Fruit nutrition content, hedonic test, and processed products of pidada (*Sonneratia caseolaris*)

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**Abstract.** Exploitation of mangrove forest products still lacks consent, it is indispensable to apply appropriate technology for the sustainable use of mangrove forest products to improve the income of coastal communities, without damaging to the mangrove forest. This study aims to investigate the fruit nutrient content, hedonic test, and processed product of pidada (*Sonneratia caseolaris*) along with examining the storage period of pidada syrup. The nutritional content and the storage period of the product for seven months were performed using proximate analysis and organoleptic test. Results showed that nutritional content in pidada fruit decreased levels of vitamin C, protein, total acid compare with pidada syrup, while total sugar and total dissolved solids rather enhanced than processed syrup product. The nutritional content of pidada fruit and syrup is favourable to improve the quality and the selling value of the mangrove processed products. The present study suggested that processing affected the nutrients content and the storage time of the product. The process of processing affects the nutrients contained in the food, and also affects the storage life of the product.

1. **Introduction**

Pidada (*Sonneratia caseolaris* (L.) Engl., Sonneratiaceae) is a mangrove plant that widely distributed in areas or edges of river estuaries, especially in low salinity areas with freshwater mixtures [1]. Tree height reaches 16 meters, fruit with a diameter of 6-8 cm, with a shiny surface, red flower crown, and red and white stamens. The fruit of *S. caseolaris* is round, made up of a pompom of white stamens in a cup-shaped calyx. [1]. *S. caseolaris* is known as a traditional medicinal plant with several biological and pharmacological properties have been reported [2-3]. *S. caseolaris* fruits have been long
consumed by community living in Indonesia and other coastal areas as a food material or ingredient in various processed food products, including syrup [4], cakes and steamed pudding [5].

Pidada extract is traditionally used as an antiseptic, treats sprains, and prevents bleeding [6]. Pidada fruit has long been known to have efficacy as traditional medicines to treat several diseases, but its use is still not widely known to the public. Therefore this study aims to investigate the fruit nutrient content, hedonic test, and processed product of pidada (S. caseolaris) along with an evaluation of pidada syrup shelf life.

2. Materials and method

2.1. Materials

A fresh of Sonneratia caseolaris fruits and syrups (Figure 1A and 1B) were collected from Lubuk Kertang mangrove forest, Langkat, North Sumatra. The plant species are determined in Indonesian Institute of Science (LIPI), Research Center for Biology Bogor. The specimen vouchers have been deposited there.

2.2. Nutritional parameters of fruits

The dietary parameters the edible fruit was analyzed for attributes such as total sugars, vitamin C, protein, total acid, total soluble solids (TSS), and total microbe using standard analytical procedures [7-8].

2.3. Organoleptic test on the processed product (pidada syrup)

Pidada syrup as the processed product was evaluated according to organoleptic score for variable parameters in 5 points hedonic scale as previously reported [8]. The hedonic test was performed as treatment time (1-7 months) storage periods. The criteria for a hedonic analysis such as 5 (5 – like very much, 4—like, 3 as either like or dislike, 2 as dislike, and 1 showing dislike very much as earlier reported [9].

2.4. Shelf life evaluation of pidada syrup

Shelf life evaluation of pidada syrup was carried out through a continuous assessment method. The sample was examined for physicochemical properties, colour, flavour, taste, viscosity, product label, product label, and product seal for a seven month of storage period as previously described [10].

3. Results and Discussions

3.1. The morphological character of pidada fruit and pidada syrup

The composition of pidada syrup processing consists of pidada juice, water, and sugar. Pidada fruit juice and the addition of granulated sugar make the characteristics of syrup to be thick, brownish in color, and have a distinctive flavor from pidada fruit. The fruit used for making syrup is chilled and cooked, which is characterized by yellowish green fruit, and textured [1].
3.2. Nutritional parameters of fruits

Testing of pidada fruit nutrition and pidupa syrup was carried out using a proximate analysis which included parameters of total sugar, vitamin C, protein, total acid, total soluble solids (TSS), and total microbes. Table 1 shows the nutritional content and changes in nutrient content found in pidada fruit with its processed product in the form of pidada syrup. Table 1 displays the nutritional content in pidada fruit decreased levels of vitamin C, protein, total acid compares with pidada syrup, while total sugar and total dissolved solids rather enhanced than processed syrup product.

|                     | Total sugars (mg/100 g) | Vitamin C (Mg/100 g) | Protein (%) | Total acid (%) | TSS (° brix) | Total microbe (cfu/mL) |
|---------------------|-------------------------|----------------------|-------------|---------------|-------------|------------------------|
| Pidada fruit        | 46.58 ± 11.22           | 187.46 ± 20.29       | 52.78 ± 1.07| 0.2697 ± 1E-04| 9.16 ± 4.58 | 25x10^4 ± 45,82         |
| Pidada syrup        | 106.77 ± 23.62          | 151.92 ± 10.42       | 38.63 ± 0.61| 0.2 ± 0.05    | 26.66 ± 2.89| 29x10^4 ± 41.63         |

TSS: total soluble solid. Data was expressed as triplicate analyses ± SD (n= 3)

It was obtained that the average total pidada fruit sugar was 46.58 mg/100 g, while pidada syrup was 106.77 mg/100 g. Vitamin C of pidada fruit is earned on average 187.46 mg / 100 grams of ingredients, while in syrup is 151.92 mg / 100 grams of ingredients. Pidada fruit protein obtained an average of 52.78%, while pidada syrup protein was 38.63%. The total acid in pidada fruit was acquired by an average of 0.26%, whereas in pidada syrup obtained a total acid of 0.2%. The TSS in the pidada fruit was acquired by an average of 9.16° brix, while in pidada syrup was obtained an average of 26.66° brix. And the total microbes in pidada fruit were obtained on average by 25x104 cfu/mL, while in pidada syrup was obtained an average of 29x104 cfu/mL.

The highest total sugar was found in pidada syrup with a total of 106.77 mg/100 g while in fruit it was 46.58 mg/100 g. Because pidada fruit syrup has gone through a process of processing, with boiling and adding sugar, which causes the increase in the total sugar in the syrup. According to SNI number 01-3544-1994, the minimum sugar content in syrup is 65%, our results met the criterion. The sugar serves to give flavor to the product and preserve the product by inhibiting bacteria that cause decay. Total sugar content is affected by the amount of sugar added to the product. The more added sugar in the syrup, the greater the percentage of total sugar. Addition of sugar in addition to providing sweetness also functions and is involved in preservation. If sugar is added to high concentrations (at least 40% dissolved solids), then some of the water that is bound is available for the growth of microorganisms and water activity from food is reduced, whereas microorganisms have minimum water requirements for growth [11].

The ability of sugar to bind water is what causes sugar to function as a preservative. This is in line with the study [11] that the addition of high levels of sugar (minimum 40%) will bind the free water contained in food. Furthermore, the addition of sugar in large quantities will speed up the heating process, and the water will be confined in the gel. This condition happens because the fruit has gone through the boiling process [7].

The addition of sugar with longer heating will cause the caramelization process to be non-enzymatic browning reactions. Caramel formed during heating gives a brown color to food products. After testing the highest vitamin C was found in pidada fruit as much as 187.46 (mg/100 g ingredients) while pidada syrup was 151.92 (mg/100 g ingredients), because the pidada fruit had gone through a boiling process with high temperature, heating process high temperatures can cause a decrease in vitamins [12], where the vitamin C of pidada fruit was 6.74 mg. Good product handling can help stabilize vitamin content in pidada syrup. The same circumstance is true for protein in fruit and pidada syrup. The highest protein content was found in pidada fruit at 52.78%, suggested that the processing of foodstuffs through the boiling process with high temperatures can damage and reduce the levels of vitamins and proteins in these foods. The total level of dissolved solids tends to increase with
increasing sugar concentration. This is in accordance with previous results on the higher the addition of sugar can produce a higher total dissolved solids [12].

3.3. Evaluation of processed product (pidada syrup)

Pidada syrup is carried out by the same test which is a hedonic test which includes the parameters of colour, flavour, taste, viscosity, product label, product packaging, and product seal. The results of pidada syrup based on hedonic testing can be seen in Figure 2. Tests were carried out 3 times on the same panellists for 7 months. After testing, the hedonic test method showed the level of people's preference for the colour of the syrup in the first month to the seventh month had not changed with a scale of 4 (like). The aroma of syrup in the first month of the fifth month also did not change, but in the sixth and seventh months decreased with scale (very dislike). Syrup taste in the first month to the fifth month did not change, but in the sixth and seventh months decreased, in the first to sixth month with a scale (neither like or dislike), while in the seventh month with a scale of 2 (disliked).

![Figure 2. Change in the level of preference of panellists in pidada syrup](image)

The thickness of the syrup in the first month of the seventh month does not change, with a scale of 4 (like). Pidada syrup product labels are obtained on a scale of 3 (either like or dislike). Pidada syrup product packaging obtained a scale of 3, while the product seal obtained a scale of 2. The changes in the level of panellists' preference for pidada syrup can be seen in Figure 2. As for the nutritional values for the mangrove species, a study [13] reported that fruits of *S. caseolaris* contain about 15.95% carbohydrate, moisture 77.10%, fat 0.86%, ash 3.85%, and protein 2.24%.

4. Conclusions

The present study confirmed the present study suggested that processing affected the nutrients content and the storage time of the product. The process of processing affects the nutrients contained in the food, and also affects the storage life of the product.

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