Determination of Iodide in Tropical Seaweed (*halopterisfilicina*)

Usman Lado Ali[1], Nasruddeen Yusuf Al-awwal[2]

[1]Department of Chemistry, Northwest University, Kano, Kano-Nigeria

[2]Department of Chemistry, SRM University, Kattankulathur-603203, India

Abstract*: Seaweed (Halopterisfilicina) was analyzed for its iodide content. The iodide content ranges from0.081 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 *Phycoerythin*which masks the present of chlorophyll. Many red algae contain *phycocynin* the blue pigment of *cyanophyta*. Examples are *Polysiphonia* and *Batrachospermum*[4].

1.2*Phaeophyta*

*Phaeophyta*or 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 chloroplast which masks the chlorophyll. Examples are *Ectocarpus, Laminaria, Fucus, Sargassum and HalopterisFilicina.*

1.3 *HalopterisFilicina*

*HalopterisFilicina*belongs to the *kindomChromalveolata,* division of *Hetrokontophyta*, class of *Phaeophyceae* and order of *Sphacelariales* in family of *Stypocaulaceae*[5], [6]. It is a small algagrownto considerable height, having both root and central axis surrounded by cortex with alternately branched pinnate thalli. Very bushy and rigid [7].

Although iodine is a micro-element/nutrient required by several red and brown algae, its metabolic role is not clear [3]. Vines and Rees [8] reported that iodine is a micro-constituent of all organisms but plentiful in seaweeds. Iodine exists as iodide in brown and red algae [3]. The presence of this iodide can be quantitatively detected as elemental iodine, the amount depend on many factors; species; whether is fruiting or sterile; locale; season of the year; the degree of exposure to seawater and wave action and temperature [3], [9]. The oar and rock weeds were initially the economic source of elemental iodine. Recovery of the element includes ashing the dried weed in beach kilms and extraction of the salts, followed by oxidation. Optimum yield depended upon avoiding loss of the iodine by leaching action of rainwater during drying and loss of free iodine before and during the ashing. The best seaweed *Laminariadigitata*, properly burnt contains 0.13-0.63% iodine, but value of over 4% been reported [10]. A quantitative result obtained from Japanese *Sargassum* was 0.05% [10]. Nuffield series of experiments [11],haveshown that an estimated maximum iodide concentration of 2% in 5g of dried weed was reported [10]. Inkelps, 1% of the dry weight may be iodine [3].

2. Sample collection and Preparation

The seaweed sample was identified through the use of pictorial references provided in [7]. The sample was

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collected from Lagos beach. Lagos State, Nigeria. The sample collected was dried under laboratory condition and pulverized to a fine powder.

2.1 Procedure

1g of the sample was weighed into a beaker and soaked with $30cm^3$ of water for 24 hours. After 24 hours, the sample was filtered into $250cm^3$-Erlenmeyer flask, the residue was washed with water, and the combined filtrate was diluted to $100cm^3$ with water.

$20cm^3$ portions of the filtrate were introduced into a separation funnel containing $5cm^3$ $CHCl_3$, $1cm^3$ $3MH_2SO_4$ and $30\%H_2O_2$. The separation funnel with its content was agitated, following the separation of the two layers; the purple layer was drained into $250cm^3$-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 iodide in the 100cm3 of the titrant was determined and the percentage of the iodine in the dried sample computed [12].

2.2 Schemes of the Reactions:

$$2I^-_{(aq)} \longrightarrow I_{2(g)} + 2\bar{e}_{(aq)}$$

$$H_2O_{2(l)} + 2H^+_{(aq)} + 2\bar{e} \longrightarrow 2H_2O_{(l)}$$

The overall is;

$$2H_2O_{2(l)} + 2H^+_{(aq)} + 2I^-_{(aq)} \longrightarrow I_{2(l)} + 2H_2O_{(l)}$$

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

$$I_{2(l)} + 2Na_2S_2O_{3(l)} \longrightarrow 2NaI_{(l)} + Na_2S_4O_4$$

Hence;

a = 2

b = 1

The amount of the iodide in the $100cm^3$ of the sample was calculated from the formula thus;

$$(Cm^3 a)(Ma)\frac{b}{a}(mol.Wt_b) = Mg_b \qquad (1)$$

Where;

Cm^3a = Volume of the titrant used

Ma = molarity of the titrant

a = number of moles of the titrand

b = number of moles of the titrant

$Mol.Wt_b$= molecular weight of the titrant

Mg_b = milligram of the titrant in $100cm^3$ of the sample.

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

$$\%iodide = \frac{milligram\ of\ the\ iodide}{milligram\ of\ the\ dried\ sample} \times 100\% \qquad (2)$$

Table 1: %iodide in the sample

Mass of the sample (g)	%Iodide in the dried weed
1	0.081
2	0.121
3	0.108
4	0.101
5	0.097

$$\boldsymbol{Mean = 0.102 \pm 0.007\%}$$

3. Result and Discussion

Table (1) above depicts the % and average (mean) %iodide obtained from the *HalopterisFilicina*.Based on that, the seaweed (*HalopterisFilicina*) was found to have an appreciable amount (0.102%)of iodide content when compared to what was earlier report for *Laminariadigitata* (0.13-0.63%) and Japanese *Sargssum* (0.05%) [10]. Though, compared to the recent development in research on these seaweeds (Laminariadigitata and Sargassum), were reported to have iodide content of 4% and 2% respectively [10], this considerable amount recovered rendered (*HalopterisFilicina*) to have poor iodide content. The low level of iodide in (*HalopterisFilicina*) may be due to the tropic nature of the environment (high temperature) and intense sun light which may thermally or photocalytically oxidizes the iodide and liberated it as elemental iodine to the environment. Other factors may include locale; 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 *HalopterisFilicina* analyzed was low in iodide content and poor for economic exploitation of elemental iodine.

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Author Profile

Usman Lado Ali, born on 3rd March, 1982 at Getso Town, Gwarzo Local Government, Kano State, Nigeria. Graduated from Bayero University Kano, Nigeria and obtained B. Sc. Honor in Chemistry, 2006. Worked with KSSSSMB Kano, Science and Technical Schools Board, Kano and Currently graduate assistant at Northwest University Kano, as well as M.Sc. Chemistry Student at SRM University, Kattankulathur-603203, India.

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