ISSN: 0067-2904
GIF: 0.851

Seasonal Variation of Phytoplankton in AL-Diwaniya River

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Abstract

This study was conducted from January to October 2014, the samples were collected monthly from four stations in AL-Diwaniya River at AL-Diwaniya city. Phytoplankton species which are diagnosed during study period are (506) and the numbers of common types in four sites are (61). Bacillariophyceae is dominate on other classes and Chlorophyceae, Cyanophyceae, Dinophyceae then Chrysophyceae and Euglenophyceae. The study shows that there are (150), (144), (118) and (94) species in the first, second, third and fourth sites. The species that have highs numbers are (*Achnanthes, Cymbella, Nitzschia, Navicula*). Other types are dominant in their existence and number during study period (*Cycltella comta, Cylotella Ocellata, Cycletella meneghiniana, Cyleotella Kutzingana, Pediastrum somplex, Diatoma elongatum and Cocconeis Placentula*) During the study period, there are seasonal and site changes in total number of phytoplankton which ranged between (440.61-2994.3 cell×10^3/L).

Keywords: Water importent, Phytoplankton, Ecological factors.

التغيرات الفصلية للهائمات النباتية في نهر الديوانية/العراق

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الخلاصة:

أجريت الدراسة الحالية ابتداءاً من شهر كانون الثاني ولغاية تشرين الاول 2014، اذ تم جمع النماذج كل شهر من اربع محطات في نهر الديوانية ضمن مدينة الديوانية . بلغ عدد أنواع الهائمات النباتية المسجلة خلال الدراسة (506) نوع وكان عدد الأنواع الشائعه بين المواقع (61) نوعاً، أظهر صنف الدايتومات السيادة التامة على باقي الأصناف تليها الطحالب الخضر ثم الخضر المزرقة ثم البرويه ثم الذهبية و اليوغلينية. كما أظهرت الدراسة وجود (150) و (144) و (118) و (94) نوعاً في المواقع الأول والثاني والثالث و الرابع على التوالي، أما الأجناس التي تميزت بعدد أعلى من الأنواع فكانت هي:

(*Achnanthes* sp. و *Cymbell* sp. و *Navicula* sp. و *Nitzschia* sp.) و كما سجلت بعض الأنواع السيادة بتواجدها وإعدادها الكلية في جميع المواقع طيلة مدة الدراسة:

(*Cyclotella comta*, *Cyclotella kutzingana*, *Cyclotella meneghinana*, *Cyclotella ocellata*, *Pediastrum simplex*, *Diatama elongatum*, *Cocconeis placentula*) لوحظ وجود تغايرات فصلية وموقعية في الأعداد الكلية للهائمات النباتية خلال مدة الدراسة إذ تراوح العدد الكلي للهائمات النباتية بين (440.61–2994.3) خلية× 10^3/لتر.

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Introduction

Water is an essential element for all living organism, more than half of living organism body weight consist of water, and all the biological processes cannot be done without the presence of water [1]. The fresh water contain substantial reproducing populations of suspended algae which are importance both ecologically and from the practical aspect of human use [2].

Phytoplankton are micro and macroscopic aquatic plants, occurring as unicellular, colonial or filamentous forms, without any resistance to currents and are free-floating or suspended in the open waters[3]. Phytoplankton composed of both eukaryotic and prokaryotic species [4] Occupies algae of great importance in the aquatic environment as an important factor in determining the feeding level [5]. Ecological factors such as depth, associated with temperature, winds and light penetration are examples of the environmental variables which may influence the phytoplankton structure [6].Diatoms are sensitive to subtle changes or disturbances in the ecosystem that may not be noticeable in other / communities [7]. Less positive incidental effect of water quality improvement is the excessive increase of algal biomass with all its negative impacts for river ecosystem balance [8].The increase of nutrient in the ecosystem case negative effect on the aquatic ecosystem [9].The loading of phosphorus and nitrogen could result in algal blooms, eutrophication and increased aquatic plant growth [10]. Eutrophication causes oxygen depletion, which can be severe enough to kill fishes [11]

Materials and method

Water samples were collected from four stations seasonally beginning from January to October 2014. For all studied sites (Figure -1), the sampling taken began at about 9a.m., and finished at approximately 1 p.m.

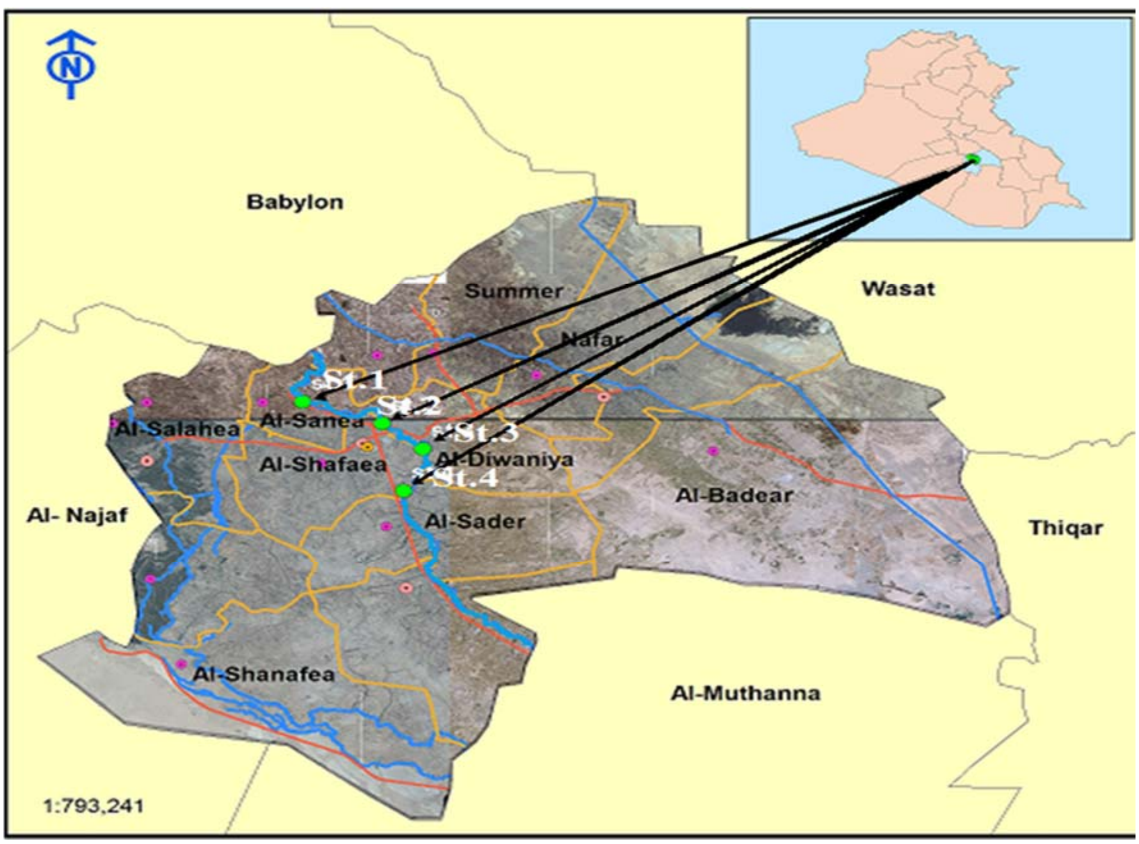

Figure 1- Map of studied stations

Qualitative study and Quantitative study:

Phytoplankton qualitative analysis was accomplished by using the following resources: [12] and [13].

One liter of each sample was placed in one liter Duran cylinder and mixed with Lugol's solution (10ml) which left to settle for 10 days, then concentrated to 100ml by a siphon. The same steps were repeated on 100ml of the concentrated sample, which was placed in 100ml cylinder and left for one week for reduction to 10ml.

Quantitative for diatoms a clean slide was put on a hot plate at 75 - 80°C, a drop 0.05ml of the preserved concentrated sample was placed on the middle of the slide and left to dry, then a drop of concentrated Nitric acid was added to the dried drop and after evaporation of the acid drop, Canada Balsam was placed on a cover slip and cover the dried sample then pressed gently to remove any air bubbles[14]. Haemocytometer slide was used to count the number of algae (non Diatoms) by adding (1-3)drop of concentrated sample after shaking it on the surface of the slide .Then the cover of the slide was put and left out for few minutes to settle the algae and then examined by microscope [15].

Result and Discussion

A total of 506 algal species were identified in all stations, 158 taxa belonged to Bacillariophyceae (17 taxa to Centrales and 141 taxa to Pennales), 27 taxa Cyanophyceae , 36 taxa Chlorophyceae , of the total number of species .Only seven species were identified belonged to Cryptophyceae, Euglenophyceae , and 5 taxa Dinophyceae, (Tabel -1).

Table 1- Numbers of phytoplankton species in the studied stations.

station	Sta.1		Sta.2		Sta.3		Sta.4		No.of sp.
Classes	Genera	Sp.	Genera	Sp.	Genera	Sp.	Genera	Sp.	
Cyanophyceae	12	18	10	15	9	17	8	14	27
Eugleanophyceae	2	2	-	-	2	3	-	-	3
Dinophyceae	2	2	1	2	2	3	2	1	5
Chrysophyceae	3	3	2	2	1	1	2	3	4
Bacillariophyceae									
Centrales	3	9	4	13	3	12	5	11	17
Pennales	21	90	21	98	17	59	20	40	141
Chlorophyceae	11	20	12	20	13	23	11	25	36
Total	54	144	50	150	47	118	48	94 93	506

Genus (*Nitzschia, Navicula, Cymbella, Achnanthes*) which more represented in this study and this agree with [16]. *Cocconaes placentula, Cyclotella ocellata,* Cyclotella menghinana, *cyclotella comta, Cyclotella kuetzingiana ,Diatoma elongatum* when presented more frequently in all study stations because,they are tolerance to environment factors (such as tempreture and nutrient decrease) more than other species, and this species live in alkalin water [16], this species represent in AL-Diwaniya River because the river water was alkalinity[17].

Bacillariophyceae group were dominant according to the total number of species in all stations, the second group of dominant algae was Chlorophyceae follwoed by cyanophyceae(Tabel -2).

Table 2- List of phytoplankton species in studied stations during study period. **(+)** Presence, **(-)**Absence

TAXA	**Station 1**	**Station 2**	**Station 3**	**Station 4**
Cyanophyceae				
Acanathosphaeria zachariasi **Lemmerman**	-	+	+	-
Anabaena aequalis **Borge**	+	+	-	-
Aphanocapsa rivularis **(Garm.) Rabenhorts**	-	+	-	+
Chroococcus dispersus **(keisal) Lemmermann**	+	-	+	+
C. limneticus **Lemmermann**	-	+	+	-
Lyngbya aestuarii **Leibmann**	+	-	-	+
L. limnetica **Lemmermann**	+	+	-	+
Merismopedia elegans **A. Braun**	+	+	+	-
M. glauca (Ehr.) **Naegeli**	+	+	-	+
M. punctata **Meyen**	-	-	+	-
Microcystis aeruginosa **Kuetzing**	+	+	+	+

Oscillatoria anguina **(Bory) Gomont**	-	-	+	+
Dinophyceae				
Ceratum sp.	-	+	+	+
Glenodinium sp	-	+	-	-
Chrycophyceae				
Chrysocapsa paludosa	+	+	-	-
Bacillariophyceae				
Centrales				
Aulacoseira ambigua **O.Muller**	+	+	+	+
A. distans (Ehr.) **Kuetzing**	+	-	+	-
A. roeseana Rabenhorst	-	-	+	+
Coscinodiscus lacustrs **Grunow**	+	-	+	+
Cyclotella comta (Ehr.) **Kuetzing**	+	+	+	-
Pennales				
Achnanthes affinis **Grunow**	+	+	-	+
Amphora normanni **Rab.**	+	-	-	-
Bacillaria paxilifer (Muell.) **Hendey**	+	-	-	+
Cocconeis diminuta **Pantocsek**	+	+	-	+
C. placentula Var. lineata **(Ehr.) Cleve**	+	+	-	-
Cymatopleura elliptica (Breb) **W. Smith**	+	+	+	-
Cymbella affinis **Kuetzing**	+	+	-	+
C. amphicephala **Naegeli**	-	+	+	+
Denticula elegans **Kutz.**	+	-	-	-
Diatoma elongatum (lyngb) **Agardh**	+	+	+	+
Diploneis ovalis (Hilse) **Cleve**	+	+	+	+
D. smithii (Breb.) **Cleve**	+	+	-	-
Epithemia argus (Ehr.) **Kutezing**	-	+	+	+
Eunotia arcus **Ehrenberg**	+	-	-	+
E. formica **Ehrenber**	-	+	-	-
E. pectinalis **Ralfs**	+	+	+	-
E. tenella (Grun.) **Hust.**	+	+	+	+
Fragilaria brevistriata **Grounw**	+	+	-	-
Frustulia creazburgensis **(Krasske) Hustedt**	-	+	-	-
Gomphonema olivacea(Lyngbye) Dawson **Ehrenberg**	+	-	-	+
Gyrosigma acuminatum (**Ktz.) Robenhorst**	+	+	+	+
Mastogloia apiculata **W. Smith**	-	+	-	-
Mastogloia smithii Thw. ex **W. Smith**	+	+	-	+
Navicula americana **(Ehr.)**	+	-	-	+
Pinnularia appendiculata **(Ag.) Cleve**	-	-	+	-
Rhoicosphenia curvata **(Ktz.) Grunow)**	-	-	+	-
Surirella capronii de Brebiss on **ex Ktz**	+	-	-	-
S. ulna Var. oxyrhynchus **(Ktz) van Heurck**	-	+	-	-
Chlorophyceae				
Actinastrum gracilimum **G. M.Smith**	+	-	-	-
Ankistrodesmus convolutus **Corda**	+	+	-	-
Chlamydomonas sp	-	+	+	-
Chlorella ellipsoidea **Gerneck**	+	-	-	-
Coelastrum cambricum **Archer**	+	+	+	+
Crucigenia quadrata **Morren**	-	-	+	+

Echinosphaerella limnetica **G. M. Smith**	+	-	-	+
Pediastrum boryanum **Meneghini**	-	-	+	-
Scenedesmus abundans **(Kirch.)** Chodat	+	-	-	-
Spirogyra crassa **Kuetzing**	+	-	+	-
Tetraedrom minimum **(A. Branum)** Hansgirg	+	+	+	+

Quantitative study showed that the highest density of phytoplankton was obtained during summer and spring 2014 , while lower densities were observed in autumn and winter 2014 (Figure -2),this may be to decomposer activation during summer that analysis complex organic material and convered to simple organic material and this final use by algae, and then water blooming occur[18].

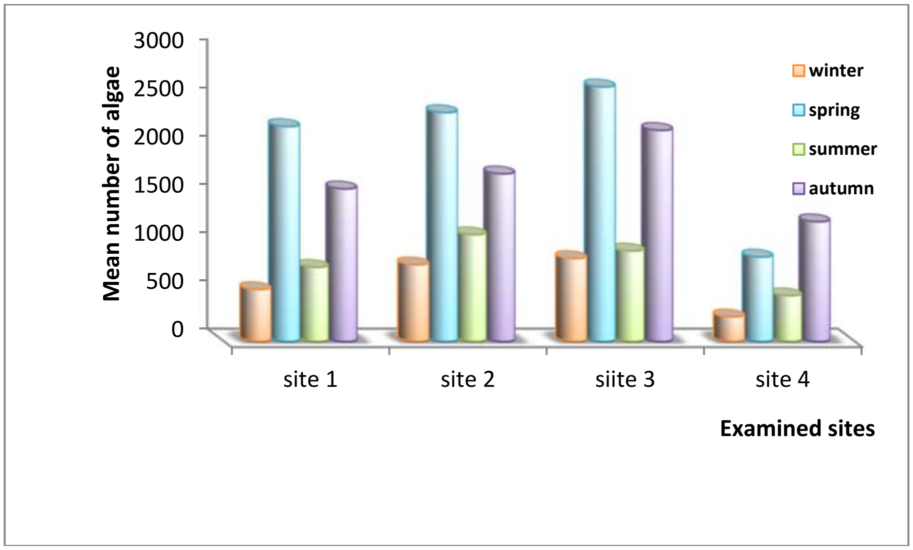

Figure 2-Mean number of algae values of water samples of AL-Diwaniya river during study period.

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