



Original Article

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Assessing the Quality of Tamarind Lace (*Carissa carandas L.*) Based Cordial in Malaysia

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Negy Oriza Sativa ¹, Elham Thaghavi ² and Muhammad Said Siregar ^{1,*}

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¹ Department of Agricultural Product Technology, Faculty of Agriculture, Universitas Muhammadiyah Sumatera Utara, Medan Timur, 20238 Kota Medan, Sumatera Utara, Indonesia. (N.O.S.)

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² Department of Science Agrotechnology, Faculty of Fisheries and Food Science, Universiti Malaysia Terengganu, 21030 Kuala Nerus, Terengganu, Malaysia. (E.T.)

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* Correspondence: msaidsiregar@umsu.ac.id (M.S.S.)

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Abstract: This study evaluates the quality assessment of developed cordial beverages. Four various formulations of cordial drink were. The first juice combines tamarind lace acid with sugar in the formulation process. In the second variant, the juice is mixed with sugar and supplemented with salt. The third formulation incorporates tamarind lace acid juice mixed with sugar and enriched with pandan leaves. Lastly, the fourth variant combines juice, sugar, and salt and adds two pandan leaves. Each formulation of tamarind lace acid-based cordial drink undergoes comprehensive evaluation, encompassing the analysis of pH, Tss, Color, and organoleptic attributes. The analysis outcomes for the cordial drink formulations revealed that cordials with the addition of salt were well-received, as indicated by the research results. The results of this study on the quality of tamarind-based soft drinks (*Carissa carandas L.*) with the addition of sugar, salt, pandan leaves with the treatment of Cordial Basic, Cordial Salt, Cordial Pandan, Cordial Salt + Pandan have pH (2.09; 1.74; 1.89; 1.66), TSS (67.38; 70.23; 67.65; 54.05) Colour (25.70; 29.69; 29.09; 26.17), a* (4.04; 3.42; 2.82; 3.77), b* (0.45; 0.49; 0.40; 0.65). In the sensory test of taste and overall acceptance, drinks with the Quality of Tamarind Fruit Juice with the Addition of Salt have the best results because they have a level of sweetness with the addition of salt in the manufacture of tamarind-based drinks significantly affects the parameters of Taste, Mouth Feeling and Odour.

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Keywords: Tamarind lace, Cordial beverage, pH, Total dissolved solids

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1. Introduction

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Cordial with passion fruit as various groups can consume the base ingredient to compete in the market with other drinks (Viera et al., 2022). Fruit juice is a processed fruit that is well-known to the public. Making fruit juice uses the main ingredient, namely fruit, and additional ingredients, namely water and sugar. This product has the potential to be a choice of refreshing drinks but is not yet practical, so it is necessary to develop a diversification of similar drinks (Jariyah et al., 2019). Tamarind fruits are astringent and slightly acidic, containing maximum amounts of pectin, vitamins, and minerals (Jayakumar & Muthuraman, 2018).

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As a result of its astringency, processing is required for the consumption of the fruit. Once the fruit is processed, the processed products can be preserved throughout the year. Karanda value-added products contain vitamins and minerals that have been carried out include syrup (Srivastava et al., 2017).

Jelly candy and fruit juice, or Karonda (*Carissa carandas L.*), is an evergreen shrub from the Apocynaceae family (Bhowmick et al., 2023; Khan, 2019). It was native to India's Himalayas and Western Ghats, growing at altitudes of 300 to 1800 meters. Within the genus *Carissa*, there are over 25 species, with 5 species native to India. This Karonda plant is perfect for arid and semi-arid regions, as it can tolerate temperatures as high as 44 °C. Major countries cultivating Karonda include India, Nepal, Malaysia, Afghanistan, Sri Lanka, and South Africa. However, the main concern with Karonda fruit is the short postharvest storage period (2 days for ripe and 5-7 days for unripe) due to the soft flesh and higher moisture content, leading to deterioration within a few days of harvest. Drying is considered one of the ways to make the fruit available throughout the year. But at the same time, fruits like berries are edible and nutrient-enriched. They are a rich source of vitamin C and hard-to-find minerals such as potassium, magnesium, phosphorus, and calcium (Banik et al., 2011).

2. Materials and Methods

This study was conducted from September 2023 to September 2023. The research was conducted at the Food Science Laboratory, University of Malaysia Terengganu. Karonda Cordial was conducted at the University Malaysia Terengganu Laboratory, Faculty of Fisheries and Food Science. The main ingredients used in this study were Karonda fruit picked from a Bukit Kor, CSR brand fine granulated sugar, red Himalayan salt, and 2 pandan leaves readily available in the laboratory. The tools used in this study include an analytical scales blender, a gas stove, a stainless-steel pot, a pH meter, a Refractometer, and a Packaging Bottle. Tools that include questionnaire paper, stationery, and plastic cups are used for organoleptic tests.

2.1. Tamarind Fruit Cordial Preparation

Tamarind fruits are picked directly from Bukit Kor Terengganu and are ripe, then 2 kg of Csr brand sugar, 4 pandan leaves, and 20 grams of Himalayan salt. Next, lace tamarind fruit and pandan leaves are washed until clean, then put the lace tamarind fruit into the blender. All ingredients are washed thoroughly, the lace tamarind fruit is put into the blender, and 2 litres of water are added. The finished blender filters lace sour fruit using a 30 mesh sieve. After filtering, pour 1 litre of lace sour juice into a saucepan, then add 2 kg of white sugar. Then cook until the sugar dissolves at °C. Then, add as much as 2 litres of water to the pot. After the sugar dissolves and the water boils, turn off the stove and let it stand for 5 minutes or until it is cool. The first treatment in making Asam Renda Drink is cooking Asam Renda fruit juice, added to 2 kg of Csr brand sugar. After that, cool it to a temperature of 60 °C, put it in a bottle, then close it and label it P1. The second treatment is cooking fruit juice mixed with sugar and added with salt. After that, cool it to a temperature of 60 °C, put it in a bottle, then close it and label it P2. The third treatment is cooking the juice mixed with sugar and adding 2 pandan leaves. After that, cool it to a temperature of 60 °C, put it in a bottle, close it, and label it Cordial P3. The fourth treatment is fruit juice mixed with sugar, added with salt, and two pandan leaves. After that, cool it to a temperature of 60 °C, then put it in a bottle, close it and label it treatment; then the analysis pH, TSS, colour and sensory.

2.1.1. pH Analysis

pH measurement was conducted employing a pH meter. Treatment Cordial Basic, Cordial + Salt, Cordial + Pandan, and Cordial + Salt + Pandan were introduced into the container. Then, document the pH reading displayed on the digital pH meter screen.

2.1.2. Total Soluble Solid Analysis

Total dissolved solids (TSS) equals the percentage of sugars and other dissolved or soluble solids or other dissolved or soluble solids in a solution (Amizan & Loo, 2020).

2.1.3. Colour Analysis

To determine the colour of the Precise Color Reader (WR-10) was used. Brightness (L^*), red greenness (a^*), and yellow greenness (b^*) values were the parameters measured in the cordial samples (Luo et al., 2019).

2.1.4. Sensory Analysis

Organoleptic tests were conducted to evaluate sensory parameters using a panel of 30 panellists on the samples. Panelists were given mineral water to neutralize the taste. The parameters tested included colour, aroma, texture and overall acceptability.

2.1.5. Statistical Analysis

This analysis was performed using SPSS with the One Way ANOVA test model with 4 types of treatment on syrup.

3. Results

3.1. Formulation Effect on pH

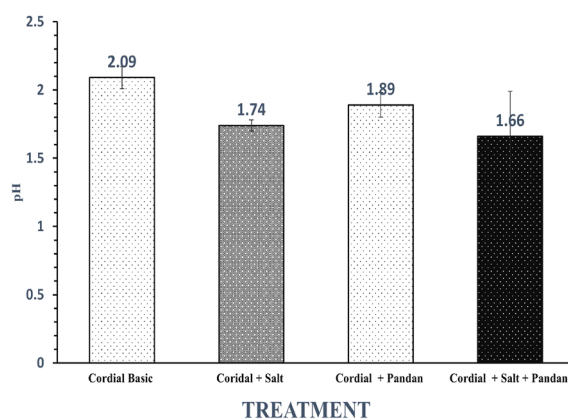


Figure 1. Formulation Effect on pH of Cordial Drink

Figure 1 shows the pH of the cordial drink sample. Statistical analysis showed significant differences ($p < 0.05$) among the various formulations of cordial drinks. The average pH value for Cordial Basic is 2.09 ± 0.089 , Cordial + Salt, 1.76 ± 0.047 , Cordial + Pandan, 1.89 ± 0.009 , and Cordial + Salt + Pandan, 1.65 ± 0.33 , respectively. Changes in pH value can significantly change the taste and pH of the acid category, causing microbes to be difficult to grow making the product more durable (Wiyono and Kartikawati 2017). The large amount of organic acid content causes fruit juice to have a low pH (Kiayi, 2018). The heating process with a long time or high temperature will tend to increase pH with the loss of organic acids, including citric acid, ascorbic acid and other acids.

3.2. Formulation Effect on Total Soluble Solid

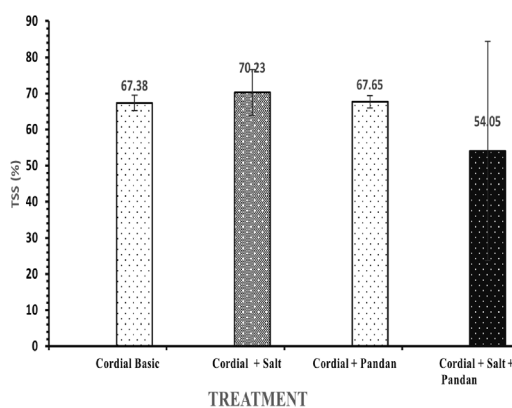


Figure 2. Formulation Effect on Total Soluble Solid (TSS) of Lace Acid

Figure 2 shows the TTS of the samples. The statistical analysis showed no significant difference ($p < 0.05$) among the treatments Cordial Basic, Cordial + Salt, Cordial + Pandan, and Cordial + Salt + Pandan. The average value of TTS for Cordial Basic, Cordial + Salt, Cordial + Pandan, Cordial + Salt + Cordial +

Pandan. The best results were found in the Cordial + Salt treatment. Adding salt can increase the colour of the cordial and make it more attractive. with the average TTS value in Cordial + salt 70.22 ± 6.31 , respectively. A hand refractometer can measure Total dissolved solids (Ihsan & Wahyudi, 2010). Salt is one of the acidulants added to the food processing process for various purposes. Acidulants (acidity regulators) function as flavour and colour enhancers, and these compounds have a synergistic effect on brightness by preventing browning reactions in syrups (Deshpande et al., 1995).

3.3. Colour Analysis

Table 1. Colour of Lace Sour Drink

Treatment	L	a*	b*
Cordial Basic	$25,70 \pm 2,093^a$	$4,04 \pm 0,949^a$	$0,45 \pm 0,518^a$
Cordial + Salt	$29,69 \pm 0,753^a$	$3,42 \pm 0,925^a$	$0,49 \pm 0,395^a$
Cordial + Pandan	$29,09 \pm 1,307^a$	$2,82 \pm 0,733^a$	$0,40 \pm 0,289^a$
Cordial + Salt + Pandan	$26,17 \pm 3,696^a$	$3,77 \pm 1,017^a$	$0,65 \pm 0,619^a$

Note: Values with different letters shown in the same column of the table indicate no significant difference ($p < 0.05$).

Table 1 captures that Cordial Basic, Cordial + Salt, Cordial + Cordial Pandan, Cordial + Salt + Pandan. From the Cordial Basic treatment it decreased due to the addition of sugar. The Cordial + salt + Pandan treatment decreased due to salt + pandan leaves. And Cordial + Pandan Treatment decreased due to the addition of Pandan Leaves. The cordial + salt treatment is higher due to the addition of salt, which can provide colour brightness, as shown in Table 1. Syrup with Syrup Treatment with salt has a higher Brightness Level value L (29.69 ± 0.753), a* (3.42 ± 0.925), b* (0.49 ± 0.395). compared to Cordial + Basic, Cordial + Pandan, Cordial + Salt + Pandan.

3.4. Sensory Analysis

An organoleptic test measures the level of liking for a product so that it can be accepted. This test includes colour, aroma, texture, appearance, taste and overall assessment. This preference level is on a hedonic scale: Like, Very Like, Neutral, Dislike and Very Dislike. These tests can help identify in more detail the variables of ingredients used or processes associated with specific sensory characteristics of the product (Destarianto et al., 2017).

Table 2. Acid Lace Cordial Sensory Analysis

Treatment	Colour	Aroma	Appearance
Cordial Basic	2.43 ± 1.098	3.17 ± 1.723	2.43 ± 1.362
Cordial + Salt	2.77 ± 1.250	3.73 ± 1.760	2.93 ± 1.430
Cordial + Pandan	2.37 ± 1.401	3.57 ± 1.794	2.77 ± 1.43
Cordial + Salt + Pandan	2.40 ± 1.404	3.67 ± 1.881	2.40 ± 1.072

Table 2. Acid Lace Cordial Sensory Analysis (Cont'd)

Treatment	Texture	Taste	Overall
Cordial Basic	2.93 ± 1.680	3.23 ± 2.079	3.27 ± 1.964
Cordial + Salt	3.90 ± 1.953	4.03 ± 1.902	4.00 ± 1.640
Cordial + Pandan	3.67 ± 1.971	3.87 ± 1.907	3.70 ± 2.103
Cordial + Salt + Pandan	3.60 ± 1.792	4.23 ± 1.774	3.33 ± 1.787

Table 2 shows the results of the sensory test assessment from 30 panellists who all liked Cordial Basic, Cordial + Salt, Cordial + Pandan, and Cordial + salt + Pandan—starting with colour, aroma, appearance, taste, texture, and overall assessment. The 30 panellists who did the sensory test liked the sour lace syrup. However, some panellists liked cordial + salt because of the salt mixture—the sour lace tastes more flavorful when drinking it than other syrups. The panellists also liked the sour lace syrup with Cordial + Salt + Pandan because of the mixture of pandan and salt in the sour lace syrup. The colour liking test shows that colour strongly impacts the level of panellist liking and is also attractive. The more attractive the colour of the food ingredients, the more interest consumers have in owning the product (Widyawati et al., 2023). Colour is also a variable in the first sensory quality that panellists can see and assess directly.

In this favorability test, panellists were asked to rate 4 samples of Asam lace syrup that had been coded. It indicates the level of liking for the colour of the lace sour syrup. After conducting a colour-liking test on lace sour syrup and performing calculations, the results can be seen in Table 2. It can be concluded from Table 2. The result obtained above is that the value of cordial + salt is greater than that of other syrups. Then, the panellists also liked the sour lace syrup because of its colour, taste, smell, and overall value. Favorability test results on aroma: aroma is a response that arises when the volatile compounds of the product or food enter the nasal cavity and are perceived by the olfactory system (Tarwenda 2017). In the favorability test, panellists were also asked to rate 4 samples of lace acid syrup that had been coded. The assessment of the level of the panellist's liking for the aroma of lace acid syrup after conducting a favorability test is the aroma of lace acid syrup and counting.

Asam Renda and do the count, the results of which can be seen in Table 2. The results above show that the cordial aroma value + salt is greater than other syrups. The results of the liking test on the appearance of lace acid cordial in the liking test, panellists were asked to give a value of 4 samples of lace acid syrup that had been coded. The assessment of the panellists' liking for the appearance of lace acid syrup and the results can be seen in Table 2. The results show a higher value of cordial + salt (2.93) than cordial + salt + pandan. (2.40). Results of the Taste test for texture: Panellists were asked to rate 4 samples of Lace Acid Cordial that had been coded in the Taste Test—the assessment of the panellists' liking of the texture of lace acid syrup. After conducting a favorability test on the texture of the lace sour syrup, the results can be seen in Table 2. The results obtained are Cordial + salt (3.90) higher than Cordial Basic (2.93). The texture is a combination of shape, size, amount and elements of product formation that can be felt by the senses of taste, touch, and taste (Tarwendah, 2017).

Favorability Test Results on Cordial Taste Acid lace, the component that most determine the acceptance of a product is taste, thus influencing the final decision of the consumer to accept or reject a food product. Assessment of the taste of confectionery products results from the cooperation of the senses - the sensory senses that play a role in observing food ingredients (Setiawan, 2019). A salt function has an impact as a flavour that can increase the acceptance of a food product because it can reduce the unpleasant taste of the product. In the liking test, panellists were asked to give a value of 4 samples of lace sour syrup. After conducting a liking test on the taste of lace sour cordial and counting, the results can be seen in Table 2. The results obtained are higher Cordial + Salt value (4.03) than Cordial Basic (3.23). The suitable composition of this cooking process balances the sweet and sour taste and creates a pleasant taste and aroma so that the product will be preferred (Normah & Noorasma, 2018). The results of the Taste Test on the overall rating: Panelists were asked to rate the 4 samples of Sour Cordial coded in the Taste Test. The panellists' level of preference for the comprehensive evaluation of lace sour cordial after conducting a favorability test on the texture of lace sour syrup can be seen in Table 2. The results obtained are Cordial + salt (4.00) higher than Cordial Basic (3.27).

4. Conclusions

This study concludes that quality of Tamarind-based Soft Drinks (*Carissa carandas L.*) with the addition of sugar, salt, pandan leaves with the treatment of Cordial Basic, Cordial Salt, Cordial Pandan, Cordial Salt + Pandan has pH (2.09; 1.74; 1.89; 1.66), TSS (67.38; 70.23; 67.65; 54.05) Colour (25.70; 29.69; 29.09; 26.17), a* (4.04; 3.42; 2.82; 3.77), b* (0.45; 0.49; 0.40; 0.65). The quality of Tamarind (*Carissa carandas L.*) based soft drink with salt addition had the best flavour with the other 3 formulations. In the sensory test of taste and overall acceptance, the drink with the Quality of Tamarind Juice with the Addition of Salt has the best results because it has a level of sweetness with the addition of salt in the manufacture of Tamarind-based drinks has a significant effect on the parameters of taste, mouth feeling, and odour.

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