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Marine Algae of Sert Coasts, Libya

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ABSTRACT

The present work was mainly intended to make recent data base of marine algae population at Sert coasts as a first step to evaluate some of their chemical composition, antimicrobial activities and economic importance. Collection, identification and classification of marine algae of Sert coasts at Mediterranean Sea eastern Tripoli were done through some irregular visits during 2008 and 2009. A total of 21 algal species (21 genera) were recorded at the study area. Five species of them (23.81%) were belonging to Chlorophyta (5 families), Six species (28.57%) belonging to Phaeophyta (4 families) and Ten species (47.62%) belonging to Rhodophyta (4 families) with special reference to Cystoseiraceae and Dityotaceae families of Phaeophyta and Corallinaceae and Rhodomelaceae families of Rhodophyta. Most of the recorded algae were safely edible and still needed to know more about their chemical composition and antimicrobial activity.

1. Introduction

Many marine organisms produce chemicals with biomedical properties that are not found, or rare, in terrestrial organisms (Nybakken, 2001) although only 4.5% of Mediterranean Sea flora and funa are introduced, in total more than 400 species (Boudouresque and Verlaque, 2005). Red and brown algae are mainly used as a human food sources (Rajasulochana, et. al., 2009) for several economically useful materials, especially to supplement man diet (Prescott, 1984) and they contain high amounts of carbohydrates, protein, minerals (Rupe'rez and Saura-Calxto, 2001) low fat contents, few calories (Lahaye and Kae, 1997) and some of them are considered great potential food sources and present almost year round (Abdallah, 2007). Many metabolites isolated from marine algae have been shown to possess bioactive efforts (Oh et al., 2008, Venkateswarlu et. al., 2007 and Rui-yun Yang *et al.*, 2006). Taxonomy is the hidden but important foundation when seaweeds would be exploited for any of their natural products, so in his work he collected the marine algae of Sert coasts to evaluate the chemical, economic, pharmaceutical importance in further studies.

2. Materials and methods

2.1 The Study area:

Sert coasts and its geographical location and main morphometric characteristics were illustrated at Fig. 1. It lies at 32° 03' 28.03'' N and 20° 02' 29.18'' E at the western Libyan coast. It characterized by long, curved and mainly sandy coasts with some rocky parts at Mediterranean Sea. It also had commercial, fishing ports and many public beaches.

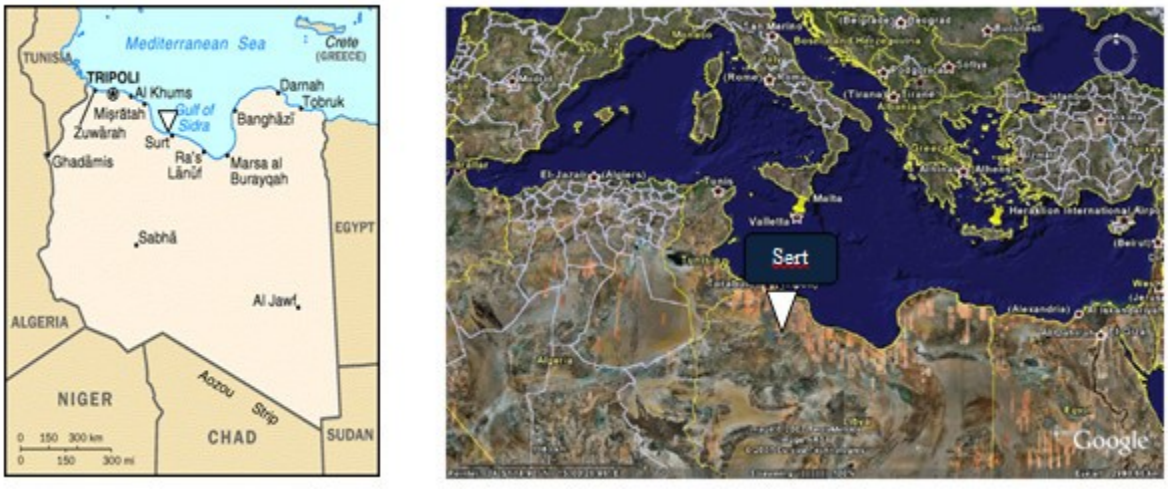

Fig. 1. Maps of Libya and the study area.

2.2 Sampling and sample preparations:

For the long distance between the study area and research laboratories of Benghazi, specimens were collected through some irregular visits during 2008 and 2009 in ice tanks at polyethylene bags. Some of them sprinkled with 4% formalin sea water solution for mounting on the herbarium sheets, glass bottles and some of them were kept freshly at ice or refrigerators for future use and subsequent taxonomic identification using Nizamuddin et al., (1979), Burrows (1991), Godeh, et al., (1992) and Aleem (1993). Epiphytes, impurities and salts are carefully and quickly removed at laboratory with tap and distilled waters. The herbarium sheets have been deposited in the Herbarium of Botany Department, Garyounis University, Benghazi {CHUG nos. FM. 650; 651}. Longitudinal and transverse sections of the axis at the apexes, midfronds and the bases were handmade and stained in 1% KI_2 or aniline blue solution.

2.3 Species richness:

Species richness index is calculated according to Wilhm, (1975) just by direct count of different green algal species (taxa) at every sampling site where, the decrease in number of species and increase in number of individuals are a characteristic feature of polluted water.

3. Results and discussion

Regarding to species richness, a total of 21 marine green algal species (21 genera) were recorded from some sampling stations along the coasts of Sert city to cover the study area (Table 1). Five species of them (23.81%) were belonging to Chlorophyta (5 families), Six species (28.57%) belonging to Phaeophyta (4 families) and Nine species (47.62%) belonging to Rhodophyta (4 families).

Regarding to Chlorophyta (5 families), Sert coasts were similar only to Tolmeta coasts which also had 6 green algal species (Said, et al., 2010). It is relatively poor of green algae as compared to all eastern coasts like Tobruk and Ain-Ghazala coasts which had 14 and 9 species, respectively (Godeh et. al., 2009). Derna and Susa also had 7 and 18 green algal species, respectively (Said, et al., 2010). Tukra coast had 11 green algal (Said and Godeh, 2008). Some of the recorded green algae were recorded also at the Turkish Urla coast (Tüney et al., 2006). At invaded Bay of Marseilles (France, NW Mediterranean) Klein and Verlaque, (2007) identified only 38 green algal taxa belonging to Chlorophyta. Rhodes Island had 33 green macroalgal taxa (Tsiamis, et al., 2007).

The relatively reduction of green species may be due to the presence of some Caulerpales which considered strong competitors (David et al., 2004 and Piazzi et al., 2005) and its production of toxic substances, which inhibit their grazing (Piazzi *et al*., 2005). The storms also act as an important structuring force on the seagrasses system and sedimentation (Schlacher-Hoenlinger and Schlacher 1998). Zimmermann, (2006) evaluated the depth, turbidity and light intensity as major limiting factors to the seagrasses growth and development.

Table 1 illustrated 6 identified brown algal species (6 genera) of the present study area of Sert coasts with dominancy of Cystoseiraceae and Dictyotaceae families. Some of the Seagrass have been described as excellent bioindicators (Pergent-Martini et al., 2005) like *Cystoseira* which considered very good indicators of good environment (Arévalo, et al., 2007) due to their high sensitivity to changes of environment and specifically to human impacts (Short and Wylline-Echeverria, 1996).

Generally, Sert coasts were also cheaper in Phaeophyceae than the eastern coasts of Libya like Derna and Tolmeta which had 14 brown algal species of each (Said, et al., 2010) and Tobruk coasts which had 11 and brown algal species (Godeh, *et al.,* 2009). The study area were more or less similar to Tukra coasts which had 7 brown algal species (Said, and Godeh, 2008) while it was richer than Ain-Ghazala coasts which had just one brown species (Godeh, et al., 2009).

Table 1: List of marine algae at Sert coasts.

Division	Family	Algae
Chlorophyta (5 Families & 5 species)	Anayamaceae	*Anadyomene* Lamouroux 1812
		Anadyomene stellata (Wulfen) C. Agardh
	Caulerpaceae	*Caulerpa* Lamouroux 1809
		Caulerpa prolifera (Forsskål) Lamouroux
	Ulvaceae	*Enteromorpha* Link 1820
		Enteromorpha intestenalis (Linnaeus) Greville
	Udoteaceae	*Halimeda* Lamouroux 1816
		Halimeda tuna (Ellis *et* Solander) Lamouroux
	Microdictyaceae	*Microdictyon* Decaisne 1839
		Microdictyon tenuius (C. Agardh) Decaisne
Phaeophyta (4 Families & 6 species)	Cystereiraceae	*Cystoseira* C. Agardh 1820
		Cystoseira discors (Linn.) C. Agardh emend Sauvageau
		Padina Adanson 1763
		Padina pavonica (Linnaeus) Lamouroux
	Dictyotaceae	*Dictyopteris* Lamouroux 1809
		Dictyopteris membranacea (Skackhouse) Batters
		Dictyota Lamouroux 1809
		Dictyota dichotoma (Hudson) Lamouroux
	Stypoaulaceae	*Halopteris* Kützing 1843
		Halopteris scoparia (Linnaeus) Sauvageau
	Sargassaceae	*Sargassum* C. Agardh 1820
		Sargassum acinarium C. Agardh
Rhodophyta (4 Families & 10 species)	Corallinaceae	*Fosliella* Howe 1920
		Fosliella zonalis (Crouan frat) Feldmann
		Lithophyllum Philippi
		Lithophyllum solutum (Foslie) Lemoine
		Neogoniolithon Setchell *ét* Mason 1943
		Neogoniolithon mamiilusum (Hauck) Hewe
		Pseudolithophyllum Lemoine 1913
		Pseudolithophyllum expansum (Philippi) Lemoine
	Rhodomelaceae	*Laurencia* Lamouroux 1813
		Laurencia paniculata (C. Tgaro) Greville
		Lophocladia Schmitz 1896
		Lophocladia lallemandii (Montagne) Schmitz
		Rytiphlaea C. Agardh 1824
		Rytiphlaea tinctoria (Clemente) C. Agardh
		Vidalia Lamouroux 1822
		Vidalia volubilis (Linn.) J. Agardh
	Peyssonneliaceae	*Peyssonnelia* Decaisne 1841
		Peyssonnelia rubra (Greville) J. Agardh
	Helmethoclaiaceae	*Liagora* Lamouroux 1812
		Liagora viscida (Forsskål) C. Agardh
Total	13 families	21 algal species (21 algal genera)

A total of nine species marine red algal species (47.62%) were recorded at the present study area of Sert coasts and tabulated in Table 1 with special reference to Corallinaceae and Rhodomelaceae families. The recorded red algal species were quite differ than the western Libyan coasts like Tukra coast (38 species) and Tolmeta coasts (13 species) recorded by Said and Godeh, (2008) and Said, et al., (2010), respectively. But more than those recorded at Derna and Susa (just 5 and 6 species,

respectively) by Said, et al., (2010) and those of Tobruk coast (16 species) which recorded by Godeh, et al., (2009).

The result was quite quantitatively differing to South Aegean Sea (Greece) which qualitatively dominated by 60 red algal taxa (Diapoulis and Tsiamis, 2007). Klein and Verlaque, (2007) identified 125 Rhodophytes at invaded Bay of Marseilles (France, NW Mediterranean) and Tsiamis et al., (2007) were studied 95 Rhodophytes on rocky shores of Rhodes Island (Greece). Cinelli, et al., (2007) recorded 62 species or Rhodophyta along the Tuscany coast in north-western Mediterranean Sea.

R/P ratio of Sert coasts was 1.67 which less than the mean value of Tunisian coasts (2.99) and all Mediterranean coasts which ranged between 2.0 and 3.8 (Ben Maiz, et. al., 1987).

Although some good indicators algae were recorded, one could conclude that the study area is relatively poor of marine algae and polluted according to Wilhm, (1975) who reported that, the decrease in number of species and increase in number of individuals is a characteristic feature of polluted water. This may be also due to the sandy nature of Sert coasts and differences of sampling programs. Many other factors like continuous distribution of invasive species from many places of the world also affected (Klein and Verlaque, 2007 and many recent reports).

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