Extraction of Sulphated Polysaccharides (SPS) from Different Species of Marine Macroalgae and Studying their role as Natural Anticoagulant

A thesis
Submitted in Partial Fulfillment of
the Requirements for the Degree of Master of Science

In
Botany (Algae)

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2016

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Acknowledgments

Praise and thanks to be Allah, The most merciful for assisting and directing me to the right way

It is my pleasure to express my sincere gratitude to **Prof. Dr. Wafaa Sobhy Abou El-kheir**, Professor of Phycology, Botany Department, Faculty of Women for Arts, Science and Education, Ain Shams University for supervising this work and for her valuable help, encouragement and her critical review of this thesis.

Sincere thanks are expressed to **Dr. Afaf Hasan Ali**, Lecturer of Phycology, Botany Department, Faculty of Women for Arts, Science and Education, Ain Shams University. I would like to express my deepest gratitude to her for giving me every support and guidance.

I'm sincerely indebted to **Dr. Fekry Ashour Mourad** Researcher in Marine Environment, The National Institute of Oceanography and Fisheries, Suez. I would like to express my deepest gratitude to him for giving me every possible help and guidance.

My deep thanks are to all staff members and colleagues in Botany Department, Faculty of Women for Arts, Science and Education, Ain Shams University for providing facilities and continuous help during this work.

Dedication

To the persons who taught me patience, strife and pushed me towards success in life and gave me all care and duty, to my kind father, tender mother and fiancé.

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Aim of the work

The present study aimed to extract sulphated polysaccharides from six marine macroalgae (*Ulva lactuca*, *Codium dwarkense*, *Sargassum denticulatum, Hormophysa triquetra*, *Cystoseira myrica* and *Hypnea cornuta*) and to emphasize the use of them as natural anticoagulant with high efficiency.

In addition, study the potential of use sulphated polysaccharides (with 2 different methods of extraction and different concentrations) as natural anticoagulants to solve the problem of blood clots and the side effects of the artificial anticoagulants such as heparin.

Abstract

Marine algae are the most important source of non-animal sulphated polysaccharides which possess important pharmacological activities such as anticoagulant, antioxidant, anti-inflammatory, antiviral, antibacterial agents. Therefore, marine algae derived sulphated polysaccharides have great potential to be further developed as medicinal products. Marine macroalgae were collected seasonally for one year (September 2013 to August 2014) from the intertidal zone of sea for site I: Ras El-adabiya which located on the western shore of Suez Bay and site II: Ras Sedr which located north–east of the Gulf of Suez. The purpose of this study was to extract sulphated polysaccharides from marine macroalgae (*Ulva lactuca*, *Codium dwarkense*, *Hypnea cornuta*, *Hormophysa triquetra*, *Sargassum denticulatum* and *Cystoseira myrica*) by two different methods (hot and cold water extracts) and chemical analysis of obtained extracts also done (protein content, total sugar, sulphate content, sulfer, nitrogen and uronic acid). The biological parameter (photosynthetic pigments) and physico-chemical parameters for sea water samples were done. The results of the physico-chemical parameters for sea water samples showed that temp. ranged between **15-30** °C, pH **7.8-8.7**, water salinity **38-42 ‰**, DO **6-7** mg/L, NO_3 **0.021-4.6** mg/L, NO_2**0.004-0.032** mg/L,

NH_4 **0.019-0.3** mg/L and PO_4 **0.005-0.015** mg/L and the results of the biological parameter (photosynthetic pigments) revealed that the concentration of chlorophyll (a) ranged between **6.9-17.46** µg/L, chlorophyll (b) ranged between **9.1-24.9** µg/L, chlorophyll (c) ranged between **11.3-12.9** µg/L and carotenoids ranged between **3.26-4.65** µg/L. The potential of use sulphated polysaccharides as natural anticoagulant was tested by the Activated Partial Thromboplastin Time (APTT) and the Prothrombin Time (PT) tests. The results showed that higher blood anticoagulant activity of SPs is proportional to the carbohydrate and sulphate contents and inversely proportional to the protein and uronic acid contents. So, the significant highest value of prothrombin time was **26.50±0.10** sec at concentration of 20% SPs for cold water extract from the brown alga *Hormophysa triquetra*, while the lowest value was **1.13±0.06** sec at conc. of 5% SPs for hot water extract from the red alga *Hypnea cornuta*. Also, the results indicated that the highest value of activated partial thromboplastin time **42.20±0.10** sec was recorded at conc. of 20% SPs for cold water extract from the brown alga *Hormophysa triquetra* and the lowest value **5.63±0.25** sec was recorded at conc. of 5% SPs for hot water extract from the red alga *Hypnea cornuta*.

Key words: Ras sedr, Ras El-adabiya, Gulf of Suez, *Hormophysa triquetra, Sargassum denticulatum*, *Cystoseira myrica*, *Hypnea cornuta, Ulva lactuca*, *Codium dwarkense*, Sulphated polysaccharides and blood anticoagulation activity.