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Physico-chemical analysis by SEM-EDX and FTIR two brown algae *Cystoseira tamariscifolia* and *Bifurcaria bifurcata*

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ABSTRACT

Seaweeds have considerable economic interest, they may be classified among the most important marine substances. They are important in most industries, especially in the pharmaceutical, food and environmental. Algae we targeted are brown algae of the family Cystoseiracées. Indeed, several previous scientific research on this kind have shown their remarkable potential for pharmaceutical scale and as adsorbents of heavy metals. In this work we analyzed the texture for Cystoseira tamariscifolia and Bifurcaria bifurcata by scanning electron microscopy coupled with energy dispersive analysis of X-ray Spectroscopy (SEM / EDAX) spectroscopy and Fourier Transform Infrared (FTIR). The the results obtained by scanning electron microscopy show firstly, very irregular and porous structures, and a heterogeneity of the pores on all surfaces and Cystoseira tamariscifolia Bifurcaria bifurcata. On the other hand, analysis by microanalyses Energy Dispersive X-ray Spectroscopy showed the presence of a significant organic composition with respect to the minerals. These results were confirmed by infrared spectroscopy Fourier Transform.

KEYWORDS

Brown algae;
SEM-EDX;
FTIR;
Analysis.

INTRODUCTION

The marine environment with more than 25,000 species of algae, is a significant global economic interest.[1] Where they are now considered very remarkable substances, hence the interest in several national and international laboratories. They have directed their work towards targeted and specialized research into the use of algae in the fields of pharmacy[2], environment[3], materials[4], food,[5]...

Morocco, with its double Atlantic and Mediterranean coast, 2850 km long, and a country deeply influenced by the sea, which implies the existence of the thousand species of algae and algal biomass as a very important reports by other countries world[6].

The aim of our work is the development of algal biomass Morocco in various applications. After assembling bibliographic data on algae, and precisely Cystoseiraceae family (brown algae), we chose two algae Cystoseira tamariscifolia and Bifurcaria bifurcata, they were oriented with respect to its encouraging results in the pharmaceutical, environmental and other in-

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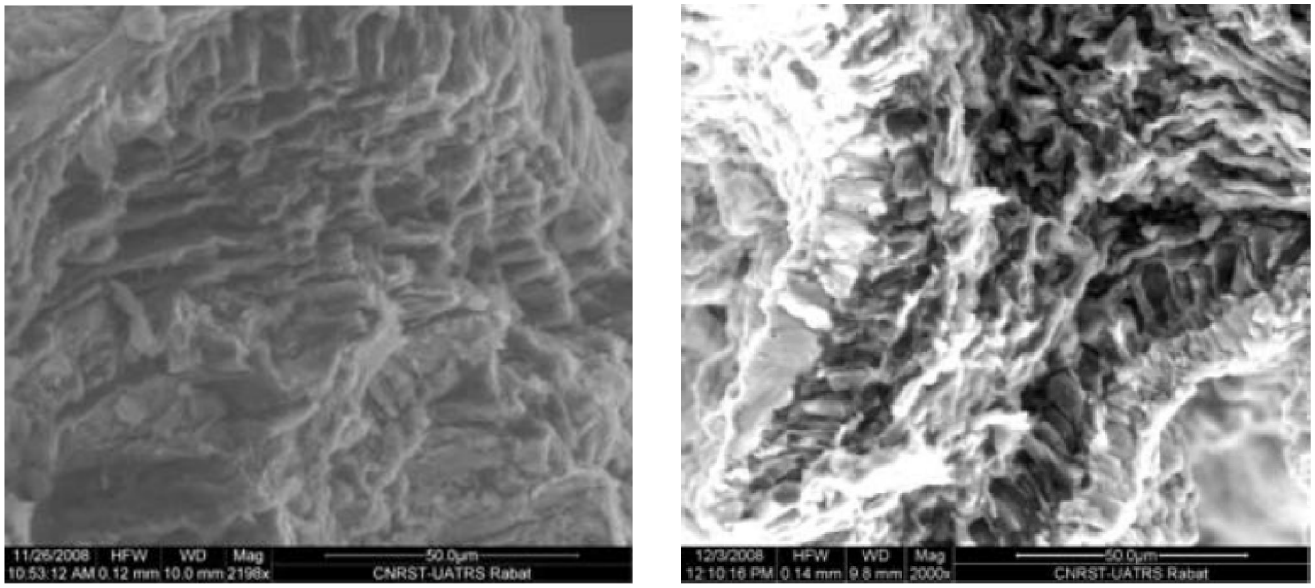
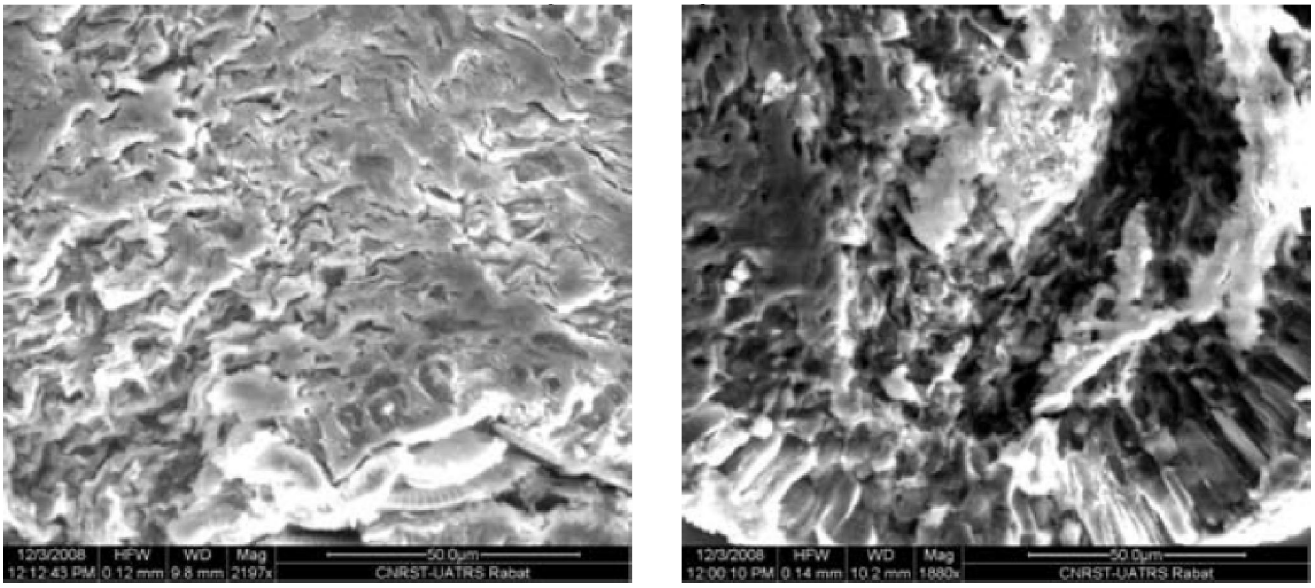


outer surface **Inner surface of an imaginary cut**

Cystoseira tamariscifolia



outer surface **Inner surface of an imaginary cut**

Bifurcaria bifurcata

Figure 1 : Structures of the outer and inner surfaces of *Cystoseira tamariscifolia* and *Bifurcaria bifurcata*.

dustrial fields[7-9].

This part of the work entitled textural analysis for the two preceding algae such as:

- Microscopic examination by the scanning electron microscope (SEM).
- The analysis of organic and minirals constituents by EDX.
- Spectroscopic analysis by Fourier transform infrared (FTIR).

EXPERIMENTAL

Biomass

The brown algae Bifurcaria bifurcata was collected from the Dar Bouaaza beach (Casablanca), Morocco in December 2009. The algae has washed with running water and with deionized water. The washed biomass was oven-dried at 60 °C for 24 h.

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TABLE 1 : EDX microanalysis based on weight percentages of the elements present in *Cystoseira tamariscifolia* and *Bifurcaria bifurcata*.

Elements	Cystoseira tamariscifolia		Bifurcaria bifurcata	
	outer surface (%)	Inner surface (%)	outer surface (%)	Inner surface (%)
C	45,63	40,48	49,69	36,39
O	22,27	37,03	27,76	38,08
N	10,39	3,36	-	2,30
S	1,50	1,97	4,29	1,63
K	5,50	5,93	8,05	9,56
Cl	6,47	4,85	5,34	7,54
Na	0,52	2,62	0,69	1,97
Mg	1,09	1,12	0,22	0,99
Ca	1,61	1, 31	2,84	1,55
Si	0,21	1,32	Trace	n.d
P	1,60	n.d	0,27	n.d
Ni	Trace	n.d	0,75	n.d
Al	0,30	n.d	0,11	n.d

n.d : not detected

Scanning electron microscope

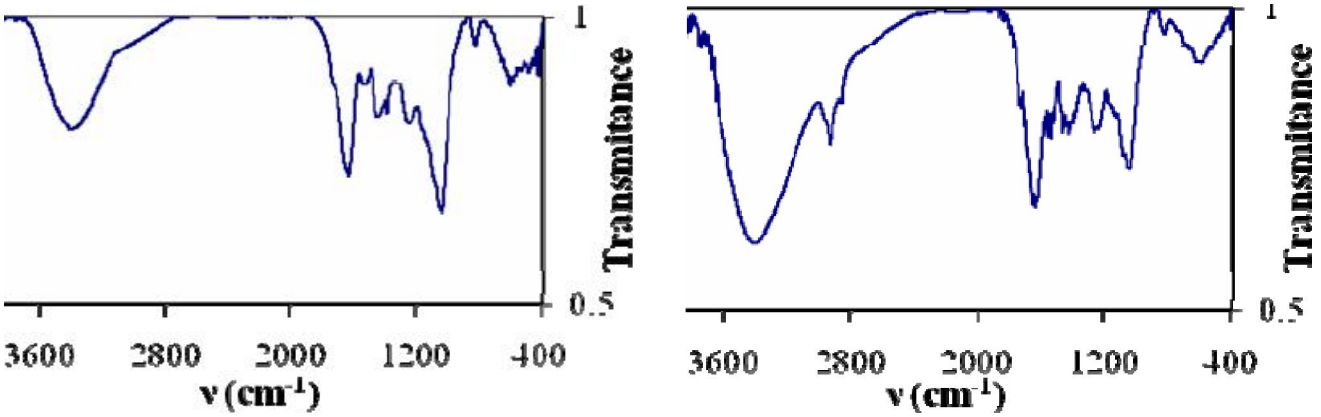
SEM is used in high-resolution environmental conditions (ESEM mode) with a gas pressure in the chamber, coupled with a complete system of X-ray microanalysis (EDX detector). (National Center for Scientific and Technical Research Rabat Morocco).

Fourier transform infrared

FTIR spectrophotometer used is VERTEX 70 type, spectrum was recorded in the region of 4000 cm^{-1} to 400 cm^{-1}. (National Centre for Scientific and Technical Research Rabat Morocco)

RESULTS AND DISCUSSION

Figure 1 shows representative photographs of the respective surfaces and Cystoseira tamariscifolia Bifurcaria bifurcata obtained by scanning electron microscopy (SEM). Snapshots are obtained on the external surfaces and other surfaces on shell sections. The results show on one hand, very irregular and porous structures, and other forms of heterogeneity on all pore surfaces and Cystoseira tamariscifolia Bifurcaria bifurcata These results encourage the evaluation of these two seaweed in the treatment of polluted water by means of adsorption. Furthermore, by microanalyses electron scattering X-ray (EDX preceding surfaces, which give the chemical compositions according to mass percentages are listed in TABLE 1. The analysis of our samples show high levels of carbon (C) and oxygen (O) which proves the presence of organic matter. The macronutrients are present in relatively large amounts: Magnesium (Mg: 0.22% - 1.12%), potassium (K: 5.50% - 9.56%), chlorine (Cl: 4 85% - 7.54%), sulfur (S: 1.50% - 4.29%), sodium (Na: 0.52% - 2.62%) and phosphorus (P: 0.27% - 1.60%). Trace elements such as silica, aluminum, and nickel are present especially on the outer surfaces with relatively low percentages. These values confirm the qualitative minerals important mineral materials.



Cystoseira tamariscifolia *Bifurcaria bifurcata*

Figure 2 : FTIR spectra *Cystoseira tamariscifolia* and *Bifurcaria bifurcata*.

Analysis by Infrared Spectroscopy Fourier Transform, is complementary to the study by scanning electron microscopy SEM coupled with EDX microanalysis, it provides information on the nature of the func-

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tional groups and the molecular bonds of the samples analyzed.

Analysis of infrared spectra for algae Cystoseira tamariscifolia and Bifurcaria bifurcata which are shown in figure 2, allows the allocation of the following absorption bands for both algae:[10-12]

- A band at around 3400 cm -1 corresponding to the vibrations of free OH or NH pulled.
- A band at 1650 cm -1 corresponding to the vibrations of elongation of the C = O vibration and asymmetric elongation of the N = O.
- A weak band at 1550 cm -1 corresponding to the vibrations of C = C elongation.
- A band at 1450 cm -1 corresponding to the vibrations of OH deformation.
- A band at 1250 cm -1 corresponding to the vibrations of elongation CCO.
- A band at around 1030 cm-1 corresponding to CO stretching vibrations.
- A band located around 850 cm-1 corresponding to the deformation vibrations of CH.
- A band at about 750 cm-1 for both algae, corresponding vibration NH.

CONCLUSION

This work is part of the recovery of algal biomass Morocco, in view of a possible initialization in the textural characterization of two marine algae Cystoseira tamariscifolia Bifurcaria Bifurcata and SEM / EDX and FTIR. Where results open a great voice of the research towards large applications.

REFERENCES

[1] T.Ainane, A.Abourriche, M.Kabbaj, M.Elkouali, A.Bennamara, M.Charrouf, M.Talbi, M.Lemrani; Journal of Chemical & Pharmaceutical Research, **6(4)**, 607-611 **(2014)**.
[2] K.Oumaskour, N.Boujaber, S.Etahiri, O.Assobhei; African Journal of Biotechnology, **11(104)**, 16831-16837 **(2012)**.
[3] V.K.Gupta, A.Rastogi; Journal of Hazardous Materials, **163(1)**, 396-402 **(2009)**.
[4] H.Zidane, A.Orbi, N.Sqalli, F.Zidane, M.Talbaoui, M.Hasnaoui, M.Fakhaoui; Environmental technology, **27(8)**, 933-943 **(2006)**.
[5] J.J.Ortega-Calvo, C.Mazuelos, B.Hermosin, C.Sáiz-Jiménez; Journal of Applied Phycology, **5(4)**, 425-435 **(1993)**.
[6] B.Duval, E.Duval, R.W.Hoham; International Microbiology, **2(1)**, 39-42 **(2010)**.
[7] H.Sanderson, D.J.Johnson, T.Reitsma, R.A.Brain, C.J.Wilson, K.R.Solomon; Regulatory Toxicology and Pharmacology, **39(2)**, 158-183 **(2004)**.
[8] G.H.Azarian, A.R.Mesdaghinia, F.Vaezi, R.Nabizadeh, D.Nematollahi; Iranian Journal of Public Health, **36(4)**, 57-64 **(2007)**.
[9] G.Markou, D.Georgakakis; Applied Energy, **88(10)**, 3389-3401 **(2011)**.
[10] D.L.Pavia, G.M.Lampman, G.S.Kaiz; Introduction to spectroscopy : A guide for students of organic chemistry, Saunders Golden Sunburst Series; Brooks Cole, **(1987)**.
[11] E.Kiefer, L.Sigg, P.Schosseler; Environmental science and technology, **31(3)**, 759-764 **(1997)**.
[12] S.Basha, Z.V.P.Murthy, B.Jha; Chemical Engineering Journal, **137(3)**, 480-488 **(2008)**.