IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT)
e-ISSN: 2319-2402,p- ISSN: 2319-2399.Volume 12, Issue 12 Ver. I (December. 2018), PP 37-41
www.iosrjournals.org

Collection and definition of freshwater algae in City of Shahat-Libya

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Abstract
The present work was intended for collection, isolation, identification and classification of some freshwater algae. It was implemented with irregular visits during spring and summer 2017 from some sites in the City of Shahat, Libya. A total of 39 species of algae was recorded in the study area. Our results were found, sixteen species (41.03%) belongs to Chlorophyta (13 families), seven species (17.95%) owned to Cyanophyta (4 families), fifteen species (38.46%) belong to Bacillariophyta (12 families) and one species (2.56%) belong to Charophyta. Most of the species were Chlorophyta, followed by Bacillariophyta, a few species of Cyanophyta. It was also noted the large abundance of Chara alga during the spring and summer. This may refer to climate change such as temperature and rainfall.

Keywords: *Chlorophyta, Bacillariophyta, Cyanophyta, isolation, freshwater*

Date of Submission: 29-11-2018 Date of acceptance: 12-12-2018

I. Introduction

The term "algae" refers to a highly diverse group of eukaryotic organisms, mostly containing chlorophyll, which are either cultivated or wild harvested, originating from various aquatic environments. Algae is recognized as one of the oldest life-forms. Between 40,000 and 100,000 species of algae have been identified so far, though that number might even underestimate the actual number[1,2 and3].The importance of biological algae is that it represents the first link in the food chain as algae play an important role in the supply of oxygen to the water source [4]. There are several factors that affect the distribution of algae in open water is the most important of these factors and natural illumination intensity as some algae found in the surface layer up to 5 meters down and called this region (Photic-zone) [5].Conditions in lakes and rivers vary not only in salinity, but also in size, depth, transparency, nutrient conditions, pH, pollution, and many other important factors. Aquatic ecologists also use the term "inland" waters to encompass a greater range of aquatic ecosystems. Even this term may be unsatisfactory, because algae occupies many other habitats, such as snow, soils, cave walls, and symbiotic associations [6].

The study of surface algae (phytoplankton) is a mirror that reflects the chemical and physical structure and changes in water from time to time [7]. So algae are used as a function of water purity or contamination [8]. Because algae is the first organism to be directly exposed to any pollution in water [9]. The source of water is more pure if it contains the highest diversity of algae and less algae density [10].

Several factors influence the distribution of algae in lakes. The most important of these natural factors are light intensity [5].The other influential factor is heat, where green algae are found to prefer a temperature of 10-15 and Bacillaroiphyta prefer temperatures a15-20 ° C while blue-green algae predominates at temperatures of 25-35 ° C[11 and 12].There is also a negative relationship between most algae and temperature except blue-green algae. In the winter, [13] indicated that both light and temperature were the determinants of the distribution and diversity of algae in a lake. Freshwater algae are globally ubiquitous and highly diverse, with tens or perhaps hundreds of thousands of species, in a myriad of forms and sizes [14, 15, 16 and 17].The aim of this work was dinged to isolate and define freshwater algae during two seasons (spring and summer) in Shahat City-Libya.

II. Material and Methods

The Study area:

Shahat City(Cyrene): its geographical location and main morphometric characteristics were illustrated in Figure (1). It lies at 32° 49′ 30″ N and 21° 51′ 29″ Eat north-eastern Libya. Shahat is a town in the District of Jabal al Akhdar. It is located 24 kilometers in the east of El-Beyda City. Temperatures in the study area are range from 20 – 28° C in a couple seasons (spring and summer)

Figure. 1. Map illustrated north of Libya and the study area

Sampling and sample preparations:

Specimens were collected through regular visits during a couple of season's spring and summer 2017 and samples bring to the laboratory in plastic Gallons 5 liter. During four hours, sedimentation was performed by a deposition sampling process. In these process samples was put in the laboratories listed capacity of 1 liter and left for three days until the precipitate complete, and then pull the upper part of the sample until the volume up to 50 ml. Reservation samples was take place in flasks conical for the purpose of examination, counting and agriculture.

Isolation and cultivation of algae:

The collected algae was grown in three media for the development of algae as following:

- [18]: (NaNO3 1.5G/L, K2HPO40.04g/l, MgSO4.7H2O 0.075g/l, CaCl2.2H2O 0.036g/l, Citric acid 0.006g/l, Ferric ammonium citrate 0.006 g/l, EDTA (disodium-salt) 0.001g/l, Na2CO3 0.02 g/l, Micronutrient solution 1ml, Distilled water One liter): This medium was used to isolate the Cyanophyta.
- [19]: (Ca(NO3)2 0.04g/l, K2HPO4, 0.01g/l,MgSO4.7H2O 0.025g/l , Na2CO30.02g/l, Na2SiO3.5H2O 0.025g/l, FeCl30.0008g/l.).This medium was used to isolate Chlorophyta.
- [20]: (NaNO3g/l, CaCl2. 2H2O 1g/l, MgSO4.7H2O 3g/l, K2HPO43g/l, KH2PO47g/l, NaCl 1g/l To 490 ml distilled water). This media was used to isolate the Bacillariophyta .These components harden when you add 15 grams of agar per liter and sterilized by the sterilizer model .Osprey70L Unit-Program Autoclave J 8051Jdot. By adding 10 ml of each stock solution and 1 ml of each of the stock trace-element solution which prepared as follows:

1. 50g EDTA and 31g KOH dissolved in 1 liter of acidified water (or 50g Na2EDTA).
2. 4.98g FeSO4.7H2O dissolved in 1 liter of acidified water (1ml conc. H2SO4 in 1 liter of distilled water).
3. 11.42g H3BO3 dissolved in 1 liter of distilled water.
4. 8.82g ZnSO4.7H2O; 1.44g MnCl2.4H2O; 1.57g CuSO4.5H2O and 0.49g Co (NO3)2.6H2O were dissolved in one liter of distilled water.

The cultivation of algae has been to take 1 ml of the sample and grown in Petri dishes (Petri-dishes) contain three types of media previously mentioned in a sterile place beside the flame and shall move the dishes in a circular motion to ensure the spread of the sample and placed in a growth chamber Growth Chamber. This is the cultivation of three replicates of each sample at room temperature and under 25 M◦ lighting 4000LUX appreciation was connected LX101LUXMeter.

Identification of algae:

The definition of algae was done by making slices from each sample and examining them with light microscopy, including the shape of thallus, the nature of the cell wall, the pigment, flagella, the nature of the food saved and the size of algae. Cell-Volume on these foundations were divided into rows, ranks, families, races and species using special keys to identify freshwater algae contained in references [21,22 , 23and 24).

III. Results and discussion

Table (1) and Figure (2) were listed and identified thirty nine freshwater algal species which found in the study area (Shahat City(Cyrene) through spring and summer. Sixteen species (41.02%) belongs to Chlorophyta (13 families), of which seven species (17.95%) were owned by Cyanophyta (4 families), Fifteen species (38.46%) belong to Bacillariophyta (12 families) and one species (2.56%) belong to Charophyta**.**

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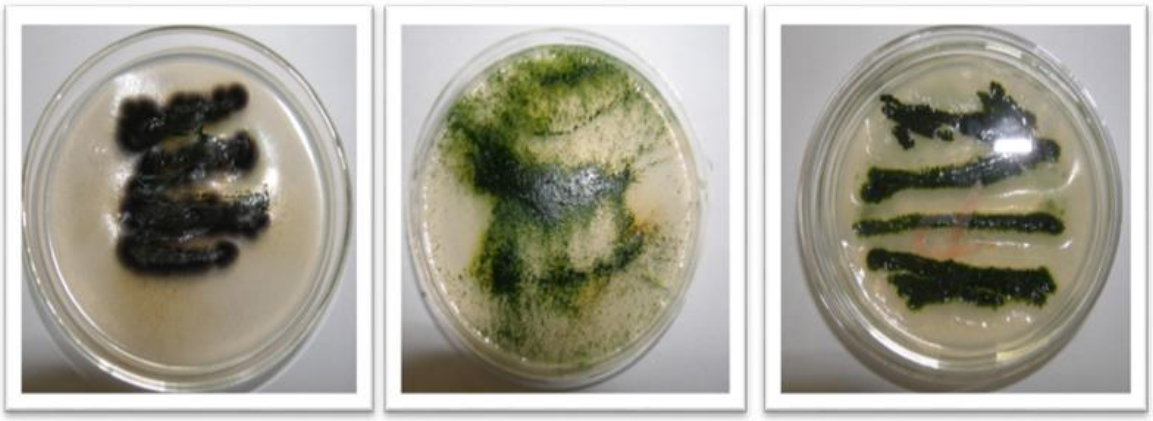

Figure 2: Some pure culture algae isolates in Petri dishes

Table 1. List of identified freshwater algae at City of Shahat- Libya

Division	Family	Algea
Chlorophyta (13 families& 16 species)	Selenastraceae	*Ankistrodesmus falcatus*
	Chlorellaceae	*Chlorella vulgaris* *Closteriopsis Micractinium*
	Chlorococcaceae	*Chloroccum humicola*
	Chlamydomonadaceae	*chlamydomonas reinhardtii*
	Closteriaceae	*Closterium* sp
	Desmidiaceae	*Cosmarium* sp
	Oedogoniaceae	*Oedogonium* sp
	Volvocaceae	*Pandorina* sp
	Hydrodictyaceae	*Pediastrum* sp
	Scenedesmaceae	*Scenedesmus acuminatus*
	Zygnemataceae	*Spirogyra* sp *Zygnema* sp *Zygonium* sp
	Ulotrichaceae	*Ulothrix* sp
	Cladophoraceae	*Cladophora glomerata*
Cyanophyta (Cyanobacteria) (5 families&7species)	Nostocaceae	*Ananbaena circinalis*
	Microcystaceae	*Gloeocapsa* sp *Microcystis* sp
	Oscillatoriaceae	*Oscillatoria tenuis* *Lyngbya* sp
	Phormidiaceae	*phormidium favosum*
	Rivulariaceae	*Rivularia globiceps*
Charophyta (1family& 1species)	Characeae	*Chara globularis*
Bacillariophyta (12 families&15species)	Coscinodiscaceae	*Melosira* sp
	Catenulaceae	*Amphora* sp
	Nitzschiaceae	*Nitzichia palea* *Hantzschia* sp
	Pinnulariaceae	*pinnularia lata*
	Naviculaceae	*Naviculamutica* *Navicula lanceolata*
	Achnanthaceae	*Achananthes* sp

	Amphipleuraceae	*Amphipleura* sp
	Fragilariaceae	*Asterionella* sp *Synedra* sp
	Stephanodiscaceae	*Cyclotella* sp
	Tabellariaceae	*Diatoma* sp
	Suirellaceae	*Surirella* sp
	Thalassiosiraceae	*Stephanodiscus* sp
Total	**30 Families**	**39 algal species**

IV. Results and discussion

Table (1) and Figure (1) listed the collected and identified thirty nine freshwater algal species which found in the study area (Shahat City(Cyrene) through spring and summer. Most of the isolated species of fresh water in the study area were from green algae followed by Bacillariophyta, It was noted that there are few species of blue green algae and also observed the abundant growth of *Chara* algae, and most species were available during the summer more than spring. In general, green algae are widespread in inland habitats, but certain groups may have specific ecological requirements. For example, flagellated Chlorophytes tend to be more abundant in standing waters that are nutrient rich. Coccoid unicells and colonies are common in the plankton of standing waters and slowly moving rivers when nutrients, light, and temperature are reasonably high. The majority of filamentous and plantlike Chlorophyta are attached to hard surfaces in standing or flowing water, but some are free-floating or colonize soils or other sub aerial habitats. Some of these species are quite tolerant of desiccation stress [25]. The variance in algal counts is due to the primary role of physical and chemical factors in water and to explaining the seasonal changes in any freshwater source that must be taken into account. Evaporation of ions and cations in the water, algae degradation and use of other microorganisms, precipitation factor and wind blowing because of their role in transport spray salts and carry some algal deposits. Many scientists have explained seasonal changes in physical, chemical and biological changes, wind velocity in open spaces, dissolved oxygen, light and indoor ventilation[26, 27 and28]. This was consequence with our observation during this study in spring and summer. In addition to the physical and chemical factors that influence the distribution of algae and their diversity in water sources, there is a biological factor that cannot be neglected. It is the competition between algae and some of the food or different excretions of algae (toxins - nitrogen substances - growth regulators), as well as grazing from primary animals Protozoa [29, 30, 31and27].Chemical agents also play an important role in the distribution of algae, a nutrient group present in the aquatic environment of algae living in fresh water where algae needs a carbon element in the form of CO2 as in photosynthesis as nitrogen is necessary for all elements of metabolism of algae and most algae in surface water where the nitrogen ratio of 0.3-8.7 mg / l. [7].Another important factor anagricultural discharges, whether directly to the water source or through the rain, are often loaded with many pesticides and agricultural fertilizers. When these wastes are deposited into the water source, they stimulate the growth of certain algae species and inhibit the growth of the other. This is the cycle that changes the composition of the algae flora. Therefore, the food chain is affected. When the above-mentioned wastes increase, a certain type of algae, which is resistant to contamination, is water-resistant, and changes the color and taste of water [32, 33 and34]. That the studies conducted on the Nile River in Egypt, related to algae indicated the increase of pollution year after year and that the algal bloom has been strongly affected in the last ten years by factories and others [35, 36 and10].Therefore, through the emergence of variability in the algae population in this study it is likely to be due to physical and chemical factors.

V. Conclusion

We can concluded the occurrence of species reflected to climate, physical and chemical factors and purity of water ,where the high diversity of algae indicate to the purity of water specially green algae. On another hand a few number of Caynobacteria also considers indicator to low pollution with organic matter.

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Hamida. EL. Elsalhin. "Collection and definition of freshwater algae in City of Shahat-Libya." IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT) 12.12 (2018): 37-41.