Effects of Long Blanching Time on Nutritional Composition of Seablite (*Suaeda Maritima*) Flour

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Abstract. Seablite (*Suaeda Maritima*) can be used as raw material for functional salt. This study aims to determine the effect of blanching time on the nutritional composition of seablite: moisture, ash, protein, fat, carbohydrate, salinity, and vitamin A. The research design used a wholly randomized non-factorial design with variations in blanching time (1, 3, 6, and 9 minutes). Making saeblite flour begins with cleaning the Seablite, blanching according to the time specified in the research design, draining, and flouring to make it into Seablite flour. Based on the results of blanching time analysis on the nutritional composition of seablite, there was an interaction between the length of blanching time on the moisture content, ash content, carbohydrate content, vitamin A, and salinity of seablite plant flour. Still, there was no reaction between the length of blanching time on the protein and fat content of seablite plant flour.

Keywords: Blanching, Nutrients, Sealible, Suaeda maritima

1. Introduction

Mangrove forests are home to the salt marsh plant known as seablite (Suaeda maritima). As a method of food diversification, seablite leaves can be employed as a source of extra nutrition in food products. They contain 6.21% dietary fiber and 6.93 mgGAE/g total phenol. In addition, the leaves have an antioxidant activity of 80.46%, which is also a potential source of antioxidants [1]. This Seablite plant has a relatively high vitamin A content. This plant has been tested to have hepatoprotective, antioxidant, and antiviral effects in the presence of triterpenoids and sterols [2].

Most people recognize two types of Seablite: Seablite with green and red leaves. The green leaf is preferred over than red leaf because the red leaves of Seablite are saltier and less pleasant to eat. Moreover, the edible part is the young leaf consumed in vegetables with high nutritional value [3]. Besides being consumed as a vegetable, seablite plants also function as potential carbon capture and storage for coastal areas and act as ground cover plants to prevent erosion [4].

Further research shows that plants growing around the coast or salt marshes can be used as raw materials for salt. Several coastal plants used as raw materials for salt are Lindur leaves *(B. gymnorrhiza)* [5], seaweed [6][7]), and Nipah fronds [8]. The salt NaCl content of these plants ranges from 9-12%. Based on SNI 8208-2016 concerning dietary salt states that the maximum NaCl content in salt is 60% [9]. Salt from coastal plants can be categorized as dietary or available salt. The nutritional content of

Seablite plants per 100 g is moisture (1.68%); fat (0.45%); ash (36.13%); vitamin C (0.02 m) [3] [10]. The high content of vitamins makes Seablite plants as an alternative to dietary salt or available salt.

The flouring process is usually used for making available salt. This process begins the drying process, which aims to reduce water in the product so that it can inhibit unwanted reactions [11]. Drying affects the quality of dry products mainly due to the browning reaction. Browning occurs when the enzyme polyphenol oxidase (PPO) reacts with oxygen to produce quinones which are browning pigments. Blanching is carried out to inactivate enzymatic activity before entering the following process. However, the blanching process also causes unwanted changes, such as loss of color, aroma, texture, and nutrition. The purpose studied to ascertain the impact of prolonged blanching on the efficacy of Seablite flour as a substitute raw material for functional salt.

2. Methods

This study was carried out at the Agricultural Industrial Technology Laboratory, Faculty of Agriculture, Trunojoyo University, Madura. The main ingredient used Seablite plants obtained from Kamal district, Bangkalan Regency.

The research design used a wholly randomized nonfactorial design with variations in blanching time. The blanching times were 0, 3, 6, and 9 minutes. Analysis of variance (ANOVA) was used for statistical study, and Duncan's test was used to continue the analysis at the 5% level. If the results indicate a significant difference, continue using the Tukey test to determine the difference between the treatments at the 5% significance level.

The first step of this research begins by cleaning the Seablite from adhering dirt and removing the plant stems. The research design specifies a time for the second stage, which is blanching. Next, the plant will be drained, and then the drying process will be carried out using the oven at 60°C for 72 hours. The last method is flouring using a blender to make it into Seablite flour. The produced flour will undertake testing for moisture, ash, protein, fat, carbohydrate, salinity, and vitamin A contents.

2.1. Moisture content

An oven is used to determine moisture content [12]. The moisture content is calculated as a weight percent, meaning how many grams of sample weighs the difference in weight from the model that has not been evaporated to the piece that has been dried. The work order is as follows:

- A porcelain cup with a lid is cleaned and dried in an oven at 105-110°C for one hour, then cooled in a desiccator for 30 minutes before being weighed (A).
- The sample is weighed to 2 grams and placed in a porcelain cup with a known weight (B). Porcelain samples were dried at 105°C for 3 hours, then cooled in a desiccator for 15 minutes before being weighed (C).
- Weighing is repeated until the weight stabilizes:

$$\%\ water\ content = \frac{(B-C)}{(B-A)} x100$$

2.2. Ash content

The ash analysis procedure refers to Fat content analysis [12]. The goal of ash content analysis is to determine the amount of ash in material that is related to the minerals being analyzed. The porcelain ash dish is cleaned and dried in the oven for 30 minutes at around 105°C. The porcelain ash cup was then placed in a desiccator for 30 minutes before being weighed. A 5-gram sample was weighed and placed in a porcelain ash cup. The cup is then burned on an electric stove until it is no longer smoking before being placed in a 600°C ashing furnace for 7 hours. The desiccator is used to cool the cup before it is weighed. The calculation of ash content is as follows:

$$\%\ ash\ content = \frac{C - A}{B - A}\ x\ 100\%$$

Information: A = Weight of empty porcelain ash cup (g) B = Weight of porcelain ash cup with sample (g) C = Weight of porcelain ash cup with a sample that has been dried (g).

2.3. *Protein content*

Determination of dissolved protein levels using the formol titration method [13]. The first step is to weigh up to 10 grams of the sample after it has been mashed with a porcelain cup, dissolved in 100 ml of distilled water, stirred for 15 minutes, and filtered. In a 100 ml volumetric flask, the filtrate was diluted with distilled water up to the tera mark, then 10 ml of the sample solution was taken, 20 ml of distilled water, 0.4 ml of potassium oxalate, and 1 ml of the indicator were added, and titrated with 0.1 N NaOH until pink. The titrated sample was added 2 ml of 40% Formaldehyde and PP indicator, then titrated again with 0.1 N NaOH, and the volume of NaOH was recorded, and the protein content was calculated. The following formula can calculate the calculation of dissolved protein levels.

$$\%\ N = \frac{formol\ titrarionx\ N\ NaOH\ x\ 14{,}008\ x\ dissolving\ factors}{sampel\ weight\ (g) x\ 10}\ x\ 100\%$$

2.4. *Fat Content*

The fat analysis procedure refers to fat content analysis [12]. A 2 gram sample (W1) was placed on filter paper and in a fat sleeve, then into a fat flask with a fixed weight (W2) that was weighed and connected to a Soxhlet tube. The fat sleeve was placed in the extractor chamber of the soxhlet tube and flushed with fat solvent. The extraction tube was placed in the Soxhlet distillation apparatus and heated for 6 hours at 40°C with an electric heater. The fat solvent in the fat flask is distilled until it is completely evaporated. The solvent will be accommodated in the extractor chamber during distillation, and the solvent will be removed so that it does not return to the fat flask. The fat flask is dried in an oven at 105°C, then cooled in a desiccator until the weight is constant (W3). The formula determines fat content:

$$\%\ fat\ content = \frac{W3 - W2}{W1}\ x\ 100\%$$

2.5. *Carbohydrate content*

The Carbohydrate analysis procedure refers to Carbohydrate content analysis [12]. The carbohydrate content was carried out by difference, which resulted from reducing 100% with the water, ash, protein, and fat content so that the carbohydrate content depended on the reduction factor. It is because carbohydrates significantly affect other nutrients. Carbohydrate content can be calculated using the formula:

$$\%\ carbohydrate = 100\% - (\%\ ash + \%\ water + \%\ fat + \%\ protein)$$

2.6. *Vitamin A analysis*

Determination of vitamin A using a spectrophotometer by placing the sample in a test tube and then adding chloroform drop by drop until dissolved. Then two drops of acetic anhydride (to remove water and SbCl3 solution. The maximum wavelength is 325 to 328 nm [12].

2.7. *Fe and Mg analysis*

The materials used in this study were Seablite plants. The chemicals used in this study were of E. Merck output quality analysis unless otherwise stated (standard iron solution concentration of 1000 µg/ml, magnesium average solution concentration of 1000 µg/ml, nitric acid 65% w/v), and demineralized aqua.

The tools used consist of atomic absorption spectrophotometer (Shimadzu AA-6300) with acetylene air flame complete with Fe and Mg cathode lamps, hot plates (Favorites), furnaces (Furnace), Whatman filter paper No.42, porcelain crucibles and tools glassware (Pyrex and Iwaki).

2.8. Salinity Test

The procedure of salinity Test using a Refractometer: Before use, the Refractometer is cleaned with a tissue pointing downwards on the prism of the Refractometer dripped with drops of liquid, such as aquadest or 5% NaCl solution. The liquid is poured into coating the entire surface of the prism. A dropper is used to take the liquid that you want to measure. Close the Refractometer carefully by returning the plate to its initial position. Do not force the prism in if it is a little stuck.

To get the salinity reading, look into the round end of the Refractometer. It will see one or more scale numbers. The salinity scale is usually marked 0/00, meaning "parts per thousand," from 0 at the bottom to 50 at the end. The measure of salinity is shown in the line where the white and blue parts meet.

After use, the Refractometer must be cleaned dry using a tissue or soft cloth. Refractometers should be stored in a dry place.

3. Results and discussion

3.1. The characteristic of the seablite plant

Seablites are perennial herbs up to 45 cm tall; old stems have nodules (caused by fallen leaves). The leaves of the plant are slightly cylindrical, thick, and fleshy with a length of about 1-4.5 cm, green in color with reddish or purplish tips. Seablites plants taste salty when eaten [14]. Seablites plants can be a source of additional nutrition for the community. To utilize Seablites plants in the form of processing various foods, there are necessary to analyze the nutritional content they have. The nutritional content of seablite plants is shown in **Table 1**.

Table 1. The Nutritional Content of Seablite Plant

Content	Amount
Water (%)	88.93 ± 0.53
Ash (%)	5.07 ± 0.03
Protein (%)	0.41 ± 0.05
Fat (%)	0.32 ± 0.08
Carbohydrate (%)	54.26 ± 0.51
Vitamin A (µg/g sample)	2.53 ± 0.32
Salinity (%)	0.73 ± 0.08
Fe (ppm)	0.19
Mg (ppm)	1,695.76
Phytochemical	
- Flavonoid	Detected
- Saponin	Detected
- Alkaloid	Detected
- Tanin	Undetected

Based on **Table 1**, the high carbohydrate content equals 54.26 ± 0.51%. The carbohydrate content of Seablited plants is higher than that of seaweed (38.7%) [7]. As a component, carbohydrate content is related to polysaccharide content. The ash content in the Seablited plants was 5.07 ± 0.03%. The ash content indicates that the product contains mineral content. The result is evidenced in seablite plants. There is a Fe content of 0.19 ppm and Mg of 1,695.76 ppm. The content of vitamin A was 2.53 ± 0.32 µg/g sample. The result aligns with the research [10]. The Seablites have a salinity of 0.73 ± 0.08 %. Salinity is the level of saltiness or salt content dissolved in water. The presence of salinity in the seablite indicates that the Seablites can be used as a source of available salt raw material. Qualitative testing of the phytochemical content in the seablite plant showed that the plant contains flavonoids, saponins, and alkaloids.

3.2. Characteristic of seablite flour

Seablite plants are processed into Seablite flour. Seablite flour can be used as a raw material for various processed foods. The mineral content of furrow flour is shown in **Table 2**.

Table 2 Mineral content in seablite flour

Blanching time	Fe (ppm)	Mg (ppm)
0 minute	0.143	1,126.83
3 minutes	0.133	1,045.92
6 minutes	0.118	908.74
9 minutes	0.102	823.09

The Fe content in furrow plants was 0.19 ppm, while seablite flour decreased with different bleaching treatments. The lower the Fe content of Seablite flour, the longer the blanching time. Furthermore, the Mg content of Seablite plants was 1,695.76 ppm, while the seablite flour decreased with increasing blanching time. Blanching is a pre-heating process used on fruits and vegetables to inactivate enzymes, specifically catalase and peroxide enzymes, which are heat-resistant enzymes found in vegetables and fruits [15]. Blanching aims to inactivate enzymes, clean raw materials, reduce their bacterial content, and wrinkle tissue to make filling raw materials easy and maintain and improve color and texture. Blanching can cause losses to the ingredients, namely loss of water-soluble and heat-sensitive nutrients, inhibits the drying process of starch-containing components, causing texture damage if the blanching time is too long. Factors that affect the damage to processing with heat are the length of time and heating temperature [11]. Food processing at high temperatures can cause the evaporation of water in these foodstuffs. The higher the temperature, the more water molecules come out of the material's surface, one of which is the minerals that dissolve along with the water.

Table 3. Nutritional Content of Seablite Flour

	Blanching time			
	0 minute	3 minutes	6 minutes	9 minutes
Moisture content	2.28 ± 0.52^{b}	2.44 ± 0.57^{b}	1.72 ± 0.18^{b}	0.97 ± 0.29^{a}
Ash content	44.73 ± 0.26^{d}	39.69 ± 0.45^{c}	35.21 ± 0.31^{b}	32.41 ± 0.04^{a}
Protein content	8.75 ± 1.00^{b}	7.88 ± 0.66^{a}	7.44 ± 1.00^{a}	6.78 ± 1.37^{a}
Fat Content	4.23 ± 0.36^{b}	3.78 ± 0.29^{b}	2.42 ± 1.02^{a}	3.95 ± 0.69^{b}
Carbohydrate content	39.98 ± 0.78^{a}	46.20 ± 1.32^{b}	53.21 ± 0.41^{c}	55.88 ± 1.76^{c}
Vitamin A	1.38 ± 0.36^{b}	1.39 ± 0.16^{b}	1.08 ± 0.12^{ab}	0.99 ± 0.13^{a}
Salinity	3.01 ± 0.09^{d}	2.65 ± 0.08^{c}	2.23 ± 0.07^{b}	1.94 ± 0.02^{a}

Note: Differences in letters a, b, c, and d show significantly different values

Water is an essential element in food, water in foodstuffs is needed for the continuity of the biochemical processes of living organisms. It is because water can affect the durability of food from destructive microbial attacks [11]. Moisture content is the amount of water contained in food, expressed in percent. Because water can affect the appearance, texture, and taste of food ingredients, the moisture content is essential in determining their quality. The moisture content of food ingredients determines their freshness and durability as well. Because high moisture allows bacteria, molds, and yeast to multiply quickly, food ingredients will change [16].

The statistical test results in Table 3 show that the blanching time treatment had a significant effect ($p < 0.05$) on the brine content, namely the p-value (0.012). The moisture content at blanching times of 0 minutes, 3 minutes, and 6 minutes significantly differed from the blanching time of 9 minutes. The moisture content during blanching at 0 minutes, 3 minutes, and 6 minutes was 2.28 ± 0.52 %, 2.44 ± 0.57 %, and 1.72 ± 0.18%. The moisture content of furrow flour with a blanching time of 9 minutes was 0.9[illegible] 0.29 %. Changes in moisture content were affected by an increase in blanching time.

Ash is an inorganic substance left over from the combustion of organic material. Ash content has to do with the minerals of a material. The ash content is determined by oxidizing the material at a high temperature of around 500-600°C and then weighing the substances left behind after combustion. Measuring ash content determines the mineral content of a material [1[illegible]].

The statistical test results in **Table 3** show that the blanching time treatment had a significant effect ($p < 0.05$) on the salt ash content, namely the p-value (0.000). The ash content at blanching times of 0 minutes, 3 minutes, a[illegible]6 minutes significantly differed from the blanching time of 9 minutes. The ash content at blanching 0 minutes, 3 minutes, 6 minutes, and 9 minutes was 44.73± 0.26 %; 39.6969 ± 0.45%; 35.21± 0.31%; and 32.41± 0.04%. The difference occurred when the blanching time increased in the 6th minute, exceeding 35%. It indicates the range of inorganic materials. In the ashing process, organic materials will be burned, while inorganic materials will not be burned [11]. The research is proven that the mineral content of seablite flour is high, namely the Mg content of 1,126.83 ppm without blanching, 1,045.92 ppm (3 minutes of blanching time), 908.74 ppm (6 minutes of blanching time) and 823.09 ppm (9 minutes of blanching time). Meanwhile, the Fe content of flour without blanching was 0.143 ppm and decreased by 0.102 with a blanching time of 9 minutes.

Protein is a type of macronutrient. Unlike other macronutrients (carbohydrates and fats), protein is more important in forming biomolecules than it is as a energy source. However, if the organism is short of energy, this protein can also be used as an energy source. Another feature of proteins is their structure, which, apart from containing N, C, H, and O, sometimes contains S[illegible] and Fe [11].

According to the statistical tests in Table 3, the blanching time treatment had no significant effect ($p > 0.05$) on the protein content of seablite flour (0.208). The protein content of Seablite flour varies depending on blanching time: 0 minutes (8.75%± 1.00), 3 minutes (7.88± 0.66%), 6 minutes (7.44± 1.00%), and 9 minutes (6.781.37%).

The fat content in the Seablite plant was 5.70%, while the fat content in the Seablite flour with blanching times of 0 minutes (4.23± 0.36%), 3 minutes (3.78± 0.29%), 6 minutes (2.4[illegible]± 1.02%) and 9 minutes (3.95± 0.69%). Following the statistical tests in Table 3, the blanching time treatment had no noticeable effect ([illegible].05) on the fat content of furrow flour (0.32 ± 0.08%).

Carbohydrates play essential role in plant growth and development. The number of carbohydrates contained in a plant can be affected by growth conditions, such as the conditions of the plant's photosynthesis process. Based on the statistical tests in Table 3 shows that the blanching time treatment has a substantial impact. ($p < 0.05$) with a significance value of 0.000. The carbohydrate content of furrow flour is the p-value (0.186). Seablite flour carbohydrate content with blanching times of 0 minutes (39.98 ± 0.78%), 3 minutes (46.20 ± 1.32%), 6 minutes (53.21 ± 0.41%), and 9 minutes (55.88 ± 1.76%). The higher the carbohydrate content of furrow flour, the longer the blanching time.

The vitamin A content in fresh Seablited plants was 2.53 µg/g sample. Processing of Seablited plants into Seablited flour causes a change in nutritional value. Making flour is carried out through a blanching process at different times. According to Table 3, the long blanching time treatment significantly affects

the vitamin A content (p 0.05), resulting in a significance value of 0.000. Vitamin A is becoming less valuable. The content of vitamin A in Seablited flour without blanching process and blanching process for 3 minutes was 1.39 ± 0.16 µg/g sample. Changes in vitamin A range occurred after a 6-minute blanching process, namely 1.08 ± 0.12 µg/g sample, and a 9-minute blanching process decreased to 0.99 ± 0.13 µg/g sample. An increase in temperature causes the content of vitamin A. Vitamin A to be easily damaged due to the rise in temperature and light around it due to oxidation [11].

Salinity is the level of saltiness or salt content dissolved in water. This definition can also refer to the level of salt content found in the soil. The minerals in seawater are composed of 55% chloride, 31% sodium, 8% sulfate, 4% magnesium, and 2% other salts. The salinity of seablites is 0.73%. When tracks are processed into flour, the salinity level rises to 3.01%. Making seablite flour using a blanching process with variations in blanching time causes the salinity value of Seablite flour to decrease. Based on **Table 3** shows that the long blanching time treatment has a major impact on the salinity content ($p < 0.05$), namely a significance value of 0.000. The salinity content of furrow flour without going through the blanching process was 3.01 ± 0.09 %. However, the blanching treatment caused a decrease in the salinity content, namely the blanching time of 3 minutes (2.65 ± 0.08 %), 6 minutes (2.23 ± 0.07 %), and 9 minutes (1.94 ± 0.02%). Salinity content is affected by temperature due to evaporation in seablited plants. The salinity in furrow flour indicates that it contains NaCl which can be used as an alternative to available salt.

Conclusion

Based on the research findings, the conclusions that can be drawn are:

1. The length of blanching time affected the moisture, ash, carbohydrate, vitamin A, and salinity contents of seablite plant flour. Nonetheless, there was no effect of blanching time on the protein and fat content of seablite plant flour.
2. Seablite plant flour has a moisture content ranging from 0.97 ± 0.29% - 2.44 ± 0.57%; ash content ranging from 32.41 ± 0.04 % - 44.73 ± 0.26%; carbohydrate content 39.98 ± 0.78 % - 55.88 ± 1.76%; Vitamin A levels ranging from 0.99 ± 0.13 µg/g sample – 1.38 ± 0.36 µg/g sample and salinity ranged from 1.94± 0.02% - 3.010.09%.

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2.8.8

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