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Sensory analysis and physicochemical characteristics of carica [*Vasconcellea pubescens*] fruit leather with seaweed [*Eucheuma cottonii*] addition

To cite this article: S Sukotjo *et al* 2021 *IOP Conf. Ser.: Earth Environ. Sci.* **741** 012017

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Sensory analysis and physicochemical characteristics of carica [*Vasconcellea pubescens*] fruit leather with seaweed [*Eucheuma cottonii*] addition

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Abstract. Carica [*Vasconcellea pubescens*] is a type of papaya fruit mostly cultivated in the Dieng area, Central Java, Indonesia. Carica is smaller than regular papaya, has an orange to yellow color, the flesh is tough, has a lot of sap and the taste is a bit sour. One of the products that can be made from Carica is fruit leather. Fruit leather is the processed fruit puree in the form of a thin sheet with a thickness of 2 - 3 mm, resembles a skin, has a plastic texture, can be rolled, and has a distinctive fruit flavor. The seaweed [*Eucheuma cottonii*] which mostly contains carrageenan, is added in the process to give the elastic texture to the fruit leather. The purposes of this study are to compare the effect of seaweed concentration on Carica fruit preferred by panelists and to analyze the physicochemical characteristics of the fruit leather. The process of making Carica fruit leather is done by preparing Carica puree, adding sugar, adding seaweed, heating, molding, and drying. The statistical analysis shows no effect of seaweed concentration on the panelists' preference test. The product has a sweet and slightly sour taste, yellowish to light brown color with the aroma of Carica. The physical analysis shows that the fruit leather has a thickness of 1.8-2.0 mm, a chewy texture, and a yield of 22.46-27.21%. Chemical analysis shows that the water content is 22.18-25.31%, the vitamin C content is 0.94-1.69 mg/100g, and dietary fiber is 5.19-10.31%.

Keywords: carica, fruit leather, seaweed, sensory analysis, physicochemical

1. Introduction

The ripe flesh of the Carica fruit [*Vasconcellea pubescens*] cannot be eaten directly, because of the large amount of sap in the fruit that can cause itching on the tongue and taste bitter, and tend to be sour. Therefore, it is usually processed before the fruit is eaten. Kusnadi et al. [1] stated that fresh Dieng Carica fruit contained vitamin C [65.12 mg/100g], vitamin A [1771.1 µg/100g], Ca[24 ppm], Fe [1.2 ppm], and P [0.0254%].

Fruit leather is processed fruit puree in the form of thin sheets with reduced water content [2]. Thus, it is a dehydrated fruit product that is eaten as a snack or dessert. Fruit leather is generally made by drying. According to Puspitasari et al. [4], drying is one of the methods of preservation by reducing the moisture content in food, so that the shelf life is longer, due to inhibition of the activity of enzymes microorganisms. According to Tondang et al. [5], Red Dragon fruit leather has a water content of 10,41% - 13,29%.

The fruit leather was chosen because it has a high shelf-life, is easy to produce, and the nutrients contained in it do not change much. According to Rizkiani et al. [3], Manalagi Apple fruit leather has a shelf life of up to 33.11 days when stored in good packaging at 30 °C. In this study, seaweed [*Eucheuma*



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cottonii] was used to enhance fruit leather texture, due to the content of carrageenan. The previous study stated that *E. cottonii* also contains various nutrients and is mostly used in food processing [6]. This research aimed to study the physical characteristics of Carica fruit leather, to compare the effect of seaweed concentration on Carica fruit leather which prefer by panelists, and to analyze moisture, vitamin C, and food fiber contents.

2. Materials and Methods

Materials used in fruit leather manufacture include Carica fruit [*V. pubescens*]. Also, other materials needed are 40% granulated sugar, and seaweed [*E. cottonii*]. Chemicals required for Vitamin C and dietary fiber analysis.

The research procedure was according to Puspitasari et al. [4]. The fruit leather processing is shown in Figure 1.

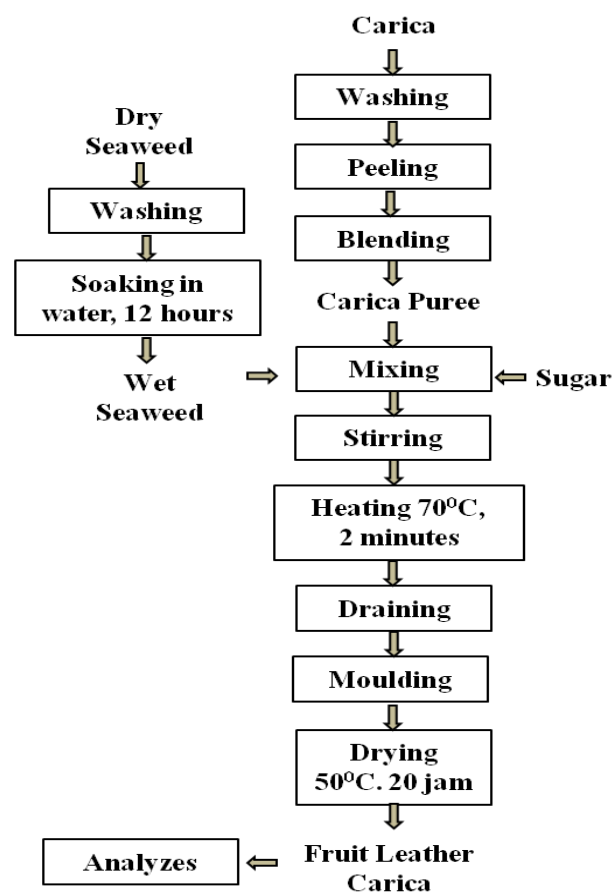


Figure 1. Fruit leather processing

The experimental design particularly used in the sensory analysis was a randomized block design [RBD] which consisted of one factor, namely seaweed concentration consists of 3 levels, namely 1%, 2%, and 3%. Sensory analysis was carried out to know the response from the panelists whether they like or dislike the product. The analysis was carried out by panelist preference on texture, taste, color, and aroma. There were 31 untrained panelists and the preference test was done when the panelists were neither full nor hungry. The samples were labeled using a code consist of three digits random and were given to the panelists. According to PDST [7], panelists would score the samples based on the hedonic rating scale which range from 1 to 5, which are like a lot [5 poin], like a little [4 poin], neither like nor dislike [3 poin], dislike a little [2 poin], and dislike a lot [1 poin].

The data were analyzed statistically using ANOVA at a significance level of 1% and 5% and continued with further tests, depended on the coefficient the diversity. Physicochemical characteristics that being analyzed were the thickness, the yields, the water content, Vitamin C content, and dietary fiber content. The fruit jelly thickness was measured using calipers, while the yield was calculated by dividing dry weight over wet weight. The method to analyze water content was SNI 01-2891-1992, point 5.1, for food fiber content was 18-8-6-2 /MU/SMM-SIG Method, whereas for vitamin C was 18-5-19 /MU/SMM-SIG [HPLC].

3. Result and Discussion

The result shows that Carica fruit leather can form a good texture on seaweed addition. It can be rolled, thus showing the elasticity of the product and this is similar to research by Widiawati [8]. The performance of the fruit leather can be seen in Figure 2.

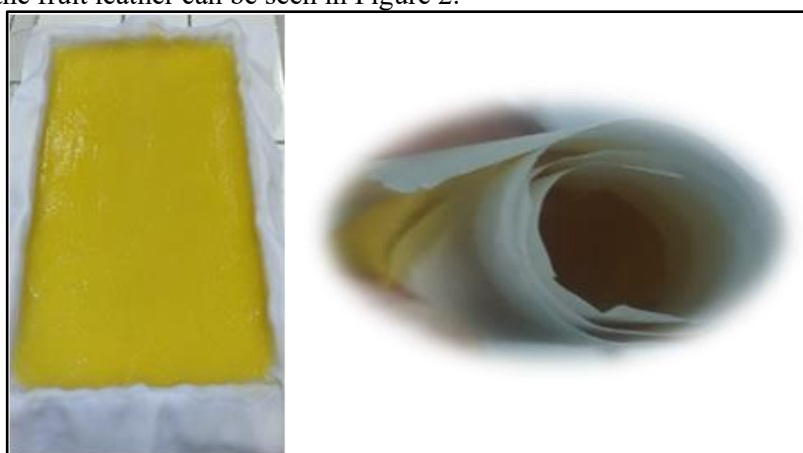


Figure 2. Fruit leather of carica

Carica fruit leather has a sweet and slightly sour taste, yellowish to light brown color with the aroma of Carica. The yellow color came from the Carica fruit and it became light brown during the heating and drying process, so caramelization happened. In general, the product description is shown in Table 1.

Table 1. Product description

Parameter	Seaweed Concentration [%]		
	1	2	3
Texture	Less chewy	Chewy	Chewy to hard
Color	Light brown	Light brown to yellowish	Yellow
Taste	Sweet	Less sweet	Least sweet
Aroma	Carica	Less Carica	Least Carica

A sensory analysis covering parameters of texture, taste, color, and aroma was performed on 31 panelists. As described in Figure 3, 2% seaweed concentration showed the highest texture score value. The seaweed enhances plasticity texture in the fruit leather since it contains carrageenan, a gelling agent [9]. The panelists' preference for taste was fruit leather with a 1% concentration of seaweed. The highest score value almost reaches 4, which is "like a little". Although sugar is added to the product due to the sour taste of Carica. According to Table 1, the higher the seaweed concentration, the least sweet the fruit leather. Another study stated that fruit leather made from papaya and pineapple showed a lower score value than Carica fruit leather [10].

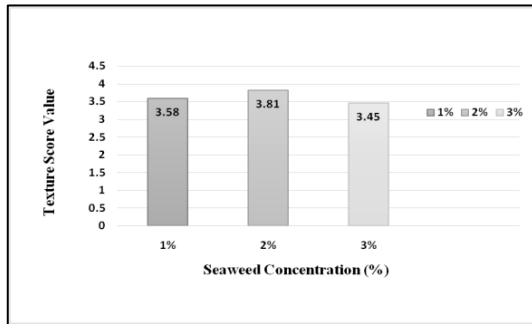


Figure 3. Panelists score value on texture

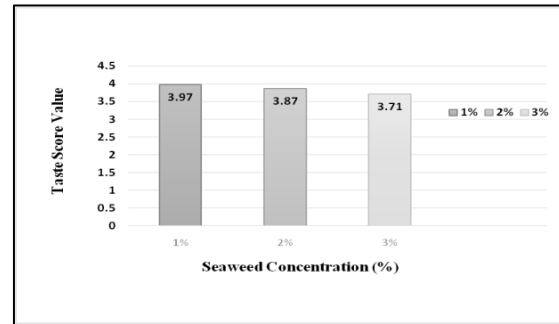


Figure 4. Panelists score value on taste

The differences in fruit leather’s color score value from different concentrations of seaweed are shown in figure 5. The panelists preferred Carica fruit leather with 1% seaweed, based on the highest score value of 3.9. As for the aroma, the highest score value also Carica fruit leather with 1% seaweed, which is 3.52. The main aroma of the fruit leather comes from Carica, which is fruity and a little bit acidic. Compared to Lubis et al. [10], the aroma of Carica fruit leather is lower in score value.

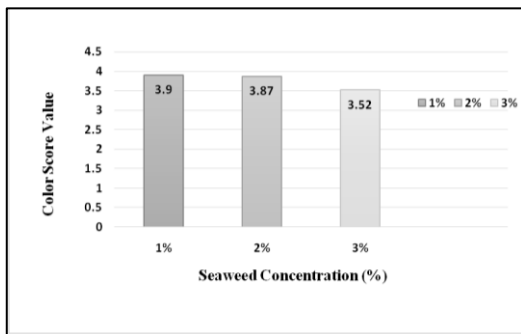


Figure 5. Panelists score value on color

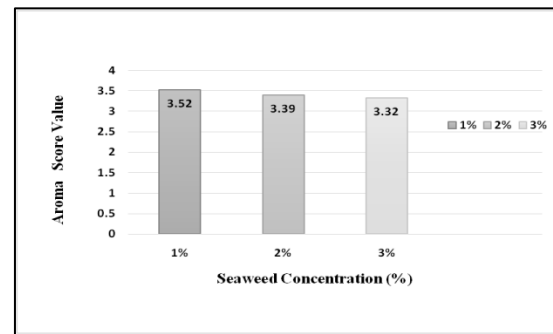


Figure 6. Panelists score value on aroma

According to the results obtained from the score value from sensory analysis, statistical analysis using ANOVA with one factor showed that there were no significant differences among treatments, namely the different concentrations of seaweed addition. Therefore, the selection of the chosen treatment is based on the efficiency used of the materials, both in terms of costs and results obtained. The data shows that the cost of using 1% seaweed is more efficient than 3% so that the chosen product is the one that contains 1% of seaweed.

The results of the yield calculation can be seen in Table 2. The yield has increased along with the increase of seaweed percentage addition. The more the amount of seaweed is added, the more water is bound in the product. This is caused by the presence of carrageenan content in seaweed which binds water. This yield certainly correlates with the water content in the product.

Table 2. Yield calculation

Calculation	Yield calculation [g]		
	1% Seaweed	2% Seaweed	3% Seaweed
Wet weight	550.00	550.00	550.00
Dry weight	123.56	145.38	149.69
Yield	22.46%	26.43%	27.21%

The results of the Carica fruit leather thickness measurement can be seen in Table 3. The fruit leather shows that the thickness differences, was less than 0.07 mm. When compared with the results from other

studies, it shows that the thickness of the fruit leather product is still slightly lower. The results of measurements of product thickness ranged from 1.83-1.90, while [11] stated that the thickness of the fruit leather ranges from 2-3 mm. To meet the fruit leather standard, it requires a different size molding tray.

Table 3. Fruit leather thickness measurement

Sample	Fruit Leather Thickness [mm]		
	1% Seaweed	2% Seaweed	3% Seaweed
1	1.7	1.9	2.0
2	1.8	2.0	1.9
3	2.0	1.8	1.7
Average	1.83	1.90	1.87

Chemical analysis carried out in this study included analysis of water content, vitamin C content, and fiber content. Water content analysis is carried out because it is very important to know the moisture content of the semi-wet product. The results of the analysis of the water content of the product ranged from 22.18 - 25.31%, that is, the maximum water content of dried candied fruits is 25% according to SNI 01-1718-1996 [12]. Meanwhile, when compared with the results of studies by [13] and [14], the resulting water content is lower, which is below 18%. The high water content of a product can result in its shelf life because bacteria will grow on products with high moisture content.

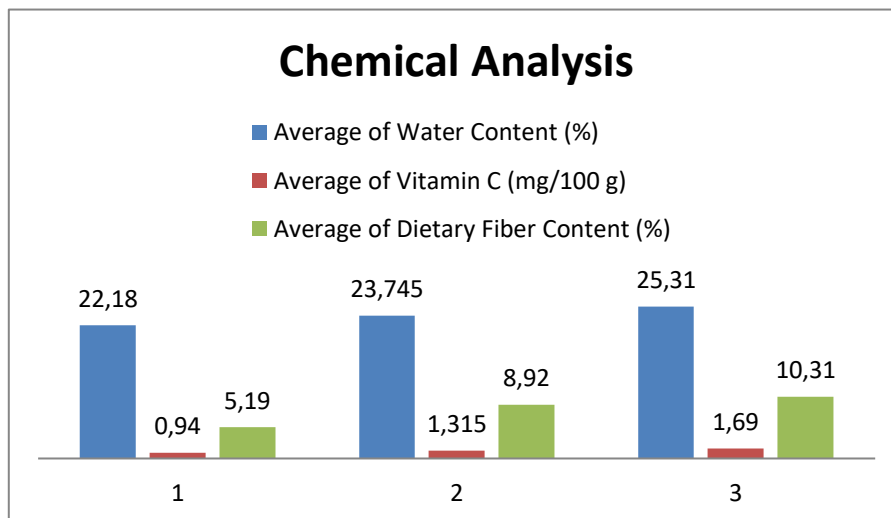


Figure 3. Chemical analysis of fruit leather papaya

The vitamin C content is necessary to be analyzed considering the main raw material for this leather fruit product is Carica. The result displayed a small amount of vitamin C in fruit leather carica with a range of 0.94 - 1.69 mg/100 g. This level of Vitamin C is very low when compared to the candied carica products that are widely sold in the Dieng area, which ranges from 24.17 - 32.12 mg/100 g [1]. This is caused by the heating process during product manufacture and the product drying process. Vitamin C is a water-soluble vitamin and is susceptible to the heating process [1]

Dietary fiber content is very important to be analyzed in this study because dietary fiber content will help in the digestive system. Besides, the ingredients used Carica and seaweed also contain dietary fiber. The results of the analysis of food fiber content of fruit leather carica products ranged from 5.19 - 10.31%. This dietary fiber content obtained from this research is higher than other previous studies' results [8] [10].

4. Conclusion

Carica fruit leather with 1% seaweed addition which was preferred by panelists, has a taste, aroma, color, and texture score value of 3,57 - 3,97 [neither like nor dislike – like a little]. The product has physicochemical characteristics of 22.46% yield, 1.83 mm of thickness, texture can be rolled, 22.18 % of water content, 0.94 mg/100 g of Vitamin C, and 5.19 of dietary fiber content.

Acknowledgments

The team would like to extend special thanks to the Institute of Technology of Indonesia for providing the funds for this research, and the Department of Agro-Industrial Technology for the support and providing the research facilities. Appreciation goes to all colleagues, who not only helped but also gave suggestions, and all research assistants who made this research possible.

References

- [1] Kusnadi, Tivani I, and Amananti W. 2016. Analisa kadar vitamin dan mineral buah karika Dieng [*Carica pubescens* LENNE] dengan menggunakan spektrofotometri UV-VIS dan AAS. *Jurnal Ilmiah Farmasi*, **5**[2]:81-87.
- [2] Anggraini S R. 2016. Pengaruh penambahan labu kuning dan karagenan terhadap hasil jadi *fruit leather* nanas. *Jurnal Tata Boga*, **5**: 89–98.
- [3] Rizkiani P, Atmaka A, and Sari A M. 2016. Pendugaan umur simpan *fruit leather* apel Manalagi [*Malus sylvestris*] menggunakan metode ASLT [Accelerated Shelf Life Test] dengan model Arrheniust. *Jurnal Teknologi Hasil Pertanian*, **9**[2]:40-50.
- [4] Puspitasari FA, Karyantina M, and Widanti Y A. 2019. Karakteristik *fruit leather* dengan variasi rasio buah naga merah [*Hylocereus polyrhizus*] – pepaya [*Carica papaya* L.] dan suhu pengeringan. *Jurnal Teknologi dan Industri Pangan*, **4**[1]: 7–14.
- [5] Tondang H M, Ekawati I G A, and Wiadnyani A A I S. 2018. Pengaruh penambahan karagenan terhadap karakteristik *fruit leather* kulit buah naga merah [*Hylocereus polyrhizus*]. *Jurnal ITEPA*, **7**[2]: 33-42.
- [6] Sukotjo S, Syarafina A, and Irianto H. 2019. The effect of seaweed [*Eucheuma cottonii*] and tofu dregs formula on chocolate pudding. *IOP Conf. Series: Earth and Environmental Science*, **439**: 1755-1315.
- [7] PDST [Professional Development Service for teacher]. 2017. *Sensory Analysis Teachers's Manual* [Dublin: PDST].
- [8] Widiawati W. 2019. *Analisis karakteristik fisikokimia dan sensori fruit leather pepaya* [*Carica papaya* L.] *dengan penambahan kolang-kaling* [*Arenga pinnata*, Merr]. [Diploma Thesis] [Padang: Universitas Andalas].
- [9] Hermawan D, Warkoyo, Harini N, Jasmine C, and Pakpahan O P. 2018. Study of proportions seaweed *Eucheuma cottonii* L. and cooking time on quality of functional of seaweed dodol. *Omni-Akuatika*, **14**[2]: 37-42.
- [10] Lubis M S P, Nainggolan R J, and Yusraini E. 2014. Pengaruh perbandingan nenas dengan pepaya dan konsentrasi gum arab terhadap mutu *fruit leather*. *J. Rekayasa Pangandan Pert.*, **2**[3]: 62-68.
- [11] Risti A P and Herawati N. 2017. Pembuatan *fruit leather* dari campuran buah sirsak [*Annona muricata*] dan buah melon [*Cucumis melo* L.]. *JOM Fakultas Pertanian*, **4**[2]: 1-15.
- [12] BSN [Badan Standarisasi Nasional]. 1996. SNI 01-1718-1996. *Syarat mutu manisan kering buah-buahan*. [Jakarta: Badan Standar Nasional].
- [13] Ramli R and Hamzah F. 2017. Pemanfaatan buah pepaya [*Carica papaya* L.,] dan tomat [*Lycopersicon esculentum* Mill.,] dalam pembuatan *fruit leather*. *Jom FAPERTA*, **4**[1]: 1-9.
- [14] Pusaningrum L, Yuwono S S, and Martati E. 2017. Karakteristik fisikokimia dan sensoris *fruit leather* apel Manalagi [*Malus sylvestris* Mill] dengan substitusi pisang candi [*Musa paradisiaca*]. *Jurnal Teknologi Pertanian*, **19**[3]: 173-182.