low pH anthocyanin acid has a red color (Sugiyono, et al 1992). If anthocyanins are high, the antioxidants contained will increase (Lestario et al, 2002). High antioxidants are very beneficial for human immunity.

The hedonic test was carried out on 30 trained respondents. The purpose of selecting these trained respondents was because the respondents had previously known about the hedonic test and had done it before. The results of the hedonic test showed differences in response between each parameter of the rosella and lemon grass combination syrup.

Taste is one of the factors in determining the quality of food or drink. The food or drink served must have a taste that can react to affect the senses so that it can cause an appetite to eat or drink (Tarwendah, 2007). The results for formula one syrup were 50% and 50%, then for formula two the flavors were 74% and 26%. Based on the table above, the flavor that the panelists liked the most was formula two, with the amount of ingredients 100 grams of rosella and 5 stalks of lemongrass by boiling method and using a temperature of 97°C. In these results, formula two is preferred because it has a sweet and sour taste, this can be compared with the journal "Vitamin C Content, Physical Quality, pH and Organoleptic Quality of Rosella Syrup (*Hibiscus sabdariffa*, L) Based on Extraction Method". The sour taste contained in rosella syrup extracted by heating will disappear, this is because the organic acids contained in rosella are lost as a result of the heating process and some of the acids are still present in the ingredients because the ingredients are not destroyed which results in the addition of sour taste sugar. contained in the syrup is lost (Mukaromah, et al 2010).

Aroma is an odor caused by chemical stimuli that can be smelled by the olfactory nerves located in the nasal cavity which can function to increase appetite (Negara et al., 2016). The results of the aroma in the syrup in formula one liked the aroma of 60% and 40% and formula two liked the aroma of 67% and 33%. Based on the results above, the panelists preferred the aroma of formula 2 syrup. In the second formula, the measurement of rosella ingredients is 100 grams and 5 stalks of lemon grass using the boiling method and using a temperature of 97°C. Formula Two prefers the scent because it has the right ratio and produces a fragrant aroma that the panelists like. This is because rosella flowers do not have the distinctive aroma of other flowers such as jasmine, roses which have a pleasant aroma and are liked by the panelists (Mukaromah et al, 2010).

Color is a sensory that can be seen directly by the panelists, the determination of the color of food or drink depends on the color it has. Attractive and natural colors can enhance taste (Negara et al., 2016). The results of the hedonic test on syrup have a color in formula one which is 80% and likes 20% and formula two has a color that likes 80% and likes 20%. The results of testing the two panelists' syrup formulas both liked it because the results showed the same value. The results of the study can be compared with the journal "The Influence of Rosella Raw Material Preparation and Cooking Time on the Antioxidant Activity of Rosella Flower Syrup (*Hibiscus sabdariffa* L.)". The use of dried rosella flowers produces a syrup with a pale red color. This is because, in rosella flowers that received the drying treatment, there was degradation or damage to compounds such as gossypetin, anthocyanin, and hibiscin glucosides and a decrease in antioxidant activity due to the drying process. This decrease in antioxidant activity will certainly cause a decrease in anthocyanin content (Hartiati, 2009).

Texture is the result of the response of the senses of taste and touch to physical stimulation when contact occurs between the oral cavity and food or drink. Texture consists of the thickness or viscosity used for liquids (Tarwendah, 2017). Based on the tests conducted on the combination syrup of rosella and lemon grass, the results showed a very like texture of 60% and a liking of 40%, and formula two liked a texture of 77% and a liking of 23%. In the hedonic test results, the favorite rite texture is formula two. In the second formula, the dose of rosella flowers is 100 gr,ams, and 5 stalks of lemon grass using the boiling method ing a temperature of 97°C. Due to the use of ingredients and sugar in good proportions, the panelists liked the texture.

## **CONCLUSION**

Based on the results of the study with physical tests and hedonic tests on the combination of rosella and lemongrass syrup that had been carried out, it was concluded that the physical test results of the viscosity test on the combination of rosella and lemongrass syrup were in formula one which was 1.39 mPas and in formula two was 1.27 mPas. The results of the pH test on formula one were 2.47 and on formula two 2.48. This syrup has a low pH because rosella contains a very large anthocyanin pigment, especially in determining color, at low pH anthocyanin acid has a red color (Sugiyono, et al 1992). The organoleptic test results for the combination of rosella and lemongrass syrup in formula one had a deep brown-red color, a distinctive rosella and lemongrass odor, and a sweet and sour taste. Formula two has a red-brown color with a distinctive rosella odor and has a sweet-sour taste. The hedonic test results on the aroma of syrup in formula Oneriked 60% and liked 40%, formula Formula Twoliked 67% and liked 33%, the taste of formula One really liked 50% and liked 50%, formula two liked it 74% and likes 26%. the color in formula one likes 80% and likes 20%, formula two has a color that likes 80% and likes 20%. Formula one likes texture 60% and likes 40%, formula two likes texture 77% and likes 23%

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