Characterization of seaweed healthy salt from Indonesian *Ulva lactuca* and *Chaetomorpha* sp. flour

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**Abstract.** Healthy salt can be produced from seaweed. Green seaweed *Ulva lactuca* and *Chaetomorpha* sp. have the potential to be used as low-sodium salt. The objective of this study was to determine the influence of green seaweed *U. lactuca* and *Chaetomorpha* sp. on the characteristics of seaweed salt based on %NaCl, Na/K ratio, and antioxidant activity. Seaweed salt was produced by soaking seaweed flour in distilled water (1:10), extracted at 40 °C for 10 minutes, dried with dehydrator at 60°C for 48 hours, and the crystallized samples were ground into a seaweed salt. *U. lactuca* seaweed salt with yield of 23.67%, Na/K ratio of 1.74, %NaCl of 57.36%, total phenolic content of 466.13 mg GAE/g sample, IC\(_{50}\) value (ABTS) of 147.54 μg/mL, and antioxidant capacity (CUPRAC) of 40.04 μmol ascorbic acid/g seaweed salt. *Chaetomorpha* sp. salt with yield of 17.33%, Na/K ratio of 1.63, %NaCl of 61.45%, total phenolic content of 677.78 mg GAE/g sample, IC\(_{50}\) value of 95.40 μg/mL, and antioxidant capacity of 59.20 μmol ascorbic acid/g seaweed salt. *U. lactuca* has low %NaCl and moderate antioxidant activity. *Chaetomorpha* sp. has high %NaCl but strong antioxidant activity.

1 Introduction

Hypertension, or high blood pressure, is a silent killer disease that causes cardiovascular diseases. Most hypertension patients (two-thirds of the worldwide total of 1.28 billion) live in low- and middle-income countries [1]. The prevalence of hypertension in Indonesia increased from 25.8% in 2013 to 34.1% in 2018, according to the *Rikkesdas* report in 2018. One of the high-risk factors for hypertension in Indonesia is an unhealthy lifestyle and

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excessive consumption of foods containing salt (sodium). High sodium consumption can increase the risk of high blood pressure and heart disease. When sodium intake increases, the body releases a large amount of fluid; therefore, the volume and blood pressure increase [2]. Blood pressure can be lowered by reducing sodium intake, increasing potassium intake, and replacing salt and foods that contain more potassium [3]. The Na/K ratio, which is beneficial for body health, was close to one based on the WHO recommendations in 2012. A high Na/K ratio is associated with high blood pressure [4]. Indonesia also regulates standards for dietary salt that must have <60% NaCl [5]. Seaweeds have the potential to be a source of raw materials that can play a role in preventing hypertension and its complications. Seaweed is rich in macro- and micro-minerals, polysaccharides, fiber, [6,7,8] and bioactive compounds as antioxidants [9,10].

Indonesia is the second-largest seaweed-producing country in the world, with a production volume of 9.6 million tons. Currently, 911 species of Indonesian seaweed are spread throughout Indonesian waters, based on data from the National Research and Innovation Agency Indonesia. Indonesian seaweeds can generally be divided into three groups based on their pigments: Chlorophyceae (green algae), Rhodophyceae (red algae), and Phaeophyceae (brown algae). Active compounds from seaweeds have been used as antioxidants in various fields, especially food, pharmaceuticals, and biomedicines. Its use is also included in the cosmetic field [11-20]. Seaweed has also been used as a low-sodium salt to prevent hypertension. Innovations in low sodium salt from Indonesian seaweed have been carried out on brown seaweed Turbinaria conoides and Padina minor [21,22], Sargassum sp. [22-26], green seaweed U. lactuca [26-29], Halimedea opuntia and C. lentillifera [30], also red seaweed Actinotrichia fragilis [31].

The development of green seaweed salt based on previous research showed that treatment at 40 °C for 10 minutes produced NaCl levels <60% for U. lactuca, C. lentillifera, and H. macroloba salts [27, 29, 30] but the Na/K ratio was not yet close value 1. The yield produced in previous research was relatively low (10-27%) and the IC50 antioxidant activity was classified as weak [28] however in other studies, the results were classified as moderate for U. lactuca salt [29]. Information on the characteristics of green seaweed salt from other species needs to be carried out to determine the raw materials that have the potential as low-sodium salts from Indonesian green seaweed. Chaetomorpha sp. is a green seaweed that is easily found in Indonesian waters. This seaweed exists in the form of branching filaments. The active compounds in Chaetomorpha sp. have been shown to act as promising antioxidant and anticancer agents for future pharmaceutical applications. This is characterized by the presence of new chemical compounds that act as strongly active antitumor chemical constituents [32]. Therefore, the aim of this study was to determine the influence of the green seaweeds U. lactuca and Chaetomorpha sp. on the characteristics of seaweed salt based on %NaCl, Na/K ratio, and antioxidant activity.

2 Methods

2.1 Materials

The raw materials used were U. lactuca seaweed from the waters of Cibuaya Beach, Ujung Genteng Village, Ciracap District, Sukabumi Regency, West Java, and green seaweed Chaetomorpha sp. obtained from Simeulue Island, Simeulue Regency, Aceh Province. The chemicals used were distilled water, ethanol p.a (Merck), acetone p.a (Merck), FeCl3 1% (Merck), FeCl3 5% (Merck), 2,4,6-Tripyridyl-S-tiazine (Sigma-Aldrich), neocuproine (Sigma-Aldrich), folin-ciocalteu 50% (Merck), gallic acid (Merck), ABTS reagent (Sigma-Aldrich), K2SO4 (Merck), and CuCl2 (Merck). The tool used was a dehydrator (B-One FCD-
3000series), water bath shaker (B-One), atomic absorption spectroscopy (AAS) (Shimadzu, Japan), and UV-Vis spectrophotometer (RS spectrophotometer-2500).

2.2 Methodology

2.2.1 Preparation of raw materials

Preparation of fresh seaweed into seaweed flour refers to previous study [27]. Fresh seaweed was washed and cleaned from sand and foreign materials. Washing was performed with flowing seawater. The clean seaweed was wind-drying for 24 hours at 25-30 °C. The semi-dried seaweed was stored in a cool box and transported to the laboratory. The seaweed was dried again in the laboratory by wind-dried for 3-5 days at a temperature of 25-30 °C. Dried seaweed was cut into small sizes (1-5 cm), crushed using a blender for 1 min until smooth, and filtered using a 30 mesh sieve. *U. lactuca* and *Chaetomorpha* sp. seaweed flours were analyzed for yield percentage, proximate [32], heavy metal [32], antioxidant capacity with the CUPRAC method [33], IC$_{50}$ antioxidant activity of the ABTS method [34] and total phenolic content [35].

2.2.2 Production of seaweed salt

Seaweed salt production refers to a modification of a previous study [36]. The modification made was the stirring duration during the heating process. *U. lactuca* and *Chaetomorpha* sp. seaweed flours (50 g) were soaked in distilled water at a ratio of 1:10 and heated at 40 °C for 10 min in a water bath shaker. The mixture was filtered using 85 mesh calico fabric and filtered again using the Whatman No. 42 paper. The filtered filtrate was dried using a dehydrator at 60 °C for 48 h to obtain crystallized salt. The crystallized samples were ground into a seaweed salt. The final result was analyzed for percentage yield, mineral composition [32], Na/K ratio, %NaCl [37], total phenolic content [35], antioxidant capacity CUPRAC [33], and IC$_{50}$ antioxidant activity of the ABTS method [34].

2.2.3 Statistical analysis

Data analysis in this study used an independent sample t-test (t-test). A t-test was used to determine the significance of the difference in the mean values of two unrelated groups. Data were analyzed in 2 repetitions. The data were processed using the Statistical Product and Service Solution (SPSS) version 25.

3 Results and discussion

3.1 Characteristics of seaweed flour

The chemical compositions of *U. lactuca* and *Chaetomorpha* sp. are shown in Table 1. The results showed that the chemical composition was the highest in both types of seaweed, namely carbohydrates, and the lowest in lipid content. *U. lactuca* had higher protein levels than *Chaetomorpha* sp., but the ash content was lower than *Chaetomorpha* sp. Other researchers have reported that the composition of *U. lactuca* [9] and *Chaetomorpha crassa* [38] was the highest in carbohydrates and the lowest in lipids.
Table 1. Chemical composition of *U. lactuca* and *Chaetomorpha* sp. flour.

<table>
<thead>
<tr>
<th>Parameter (% dw)</th>
<th><em>U. lactuca</em></th>
<th><em>U. lactuca</em>[^9]</th>
<th><em>Chaetomorpha</em> sp.</th>
<th><em>Chaetomorpha crassa</em>[^38]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ash</td>
<td>34.68±0.02</td>
<td>34.87±1.19</td>
<td>39.65±0.23</td>
<td>46.25±0.33</td>
</tr>
<tr>
<td>Protein</td>
<td>14±0.21</td>
<td>7.17±0.17</td>
<td>10.16±0.18</td>
<td>0.97±0.26</td>
</tr>
<tr>
<td>Lipid</td>
<td>2.58±0.03</td>
<td>1.99±0.35</td>
<td>0.95±0.01</td>
<td>2.32±0.35</td>
</tr>
<tr>
<td>Carbohydrate (by difference)</td>
<td>48.74±0.24</td>
<td>55.97±1.13</td>
<td>49.24±0.13</td>
<td>50.46±2.29</td>
</tr>
</tbody>
</table>

Macro- and micro-mineral elements are related to ash content [31]. Ash content can determine the mineral content of a raw material [39]. The ash content of *U. lactuca* seaweed flour from Cibuaya Beach was lower than *U. lactuca* from Sekotong Waters, West Nusa Tenggara (34.87±1.19\% dw) [9]. The ash content of *C. crassa* seaweed flour from the waters of Ujung Genteng, Sukabumi was 46.25±0.33\% dw [38] higher than *Chaetomorpha* sp. seaweed from Simeulue Island. The ash content in the material can be influenced by differences in the seaweed type [21] and habitat [31].

Seaweed has a relatively high protein content compared to terrestrial plants. The protein content of *U. lactuca* seaweed flour from Cibuaya Beach in this study was higher than *U. lactuca* flour from Sekotong waters, West Nusa Tenggara (7.17±0.17\% dw) [9]. The protein content of *C. crassa* seaweed flour from the waters of Ujung Genteng, Sukabumi was 0.97±0.26\% dw lower than *Chaetomorpha* sp. from Simeulue Island. Differences in seaweed protein content may be caused by the type of seaweed and season period [31]. The highest protein levels were obtained in winter and spring, whereas the lowest protein levels were recorded during the summer. Changes in protein content in different seasons can be caused by variations in environmental conditions, such as light intensity and nitrogen storage during different seasons [40]. The seaweed *U. fasciata*, *C. corneus*, and *S. vulgare* from the coast of Bahia state in the tropical region of Brazil had the highest protein content during the rainy season and the lowest during the summer [41]. The seaweed *U. lactuca* from Cibuaya Beach was collected during the rainy season, namely between February and March, while *U. lactuca* from the waters of Sekotong, West Nusa Tenggara, was collected during the summer (September) [9]. Seaweed *Chaetomorpha* sp. is taken during the transition from hot to rainy season. Low temperatures during the rainy season effectively support the biosynthesis of several primary and secondary metabolite compounds, one of which is protein [42].

Seaweeds have low lipid contents [9, 31]. The lipid content of *U. lactuca* seaweed flour from Cibuaya Beach was higher than *U. lactuca* flour from Sekotong waters, West Nusa Tenggara (1.99±0.35\% dw) [9]. The lipid content of *C. crassa* seaweed flour from the waters of Ujung Genteng, Sukabumi was 2.32±0.35\% dw higher than *Chaetomorpha* sp. from Simeulue Island. Lipid acts as a food reserve for plants and algae and was hydrolyzed by lipase during seed germination [43]. The carbohydrate content of *U. lactuca* seaweed flour from Cibuaya Beach was lower than *U. lactuca* seaweed flour from Sekotong waters, West Nusa Tenggara (55.97±1.13\% dw) [9]. The carbohydrate content of *C. crassa* seaweed flour from the waters of Ujung Genteng, Sukabumi was 50.46±2.29\% dw higher than *Chaetomorpha* sp. from Simeulue Island. Carbohydrates are generally composed of polysaccharides that are related to the fibers in the material. The fiber in the material has a high content owing to the high polysaccharide content in the seaweed cells [44].

Heavy metal analysis is one way to determine the contamination of aquatic resources by heavy metals. The results for heavy metals are presented in Table 2. The results showed that the heavy metals mercury (Hg), arsenic (As), and lead (Pb) were not detected in either type of seaweed. Heavy metal contamination in a material can be influenced by water conditions and habitat [45], rainfall, age of seaweed harvest, and human activities, including the
discharge of waste and residual substances into water [8]. Heavy metal contamination that exceeds the standards for dried seaweed [46] and food [47] can accumulate in the body, making it dangerous to human health [48].

Table 2. Heavy metal of *U. lactuca* and *Chaetomorpha* sp. flour.

<table>
<thead>
<tr>
<th>Parameter</th>
<th><em>U. lactuca</em></th>
<th><em>Chaetomorpha</em> sp.</th>
<th>Dry seaweed [46]</th>
<th>Food [47]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hg</td>
<td>nd</td>
<td>nd</td>
<td>Max. 0.50</td>
<td>Max. 0.03</td>
</tr>
<tr>
<td>As</td>
<td>nd</td>
<td>nd</td>
<td>Max. 1.00</td>
<td>Max. 1.00</td>
</tr>
<tr>
<td>Pb</td>
<td>nd</td>
<td>nd</td>
<td>Max. 0.30</td>
<td>Max. 0.20</td>
</tr>
</tbody>
</table>

Note: nd (not detected).

3.2 Characteristics of seaweed salt

The yield of *U. lactuca* seaweed salt was higher than *Chaetomorpha* sp. salt (Table 3). The salt yield of *Chaetomorpha* sp. was still higher than the red seaweed salt *A. fragilis* (12.76%) [31]. The yield of *U. lactuca* seaweed salt obtained from Cibuaya Beach was 32.36±1.89% [29] higher than *U. lactuca* salt in this study, even though it came from the same place. Previous studies reported that green seaweed salt had a yield ranging from 10-32% [27-30] and brown seaweed salt 20-26% [21-25]. Differences in seaweed salt yield can be influenced by several factors, including the type of seaweed, chemical composition, and mass loss during the filtering process [22].

Table 3. Yield, mineral content, Na/K and NaCl percentage of *U. lactuca* and *Chaetomorpha* sp. salt.

<table>
<thead>
<tr>
<th>Parameter</th>
<th><em>U. lactuca</em></th>
<th><em>U. lactuca</em> [29]</th>
<th><em>Chaetomorpha</em> sp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield (%)</td>
<td>23.67</td>
<td>32.36±1.89</td>
<td>17.33</td>
</tr>
<tr>
<td>Na (mg/g)</td>
<td>72.47±0.05a</td>
<td>83.88±0.16</td>
<td>84.05±0.17b</td>
</tr>
<tr>
<td>K (mg/g)</td>
<td>41.62±0.04a</td>
<td>56.21±1.44</td>
<td>51.62±0.06b</td>
</tr>
<tr>
<td>Ca (mg/g)</td>
<td>69.77±0.05a</td>
<td>4.72±0.05</td>
<td>63.43±0.02b</td>
</tr>
<tr>
<td>Fe (mg/g)</td>
<td>7.31±0.13a</td>
<td>0.05±0.01</td>
<td>9.16±0.06b</td>
</tr>
<tr>
<td>Mg (mg/g)</td>
<td>35.20±0.01a</td>
<td>2.30±0.12</td>
<td>36.37±0.05b</td>
</tr>
<tr>
<td>Na/K ratio</td>
<td>1.74a</td>
<td>1.49</td>
<td>1.63b</td>
</tr>
<tr>
<td>%NaCl</td>
<td>57.36±0.34a</td>
<td>23.90±0.08</td>
<td>61.45±0.15b</td>
</tr>
</tbody>
</table>

Note: Superscript font different groups showed a significant difference (p<0.05).

Analysis of the independent sample t-test showed that there was a significant (p<0.05) difference between the mineral content of *U. lactuca* salt and *Chaetomorpha* sp. salt (Table 3). These results indicated that differences in green seaweed species influenced the mineral content of the seaweed salt produced. The highest mineral contents of Na, K, Fe, and Mg in *Chaetomorpha* sp. salt and Ca mineral in the *U. lactuca* salt. The highest mineral content in each salt of *U. lactuca* and *Chaetomorpha* sp., namely mineral Na, and the lowest mineral Fe. Other researchers who analyzed the mineral content of *U. lactuca* seaweed salt from Cibuaya Beach reported that the highest mineral content was Na and the lowest was Fe [29]. Other researchers have also stated that Na is the highest and Fe is the lowest in the mineral content of *A. fragilis* red seaweed salt [31]. The brown seaweed salt *S. polycystum* has the highest mineral content, K (247.59±3.90 mg/g) [18] and the lowest mineral Fe (0.60±0.00
mg/g) [25]. The mineral content of seaweeds can be influenced by the raw material habitat, harvest age, availability of aquatic nutrients, and environmental conditions [47].

Minerals are nutrients that are required in small quantities but play an important role in the metabolism of the body. Minerals play an essential role in assisting the mechanism of body physiology, including maintaining the function of bones and teeth, which requires a supply of the minerals Ca, P, and Mg; maintenance of internal homeostasis of the body; acid-base balance and body fluids, which require Na and K minerals [49]; and ability in oxidation and reduction reactions as well as cellular respiration, which requires the role of Fe minerals [50].

Analysis of the independent sample t-test showed that there was a significant (p<0.05) difference between the Na/K ratio and %NaCl of U. lactuca salt and Chaetomorpha sp. salt (Table 3). These results indicated that differences in green seaweed species influenced Na/K ratio and %NaCl of the seaweed salt produced. Both seaweed salts had Na/K ratios of close to 1. The Na/K salt ratio of U. lactuca and Chaetomorpha sp. is still higher than the brown seaweed salts S. polycystum (0.50) [25] and T. conoides (0.81) [21], but better than the red seaweed salt A. fragilis (3.32) [31]. The Na/K ratio recommended by the WHO for body health is close to 1 [51]. The ideal sodium and potassium intake levels for adults in the United States and Canada, namely, the Na/K ratio <1 ranges from 0.49 [52]. It has been proven that blood pressure in adolescents aged 17-21 years can decrease with a Na/K ratio of 0.60-0.75 [53].

The Na/K ratio plays an important role in controlling blood pressure and the excessive discharge of fluids containing K in hypertensive patients. Potassium minerals increase cell growth and help maintain normal blood pressure, whereas sodium minerals can be used to maintain osmotic and acid-base fluid balance [54]. Potassium and sodium are a pair of minerals that work together deeply maintaining fluid, electrolyte, and acid-base balance, so that they can influence blood pressure regulation in the human body [55]. The mineral content of sodium and potassium has the opposite role; namely, the mineral sodium has the ability to increase blood pressure, whereas the mineral potassium lowers it. Therefore, sodium and potassium intake in the human body must be balanced [56].

The %NaCl of U. lactuca salt meets the SNI 8208:2016 about dietary salt standards (%NaCl <60%) [5] but that of Chaetomorpha sp. has not yet been fulfilled (61.45±0.15%). Consumption of high levels of sodium is not recommended because it can cause health problems, especially in patients with hypertension. A fairly effective way to overcome hypertension is to optimize the salt composition by reducing the %NaCl without reducing the quality and sensory taste [57].

3.3 Total phenolic content and antioxidant activity

Total phenolic content and antioxidant capacity of U. lactuca seaweed flour were higher than Chaetomorpha sp., and both seaweed flours were classified as weak antioxidants based on IC<sub>50</sub> value (Table 4). Analysis of the independent sample t-test showed that there was a significant (p<0.05) difference between total phenolic content, IC<sub>50</sub> value, and antioxidant capacity by the CUPRAC method of U. lactuca and Chaetomorpha sp. salts (Table 4). The highest total phenolic content and antioxidant capacity were observed in Chaetomorpha sp. salt and the IC<sub>50</sub> value of Chaetomorpha sp. salt was classified as strong, and U. lactuca salt was classified as moderate.

The results showed that the total phenolic content and antioxidant capacity of seaweed after being converted into seaweed salt increased, and the IC<sub>50</sub> value was also lower than that in flour form. Seaweed salt was soaked and heated with distilled water at a ratio of flour to distilled water (1:10). The principle of this process is the same as that of the extraction of active compounds, which causes the active components in seaweed to be extracted with
distilled water. Aquades are the most polar solvent compared to other solvents [58]. The phenolic compounds in a material increase depending on the polarity of the solvent [10].

Table 4. Total phenolic content and antioxidant activity of *U. lactuca* and *Chaetomorpha* sp. flour and salt.

<table>
<thead>
<tr>
<th>Parameter</th>
<th><em>U. lactuca</em> flour</th>
<th><em>Chaetomorpha</em> sp. flour</th>
<th><em>U. lactuca</em> salt</th>
<th><em>Chaetomorpha</em> sp. salt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total phenolic content (mg GAE/g sample)</td>
<td>711.83</td>
<td>663.08</td>
<td>466.13&lt;sup&gt;a&lt;/sup&gt;</td>
<td>677.78&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>IC&lt;sub&gt;50&lt;/sub&gt; ABTS method (µg/mL)</td>
<td>192.66</td>
<td>195.96</td>
<td>147.54&lt;sup&gt;a&lt;/sup&gt;</td>
<td>96.6&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>CUPRAC (µmol ascorbic acid/g seaweed salt)</td>
<td>12.05</td>
<td>7.77</td>
<td>40.04&lt;sup&gt;a&lt;/sup&gt;</td>
<td>59.20&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Note: Superscript font different groups showed a significant difference (p<0.05).

Total phenolic content was measured using the Folin-Ciocalteu method, which aims to determine the content of phenolic compounds in the material. Phenolic compounds are chemical compounds that have the potential for antioxidant activity because they play a role in preventing oxidation events. Testing total phenol levels is one basic parameter used in antioxidant activity testing [59]. Total phenolic content of *U. lactuca* seaweed salt with activated charcoal from the Aceh Province Brackish Water Aquaculture Center (BBAP) was 13.72±0.19 mg GAE/g sample [28] lower than *U. lactuca* seaweed salt from Cibuaya Beach (466.13 mg GAE/g sample) and seaweed salt *Chaetomorpha* sp. from Simeuleu Island (677.78 mg GAE/g sample). This may be due to the addition of other ingredients, namely activated charcoal, to the salt product, which affects total phenolic content.

Antioxidants can act as donors of hydrogen atoms or inhibit free radicals to delay the initiation stage of free radical formation [60]. The higher the IC<sub>50</sub> value for the ABTS method, the lower the antioxidant activity of the sample. The IC<sub>50</sub> value is inversely proportional to the antioxidant activity. The IC<sub>50</sub> value was classified as very strong if the IC<sub>50</sub> was <50 µg/mL, strong if the IC<sub>50</sub> was 50-100 µg/mL, moderate if the IC<sub>50</sub> was 100-150 µg/mL, and weak if the IC<sub>50</sub> was 150-200 µg/mL [61]. IC<sub>50</sub> value of *U. lactuca* salt from Cibuaya Beach was approximately 173.07 µg/mL (weak antioxidant activity) [62]. This result shows that *Chaetomorpha* sp. salt has good potential as a source of antioxidants compared to *U. lactuca* salt. The ABTS method is based on the principle of synthetic antioxidant compounds that inhibit free radicals. ABTS+ is a synthetic organic compound with a blue-green color, and its presence can be reduced by antioxidant compounds using the principle of decolorization [63].

The CUPRAC antioxidant capacity of *U. lactuca* seaweed salt originating from Sukabumi Waters, West Java is 20.29 µmol ascorbic acid/g seaweed salt [64]. Different antioxidant capacities can be caused by differences in raw material conditions, including habitat, season, harvest age, and seaweed type. The principle of antioxidant activity of the CUPRAC method, namely its ability to reduce chelates Cu<sup>2+</sup>, which was turquoise blue, becomes Cu<sup>+</sup>, which was yellow when electrons are donated by the antioxidants. The advantages of using the CUPRAC method to determine antioxidant activity are that it was easy to react, selective, stable, and can be easily applied [34].

4 Conclusion

*U. lactuca* seaweed salt had a higher Na/K ratio than *Chaetomorpha* sp. but it was still close to one. *U. lactuca* seaweed salt had %NaCl within the standard of dietary salt, but not for
Chaetomorpha sp. salt. *U. lactuca* had moderate antioxidant activity, whereas *Chaetomorpha* sp. had strong antioxidant activity.

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