Determination of Iodide in Tropical Seaweed 
(halopterisfilicina)

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Abstract: Seaweed (Halopterisfilicina) was analyzed for its iodide content. The iodide content ranges from 0.081 to 0.121% of the dried weighed sample. Various factors were suspected inhibiting the iodide content. The oxidation method adopted employ the use of 30% hydrogen peroxide in acidic medium, subsequent extraction with chloroform and titration against 0.05N Sodium Thiosulphate gave an average iodide content of 0.102% of the dried weighed sample.

Keywords: Seaweed, HalopterisFilicina, Iodide, Iodine, Tropical,Phaeophyceae

1. Introduction

Seaweeds are macroscopic member of the division Chlorophyta, Phaeophyta and Rhodophyta living in sea [1], [2]. As communities they are easy to recognize. They are plants visible to naked eyes, growing attached to the solid substrata between and below tide marks. Seaweed may occur in unattached state, as for example Sargasso Sea[3]. However, attached plants form the greater portion of the total seaweed stock of the world. The division Chlorophyta, Phaeophyta and Rhodophyta were noticed among the most beautiful in the world, especially the red algae (Rhodophyta). They are also academically and commercially interesting such interest they generate that an international symposium is convened in every three years to present information and ideas on their biology, chemistry and commercial significance [3].

Phaeophyta (brown algae) and Rhodophyta (red algae) are the most important as they display distinctions between themselves and others, (i.e. Chlorophyta and higher plants). These variations could be in color, environmental needs and composition [4].

1.1 Rhodophyta

Rhodophyta or red algae form a big group of highly specialized marine algae comprising about 3,000 species. They are distributed in both temperate and tropical seas particularly in the letter. They are however some parasitic and epiphytic varieties, which grow on other algae. Although marine, Rhodophyta are characteristically red or purplish in color due to the presence of red pigment called Phycoerythrin which masks the present of chlorophyll. Many red algae contain phycocyanin the blue pigment of cyanophyta. Examples are Polysiphonia and Batrachospermum[4].

1.2 Phaeophyta

Phaeophytaor brown algae are interesting group of seaweeds of forms and sizes, comparing of about 1,000 species [4]. They are distributed between tidal levels along the coast, predominantly of temperate seas. They are mostly attached to the rock or some other substrata. Some few are free floating. Their color range from brown to olive-green due to the present of brown pigment (fucoxanthin) in their chloroplastic which masks the chlorophyll. Examples are Ectocarpus, Laminaria, Fucus, Sargassum and HalopterisFilicina.

1.3 HalopterisFilicina

HalopterisFilicina belongs to the kindomChromalveolata, division of Heterokontophyta, class of Phaeophyceae and order of Sphacelariales in family of Stypocalacaceae[5]. It is a small algalgownto considerable height, having both root and central axis surrounded by cortex with alternately branched pinnate thalli. Very bushy and rigid[7].

2. Sample collection and Preparation

The seaweed sample was identified through the use of pictorial references provided in [7]. The sample was
collected from Lagos beach, Lagos State, Nigeria. The sample collected was dried under laboratory condition and pulverized to a fine powder.

2.1 Procedure

1 g of the sample was weighed into a beaker and soaked with 30 cm³ of water for 24 hours. After 24 hours, the sample was filtered into 250 cm³ Erlenmeyer flask, the residue was washed with water, and the combined filtrate was diluted to 100 cm³ with water.

20 cm³ portions of the filtrate were introduced into a separation funnel containing 5 cm³ CHCl₃, 1 cm³ 3M H₂SO₄ and 30% H₂O₂. The separation funnel with its content was agitated, following the separation of the two layers; the purple layer was drained into 250 cm³ Erlenmeyer flask. The extraction was repeated two more times to ensure the disappearance of the purple color from the organic layer. The purple color solution was titrated with standard sodium Thiosulphate solution. The end point was indicated by the disappearance of the purple color. The procedure was repeated within sample for concordant readings and using different sample weights.

In each case, the volume of the titrand used was determined and recorded. The amount of iodine in the 100 cm³ of the titrant was determined and the percentage of the iodine in the dried sample computed [12].

2.2 Schemes of the Reactions:

\[
\begin{align*}
2I_2(aq) & \rightarrow I_2(g) + 2\bar{e}(aq), \\
H_2O_2(l) + 2H_1(aq) + 2\bar{e} & \rightarrow 2H_2O(l)
\end{align*}
\]

The overall is;

\[
2H_2O_2(l) + 2H_1(aq) + 2I_1(aq) \rightarrow I_2(l) + 2H_2O(l)
\]

Then, the iodine so generated will react with Sodium thiosulphite according to the equation.

\[
I_2(l) + 2Na_2S_2O_3(l) \rightarrow 2NaI(l) + Na_2S_4O_4
\]

Hence;

a = 2
b = 1

The amount of the iodide in the 100 cm³ of the sample was calculated from the formula thus;

\[
(Cm^3)a(Ma)\frac{b}{a}(m.\text{Wt}_b) = Mgb
\]

Where;

\[
Cm^3a = \text{Volume of the titrant used} \\
Ma = \text{molarity of the titrant} \\
a = \text{number of moles of the titrand} \\
b = \text{number of moles of the titrant} \\
\text{Mol.Wt}_b = \text{molecular weight of the titrant} \\
Mgb = \text{milligram of the titrant in 100 cm³ of the sample.}
\]

The percentage of the iodide in the dried sample was also calculated from the formula thus;

\[
\% \text{iodide} = \frac{\text{milligram of the iodide}}{\text{milligram of the dried sample}} \times 100%
\]

<table>
<thead>
<tr>
<th>Mass of the sample (g)</th>
<th>%Iodide in the dried weed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.081</td>
</tr>
<tr>
<td>2</td>
<td>0.121</td>
</tr>
<tr>
<td>3</td>
<td>0.108</td>
</tr>
<tr>
<td>4</td>
<td>0.101</td>
</tr>
<tr>
<td>5</td>
<td>0.097</td>
</tr>
</tbody>
</table>

\[
\text{Mean} = 0.102 \pm 0.007\%
\]

3. Result and Discussion

Table (1) above depicts the % and average (mean) %iodide obtained from the Halopteris Filicina. Based on that, the seaweed (Halopteris Filicina) was found to have an appreciable amount (0.102%) of iodide content when compared to what was earlier report for Laminaria intestinalis which was lower compared to what was earlier report for Laminaria intestinalis and Sargassum. Though, compared to the recent development in research on these seaweeds (Laminaria intestinalis and Sargassum), they were reported to have iodide content of 4% and 2% respectively [10], this considerable amount recovered rendered (Halopteris Filicina) to have poor iodide content. The low level of iodide in (Halopteris Filicina) may be due to the tropic nature of the environment (high temperature) and intense sun light which may thermally or photocatalytically oxidizes the iodide and liberated it as elemental iodine to the environment. Other factors may include loclae; degree of exposure to the water, wave action and whether it is fruiting or sterile.

4. Conclusion

Unlike Oarweeds and rockweeds which were the initial economic sources of elemental iodine [10], the Halopteris Filicina analyzed was low in iodide content and poor for economic exploitation of elemental iodine.

References


Author Profile