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Screening of Epiphytic Algae on the Aquatic Plant *Phragmites australis* inhabiting Tigris River in Al-Jadria Site, Baghdad, Iraq

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Abstract:

The present work included qualitative study of epiphytic algae on dead and living stems, leaves of the aquatic plant *Phragmitesaustralis* Trin ex Stand, in Tigris River in AL- Jadria Site in Baghdad during Autumn 2014, Winter 2015, Spring 2015, and Summer 2015. The physical and chemical parameters of River's water were studied (water temperature, pH, electric conductivity, Salinity, TSS, TDS, turbidity, light intensity, dissolve oxygen, BOD_5, alkalinity, total hardness, calcium, magnesium and plant nutrient). A total of 142 isolates of epiphytic algae were identified. Diatoms were dominant by 117 isolates followed by Cyanobacteria (13isolates), Chlorophyta (11 isolates) and Rhodophyta (1 isolate), Variations in the isolates number were recorded on different parts of macrophyte host as well as, indifferent seasons. Eight new algal isolates (*Achnanthesexigue* var. *heterovalvata* Krasske, *Navicula exilissima* Grunow, *Navicula falaisiensis* var *lanceola* Grunow, *Navicula microcephalo* Grunow, *Pleurosigma obscurum* W. Smith, *Stauroneis amphioxys* var. amphioxys Gregory, *Stenopterobia intermedia* Lewis and *Audouinella hermannii* Roth).were identified as new records.

Key words: Epiphytic Algae, *Phragmites australis*, Tigris River.

Introduction

Epiphytic algae are living organisms attached to aquatic plants and acting as aprimary producers of food chain in aquatic ecosystem and as natural food for herbivorous zooplanktons and fish [1]. Aquatic plants acts a key ecological role by providing shelter, substrate, nutrient source for epiphytic algae which are dominants isolates in lotic system. increased growth of epiphytic algae may inhibit growth and reproduction of aquatic plants [2]. Biomass of epiphytic algae may be affected by different factors as macrophyte architecture, water depth, seasonal changes, light intensity, pH, temperature and abundance of macrophytes [3]. Many studies were interested in epiphytic algae as [4] who studied the epiphytic algae on different macrophytic hosts and their relationship with physical and chemical factors. In Iraq, the epiphytic algae were investigated in different aquatic systems including Tigris River [5, 6], Euphrates River [7, 8] and Shatt

AL-Arab River [9]. This study aims to screen the epiphytic algal composition on the aquatic plant *Phragmites australis* in Tigris River at AL-Jadria Site in Baghdad.

Materials and Methods:

The current study was carried out during the period from October 2014 (Autumn) to June 2015 (Summer). Physical and chemical characteristics of Tigris River's water were determined according to the methods reported by APHA[10]. The composition of epiphytic algae was investigated on living and dead parts of *Phragmites australis*(stem and leaf) in Tigris River at AL-Jadria Site. Samples were collected seasonally from four different parts of plant and were placed in polyethylene box and then all samples were cut into small pieces and kept in 50 ml distilled water. Shaking and scrubbing methods were used to separate epiphytic algae from their host [11]. The epiphytic algae isolates were conserved with 1 ml Lugols iodine solution for 10- 15 days to sediment the samples and concentrated for counting [12]. The micro transect method was used to count the diatoms and the hemocytometer method for non-diatomic algae[13]. The identification of epiphytic algal isolates was performed according to well known specialized references [14-23].

Results and Discussion:

Physico-chemical water characteristics were illustrated in Table 1, where distinct seasonal variations in all parameters were recorded.

Table (1) Physico-chemical characteristics of Tigris River's water during study seasons (2014-2015)

Properties	Autumn 2014	Winter 2015	Spring 2015	Summer 2015
Air Temperature(C^0)	20- 24 22± 2.8	16- 20 17.7± 2.08	23- 25 24± 1.4	36- 40 38± 2.8
Water Temperature(C^0)	17- 21 19±2.7	12- 16 14± 2	19-22 20.5± 1.58	29- 33 31± 2.5
Dissolved Oxygen(mg/L)	8- 8.6 8.3±0.42	6.5- 8.3 7.2±0.93	6- 6.4 6.2± 0.28	5- 5.8 5.4±0.56
Biochemical Oxygen Demand(mg/L)	2.7- 4.5 3.6 ± 1.2	1.6- 4.9 2.7± 1.8	3.4-3.8 3.6± 0.28	0.8- 1 0.9± 0.14
pH	7.6- 8 7.8±0.2	7.1-8.2 7.7± 0.57	7.8- 8 7.9 ±0.14	7.9- 8.3 8.1± 0.27
Total dissolved solid (mg/L)	234-266 250± 22.6	325-665 495± 24.0	400-465 432.5± 45.9	300-340 320± 28.2
Total suspended Solid (mg/L)	127-56 91.5± 50.2	24-49 38.6± 10.6	26-62 44± 25	53-67 60± 9.8
Electric Conductivity(µs/cm)	480-510 495± 21.2	350-700 570± 191.5	850-870 860± 14.4	590-650 620± 42
Salinity %	0.292-0.311 0.3± 0.013	0.210-0.431 0.349± 0.12	0.526-0.538 0.532± 0.008	0.370-0.390 0.380± 0.014
Turbidity	122-53 87±48.7	23-47 37± 12.4	25-69 47± 31.1	42-64 53± 15.5
Light intensity(cm)	20-48 34± 19.7	37-101 65.3± 32.6	80-92 86± 8.48	39-43 41± 2.82
Alkalinity(mgCaCO3/1)	120-240 180± 84.8	90-200 150± 55.6	149-210 179± 43.1	150-190 170± 28.2
Total hardness	248-384 316± 96.1	230-527 372± 148.8	330-399 364.5± 34.5	110-130 120± 14.1
Calcium(mg/L)	70-103.2 86.2± 23.7	84.1- 115.1 97.4± 16.09	62.7-68.4 65.5± 2.8	36.2-40.5 38.3± 24
Magnesium (mg/L)	50.5-83.6 67.5± 23.3	35.4-88.7 61.3± 26.6	22.2-25.7 23.9± 2.4	11.5-17.4 14.5± 4.2
Reactive Silicate SiO_3 (mg/L)	3-3.3 3.15± 0.2	2.9-3.3 3.1± 0.28	2.3-3.1 2.7± 0.56	2.8-3.2 3± 0.28
Total phosphate (mg/L)	0.569-0.897 0.73± 0.22	0.195-0.832 0.47± 0.32	0.195-0.22 0.2± 0.06	0.9- 0.32 0.12± 0.8

Mean ±SD

The results of qualitative study of epiphytic algae on different parts of *Phragmites australis* were illustrated in Tables (2,3),Figures (1-2) and Plate (1-3).

Table (2) List of epiphytic algae isolates recognized on different part of *Phragmites australis* inhabiting Tigris River's water on Al-Jadria Site during study seasons (2014-2015)

Phragmitesaustralis / Taxa	Autumn				Winter				Spring				Summer			
	L.S	D.S	L.L	D.L	L.S	D.S	L.L	D.L	L.S	D.S	L.L	D.L	L.S	D.S	L.L	D.L
CYANOPHYCEAE																
Anabaena sp.	+	+	+		+		+		+	+	+	+	+	+		
Aphanocapsa sp.	+				+		+		+	+	+	+		+	+	
*Merismopediaconvulata*de Brebisson		+		+					+	+	+	+	+		+	+
Nostoc sp.	+		+			+		+	+	+		+	+	+		
*Oscillatorialimentica*Lemmermann	+	+	+		+	+			+	+	+	+	+	+		+
O. limosa(Roth.) Agardh		+	+	+	+			+	+	+	+			+		
*O. princeps*Vaucher	+	+		+	+		+		+	+	+		+	+	+	
O. tenuisAgardh	+	+	+		+	+			+	+	+	+	+		+	+
*Phormidiumtenue*Gomont	+	+	+	+		+	+	+	+	+	+	+	+	+		+
*SpirulinaLaxa*G.M.Smith	+				+				+		+		+		+	+
S. majar(Witter.) Küetzing	+	+		+	+			+	+	+	+	+		+	+	
*S. nordstedtii*Goment	+		+	+			+		+	+	+	+	+	+		+
*S. subsalsa*Oersted	+		+			+			+	+	+	+	+		+	+
CHLOROPHYCEAE																
Actinastrumgracilimum G.M. Smith		+							+	+				+	+	+
Cladophoraglomerata (L.) Küetzing	+	+			+	+			+	+			+	+		
*Coelastrummicroporum*Naegeli		+		+					+	+			+		+	
*Coleochaetepulvinata*A. Braunin						+				+						
*Mougeotiascalaris*Hassal	+	+								+				+		
*Ooedogonium*sp.	+	+	+	+	+	+			+	+	+	+		+	+	+
*Oocystiselliptica*West			+		+				+			+		+		+
*O. solitaria*Wittrock	+		+	+				+	+		+	+	+	+		
Pediastrumboryanum(Turp.) Lagerheim			+		+					+		+	+			+
Scenedesmusbijuga(Trup.) Chodat	+	+		+					+	+	+	+	+	+		
S. quadricauda (Trup.) de Brebisson	+	+		+		+					+	+		+	+	+
BACILLARIOPHYCEAE																
A- CENTRALES																
*Coscinodiscuslacustris*Grunow	+	+	+	+				+	+	+	+		+	+	+	
Cyclotellacatenata(A. Braun.) Bachmann	+	+							+	+	+	+	+	+	+	+
*C. Comensis*Grun*ow*	+	+				+					+	+	+	+	+	
*C. Meneghiniana*Kützing	+	+		+	+	+				+			+	+	+	+
*C. ocellata*Pantocsek	+	+	+			+			+	+	+	+		+	+	
C. Operculata(A.C.Ag.) Kützing		+		+	+	+			+	+				+	+	
Melosira granulate(Ehr.) Ralfs		+		+		+			+	+			+		+	
M. Italica (Ehr.) Kütz	+	+		+		+			+	+		+		+	+	+
*M. Roesana*Rabenhorst		+							+	+			+			+
*M. varians*Agardh		+		+		+			+	+	+		+	+	+	
B-PENNALES																
*Achnantheseffinis*Grun*ow*	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
***A.exigue*var.*heterovalvata*Krasske**	+	+							+	+		+			+	
*A. microcephala*Kützing		+		+	+				+	+		+		+		+
*A. minutissima*Kützing	+				+					+					+	+
Amphiporapaludosa w. Smith		+							+	+						
Amphora commutate Grunow		+		+	+				+	+	+	+	+	+	+	+
*A. Normani*Rabenhorst			+						+	+		+	+			
*Bacillariapaxillifer*Gmelin	+	+		+	+	+			+	+	+	+	+	+	+	+
Centronellareichelteii Voigt	+								+	+						
Caloneis amphisbaena (Bory.) Cleve		+								+				+		
*Cocconeispediculus*Ehernberg	+				+		+		+	+		+	+	+		
*C. Placentula*Ehernberg	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
C. Placentula var. euglypta(Ehr.) Cleve	+	+	+	+	+	+	+		+	+			+	+	+	+
C. Placentula var. lineata(Ehr.) Cleve	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+
Cymatopleurasolea(Breb.) W.Smith	+		+		+	+			+	+	+	+		+		+
Cymbella affinis Kützing	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+
C. Cistula(Hemp.) Grun*ow*	+	+				+			+	+	+			+		
C. Cymbeformis(Kütz) Van. Heurck	+	+	+	+		+	+		+	+	+	+	+	+	+	+
C. gracilis(Rabh.) Cleve									+				+	+		
C. lanceolata(Ehr.) Van. Heurck	+	+		+	+			+	+	+	+	+	+	+	+	+

Phragmitesaustralis / Taxa	Autumn				Winter				Spring				Summer			
	L.S	D.S	L.L	D.L	L.S	D.S	L.L	D.L	L.S	D.S	L.L	D.L	L.S	D.S	L.L	D.L
C. obtusiuscula(Kütz.) Grun*ow*	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+
C. parva(W.Sm.) Cleve		+							+	+			+	+	+	+
*C. prostrate (*Berk.) Cleve	+	+		+	+		+		+	+	+	+	+	+	+	+
C. tumida(Berb.) Van. Heurch	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
*C. tumidula*Grunow	+					+			+	+	+	+	+	+	+	+
*C. turgida (*Greg.) Cleve	+	+		+					+	+	+	+	+	+		
*C. ventricosa*Kützing	+	+	+	+	+	+		+		+		+	+	+	+	+
Diatomaanceps(Ehr.) Grunow	+	+		+	+	+			+	+	+	+		+		
*D. vulgare*Bory	+	+		+	+	+		+	+	+	+	+	+	+	+	+
*D. vulgare*var.*berve*Grunow					+	+		+	+	+		+				+
*D. vulgare*var. *producta*Grunow		+				+			+	+		+	+	+		
Diploneiselliptica(Kütz.) Cleve	+			+		+	+					+				
D. puella(Schum.) Cleve	+	+			+	+	+				+	+	+	+	+	
D. ovalis var. *oblongella* Naegeli						+	+	+				+				
Fragilaria sp.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
F. capucina Desmazieres			+			+	+		+	+			+	+		
Gomphonema constrictum var. *capitata*(Ehr.) Cleve	+	+		+		+	+		+	+	+	+	+	+	+	+
*G. angustatum (*Kütz.) Rabenhorst	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+
G. angustatum var. *producta* (Ehr.) Grunow	+			+	+	+		+	+	+		+	+	+	+	+
G. olivaceum(Lyng.) Kützing	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+
G. paravalum(Kütz.) Grunow	+	+		+		+					+	+	+	+		
G. ventricosum Gregory					+			+		+		+		+		
Gyrosigma acuminatum(Kütz.) Rabenhorst		+		+	+		+		+	+	+				+	+
G. spencerii(W.Sm.) Cleve	+				+	+	+	+				+	+	+		
Hantzschia amphioxys Ehernberg									+	+			+	+		
Mastogloia Smithii var. *amphicephala* Grunow	+			+		+	+				+		+	+		
Navicula anglica Ralfs	+	+			+	+			+	+		+		+		
N. cari Ehrenberg	+						+	+	+	+		+	+	+		
*N. cincta*var. *houfleri* Grunow		+		+		+	+	+	+	+	+			+		+
N. cincta(Ehr.)Kützing	+		+	+	+	+	+		+	+	+		+	+		+
N. cryptocephile Kützing	+				+	+	+		+	+	+	+	+	+	+	+
N. cryptocephile var. *excilis* (Kütz) Grunow	+		+		+				+	+	+		+	+	+	
N. cryptocephile var. *veneta* (Kütz) Cleve	+				+			+	+	+		+	+			
***N. exilissima* Grunow**	+	+	+	+	+		+		+	+	+	+	+	+	+	+
N. falaisiensis Grunow	+	+									+			+		
N. falaisiensis var. *lanceola* Grunow		+								+	+			+		
N. gandersheiminsis Krasske	+	+				+					+		+	+		
N. gastrum(Ehr.)Kützing	+						+		+	+			+			
N. gothlandica Grunow		+				+			+	+	+	+	+	+		
N. gracilaides A. Mayer	+	+	+	+		+	+		+	+	+	+	+	+	+	+
N. gregaria Donkin		+				+		+		+	+			+		
N. grimmei Krasske	+	+								+	+		+			
N. Hustedtii Donkin	+	+		+						+	+		+	+		
N. Halophila (Grun.) Cleve	+							+		+				+	+	
N. inflate Donkin	+		+							+		+			+	
N. Lanceolata (A.C.Ag.) Kützing		+		+					+	+	+	+		+		+
N. menisculus Schumann	+				+			+					+	+		
***N. microcephala* Grunow**	+			+					+	+			+	+		
N. minuscula Grunow	+		+		+		+	+	+	+		+	+	+	+	+
N. noth Wallace					+		+		+	+	+	+	+		+	
N. pygmaea Kützing	+		+	+	+					+	+		+		+	
N. radiosa Kützing	+			+		+		+	+	+	+	+	+	+	+	+
N. radiosa var. *tenella* (Breb.) Grunow	+	+								+	+		+	+	+	
*N. rhycocephala*Kützing	+	+		+	+				+	+	+	+	+	+		
*N. salinarum*Grunow	+				+				+		+		+		+	
N. viridula var. *rosiellata*(Kütz.) Cleve				+					+	+			+			
N. Schroeteri Meister	+	+				+		+	+	+	+	+	+	+	+	+
Nitzschiaapiculata(Greg.) Grunow		+	+		+	+	+	+		+		+	+	+		
N. acuta Hantzsch		+							+	+	+			+	+	
N. closterium (Ehr.) W.Smith										+		+	+			+
N. dissipata (Kütz.) Grunow	+				+			+	+	+	+		+		+	
N. frustulum Kützing	+	+	+							+	+					
N. gracilis Hantzsch	+		+		+				+	+	+	+	+	+		+
N. filiformis (W.Sm.) Hustedt		+		+		+			+	+		+	+		+	
N. hungrica Grunow		+			+	+		+	+	+		+	+			
N. Longissima (Breb.) Ralfs				+		+			+	+				+		
N. obtusa W. Smith					+				+	+	+					

Phragmitesaustralis / Taxa	Autumn				Winter				Spring				Summer			
	L.S	D.S	L.L	D.L	L.S	D.S	L.L	D.L	L.S	D.S	L.L	D.L	L.S	D.S	L.L	D.L
N. paleacea Grunow	+			+	+		+	+	+	+	+	+	+	+		
N. recta Hantzsch			+						+		+	+	+	+		
N. sigma (Kütz.) W. Smith	+									+			+			
N. sigmoidea (Ehr.)W. Smith									+					+		
N. spectabilis (Ehr.)	+	+			+				+			+	+	+		
N. vermicularis (Kütz) Grunow	+								+	+			+			
Peronia fibula (Breb&Arn) Ross	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Pinnularia leptosome Grunow	+	+	+		+				+		+	+	+			
P. vriidis (Nitzs.) Ehrenberg									+	+						
Pleurosigmaelongatum W. Smith	+					+	+	+			+		+			
P. obscurum W. Smith		+	+						+	+	+		+	+	+	
Rhicospheniacurvata (Kütz.) Grun	+	+		+	+	+		+	+	+	+	+	+	+	+	
R. marina (W.Sm) M. Schmidt				+					+	+	+	+		+	+	
*Stauroneisanceps*var. ancepsEherberg									+	+						
S. amphioxys Gregory var. amphioxys	+	+	+						+	+	+	+		+	+	
***Stenopterobia intermedia* (Lewis) Brebisson**									+							
Surirellalinearis W. Smith								+	+	+	+	+		+		+
S. linearis var. *constricta* (Ehr.) Grunow						+			+	+	+	+				
S. ovalis Berbisson	+				+		+			+	+		+		+	
S. ovata var. *pinnata*(W. Smith) Hustedt	+								+		+			+	+	
Synedra capitata Ehrenberg					+			+			+					
S. ulna (Nitzs.) Ehrenberg	+	+		+	+	+	+	+	+	+	+	+	+	+		+
RHODOPHYCEAE																
***Audouinell ahermannii*(Roth)**		+														

Present +living stem L.S. Dead stem D. S. living leaf L.L. Dead leaf D.L.

Table (3) Numbers of epiphytic algae on different parts of *P. australis* inhabiting Tigris River at Al-Jadria Site during the study period (2014-2015)

a) Autumn 2014

Phragmite saustralis / Taxa	Living stem		Dead stem		Living leaf		Dead leaf	
	No.	%	No.	%	No.	%	No.	%
Cyanophyceae	11	7.7	9	6.3	8	5.6	6	4.2
Chlorophyceae	6	4.2	7	4.9	4	2.8	5	3.2
Rhodophyceae	-	-	1	1	-	-	-	-
Bacillariophyceae	76	53.6	64	45	30	21	50	32
TOTAL	**93**		**81**		**42**		**61**	

b) Winter 2015

Phragmite saustralis / Taxa	Living stem		Dead stem		Living leaf		Dead leaf	
	No.	%	No.	%	No.	%	No.	%
Cyanophyceae	8	5.6	5	3.5	5	3.5	4	2.8
Chlorophyceae	4	2.8	5	3.5	2	1.4	3	2.1
Rhodophyceae	0	0	0	0	0	0	0	0
Bacillariophyceae	54	38	57	40	34	23.9	30	21
TOTAL	**66**		**68**		**41**		**37**	

c) Spring 2015

Phragmite saustralis / Taxa	Living stem		Dead stem		Living leaf		Dead leaf	
	No.	%	No.	%	No.	%	No.	%
Cyanophyceae	13	9	12	8.2	12	8.2	10	7
Chlorophyceae	7	4.9	8	4.9	4	2.8	6	4.2
Rhodophyceae	0	0	0	0	0	0	0	0
Bacillariophyceae	88	61.9	99	69.7	72	50	76	53.5
TOTAL	**108**		**119**		**88**		**86**	

d) Summer 2015

Phragmite saustralis / Taxa	Living stem		Dead stem		Living leaf		Dead leaf	
	No.	%	No.	%	No.	%	No.	%
Cyanophyceae	10	7	9	6.3	7	4.9	7	4.2
Chlorophyceae	5	3.5	8	5.6	4	2.8	5	3.5
Rhodophyceae	-	-	-	-	-	-	-	-
Bacillariophyceae	82	57	84	59	57	40	42	29
TOTAL	**97**		**101**		**68**		**53**	

A total of 142 taxa of epiphytic algae were identified. Bacillariophyta were dominated by 118 taxa, this was inconformity with many studies[24, 2, 5], followed by Cyanophyta (13 taxa), Chlorophyta (11 taxa) and Rhodophyta (1taxon).

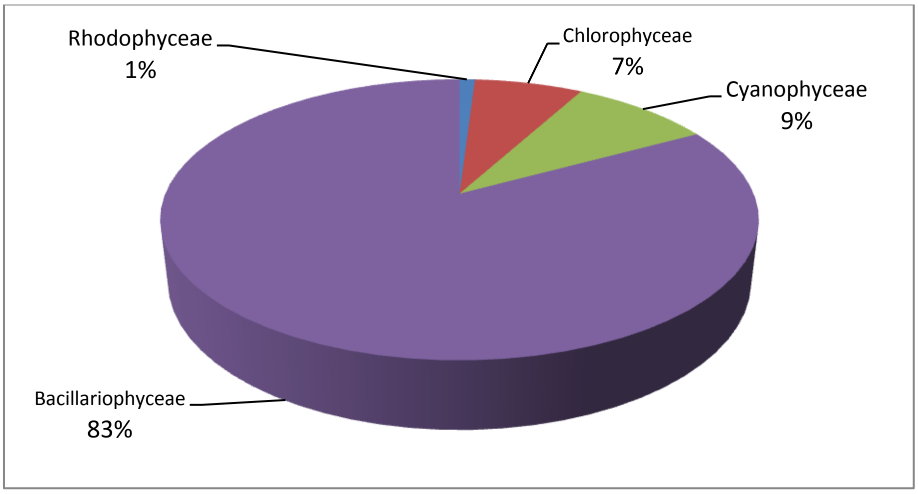


Fig. 1. Percentage of epiphytic algae on different parts of *P. australis* inhabiting Tigris River's water at Al-Jadria site

The obtained results of this study illustrated distinct variations in the total algal isolates grown on the different parts of the plant and in different seasons. The present study recorded the highest number of algal isolatesin spring seasons which significantly enhanced the abundance of all algal divisions [25].This may be due to suitable temperature of the season (20.5 ºC), availability of nutrients and dense growth of macrophyte.

Algae provided a nutrient rich food source to grazing herbivores[26,27] which may cause a decrease in the number of isolates recorded in Summer and Autumn seasons, in addition to the effect of other abiotic factors.

Numbers of epiphytic algae isolate were decreased in Winter, which may be due to low temperature (14 ºC) and light intensity of this season in addition to the chemical properties of River's water as shown in Table 1. This fact allowed dominance of epiphytic algae which were more tolerant to fluctuations in environmental condition and stresses such as Bacillariophyta, Cyanophyta, and coccoid forms of Chlorophyta[28].

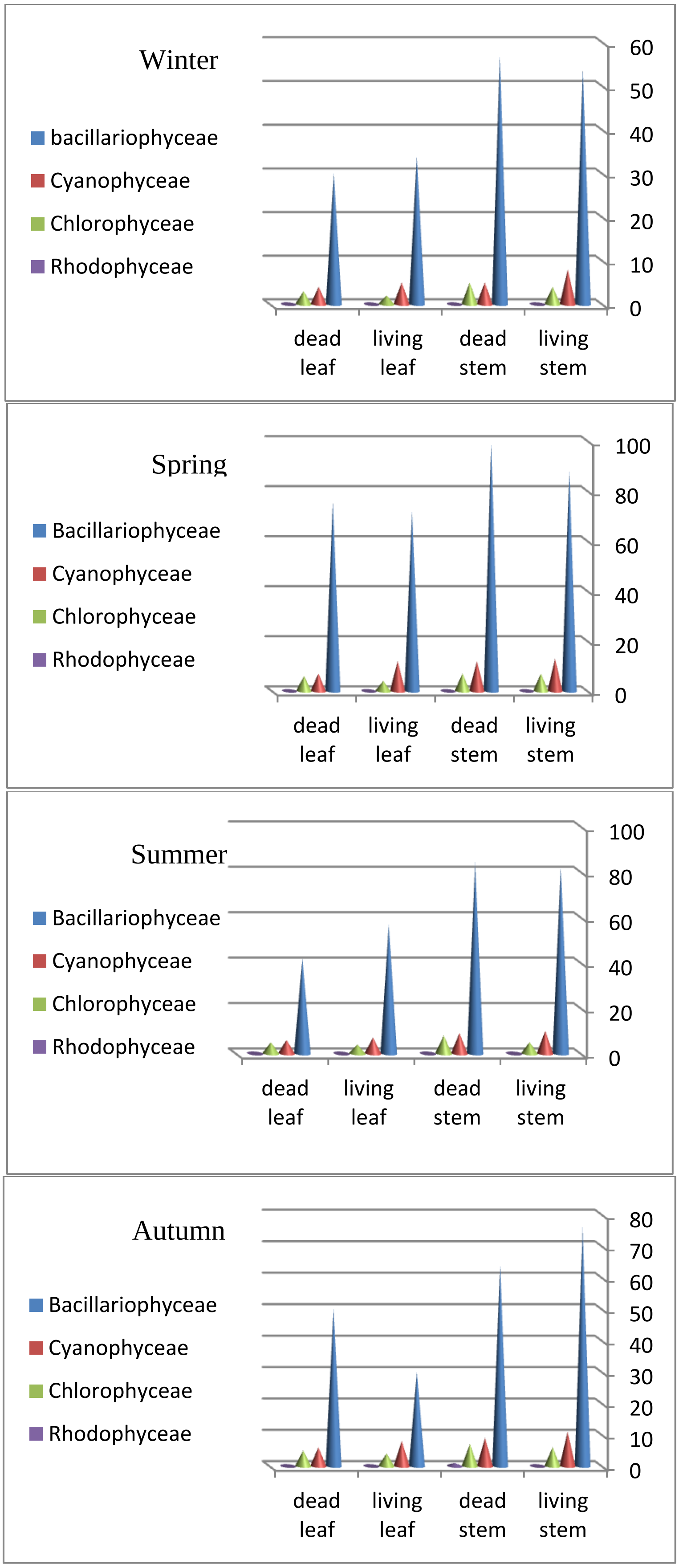


Fig. 2. Numbers of epiphytic algae isolates on different parts of *P. australis* inhabiting Tigris River at Al-Jadria Site during the period of study (2014-2015)

The periphytic community was influenced by availability and diversity of substrates in the environment especially macrophytes[28,29] .
The aquatic plant *P.australis* is a common plant in Iraq inland water [30]. The wide distribution of this macrophytemay be due to its high tolerance to different environmental conditions[31]. It seems that epiphytic biomass on individual macrophyte may depend not only on seasonal conditions and host plant but also on biotic and abiotic factors such as availability of nutrients, dissolved oxygen, water temperature and water flow [25, 32] ,as well as on change of light intensity [33, 34] .
Other factors such as grazing pressure [35] can modify isolates abundances on the macrophyte. The permanence and development of epiphytic community on *P.australis* may be changed with morphology of leaf (leafblades consist of two parts, the 1st part covering stem extended vertical in water column and the 2nd part is flat and tapering to a long filiform tip extended horizontally in water column) [36- 37], which could provide a different microhabitat and act as a selective factor to algae adhesion[38]. Vertical direction of stem in water column make stem less susceptible to disturbances caused by the action of currents, which may promoted a higher abundance of epiphytic algae on stem compared to leaf which may provide a different microhabitat and had distinct spatial distributions in the same environment. This is probably due to delicate horizontal direction of leaves in the water column, which may allow the leaf to be susceptible to a greater intensity of disturbance by water currents and development of loosely attached epiphytic algae on these substrates. The present study has recorded the highest number of algal isolates on stem of the aquatic plant *P. australis*, while the lowest number of isolates was recorded on leaf of macrophyte host, the distribution and density of epiphytic algae were attributed to geometric morphology, surface structure of the macrophyte and age of aquatic plant[39, 40] .
The results of this study showed high values of water temperatures in the Summer and low values in the Winter as they affected by surrounding air. Changes in the values of electrical conductivity and salinity were recorded during study period. Being lower values of E.C. in Autumn may be due to elevated water level during this season that caused dilution water and reduced ions and salt concentration in river.
The pH was an indicator on the alkalinity and acidity water. The result of the present study ranged 7.1- 8.3 [Table 1]. It is a common feature in Iraq inland water buffering capacitydue to a high content of calcium bicarbonate [41-42].
Total dissolved solid ranged between 250-495 mg/L where high values were recorded in winter and low values in summer, and that may be due to soil washing by rain water [6].
While highvalues of TSS were recorded in autumn because of River Dredging Process during samples collecting.
The total alkalinity was affected by many factors such as temperature, decomposition of organic matters and concentration of CO_2 [43]. The present study showed that water levels have significant impact on the values of alkalinity [44]. Higher concentrations of total hardness were recorded in Winter, and that may be due to calcareous nature of Iraqi soil, or due to the high amount of salts reached by irrigation process as the river is surrounded by agricultural lands [45]. The reason for low total hardness in the Summer may be due to consumption of CO_2 by algae for photosynthesis [46]. Calcium concentrations were higher than

magnesium concentrations during study periods which may due to the solubility of CO_2 in water and its reaction with calcium in contrast to magnesium which tend to precipitate [47]. They may also be due to high concentration of sulphate ions that precipitate magnesium as magnesium sulphate [48]. The lower value of calcium in some study months were attributed to consumption by algae or precipitation when they formed compounds dissolved in water which may increase the concentration of magnesium as a result of drift from soil [44].

A total of 46 genera of epiphytic algae were encountered during this study (7 Cyano-, 9 Chloro, 25 Bacillario- and 1 Rhodophyta); the isolates number included in these genera showed a significant deviation from random distribution on dead and living parts of macrophyte. These data suggest that the living part of host plant provides as uitable substrate for many isolates of epiphytic algae[24, 49], this may be due to a favorable physical condition of substrate and availability of nutrient. On the other hand, isolates diversity according to number of isolates encountered was high on the dead part of macrophyte could be relative to the nutrient interaction, the physical condition of substrate and reduced competition between the plant host and algal epiphytes to gets light or necessary nutrients [50] .

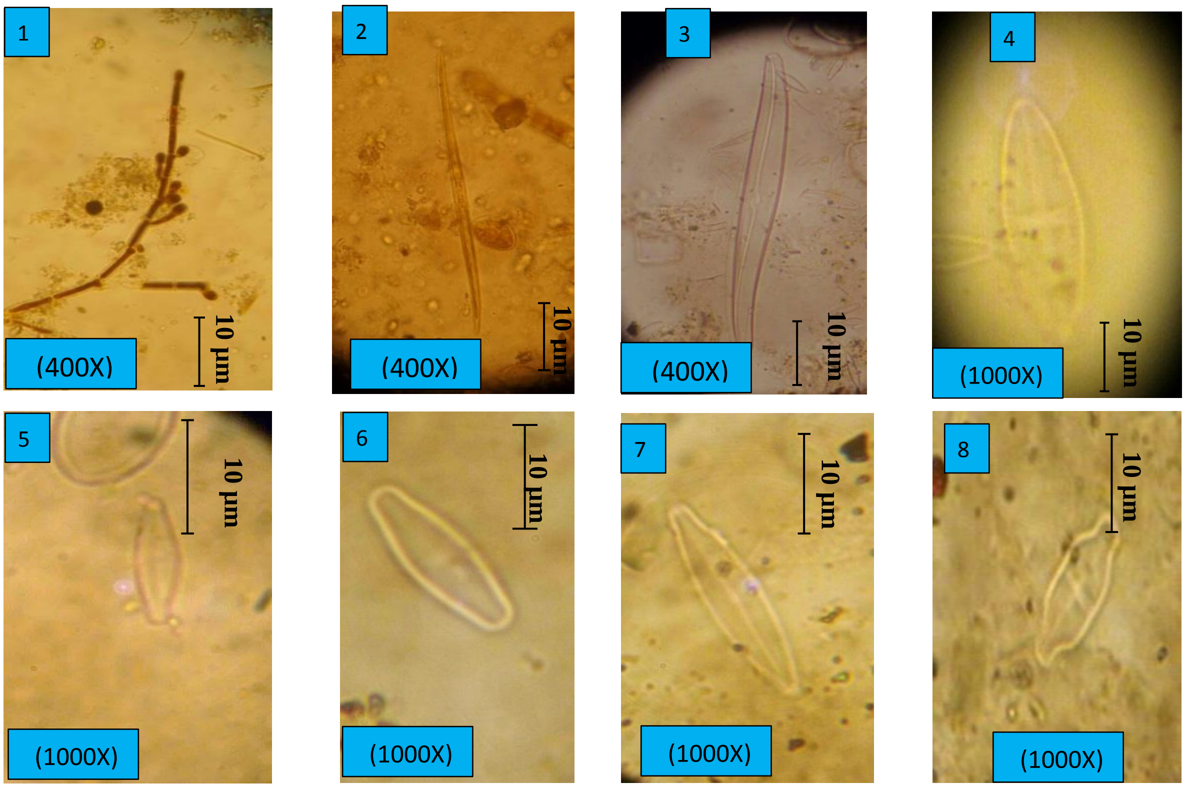


Plate (1): Illustrate some the isolated diatoms and Red alga from different parts of *P. australis*

Red Algae

1. Audouinellahermannii Roth

2-8. Diatoms:

2-Stenopterobiaintermedia (Lewis),

3-*Pleurosigmaobscurum*W.Smith, 4-*Stauroneisamphioxys*Gregory var. *amphioxys*,

5-*Naviculamicrocephalo*Grunow., 6-*Naviculaexilissima*Grunow,

7-*Naviculafalaisiensis*var.*lanceola*Grunow, 8-*Achnanthesexigue*var. *heterovalvata*Krasske .

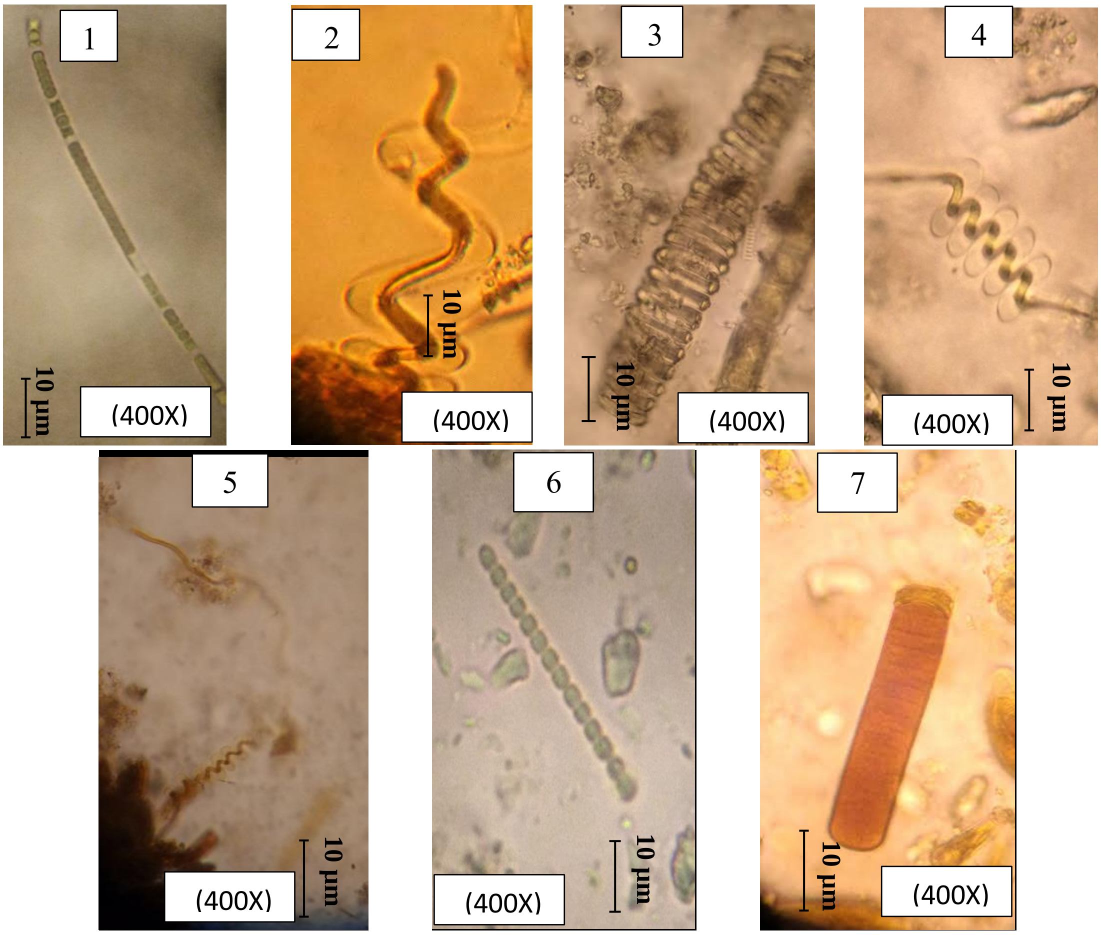
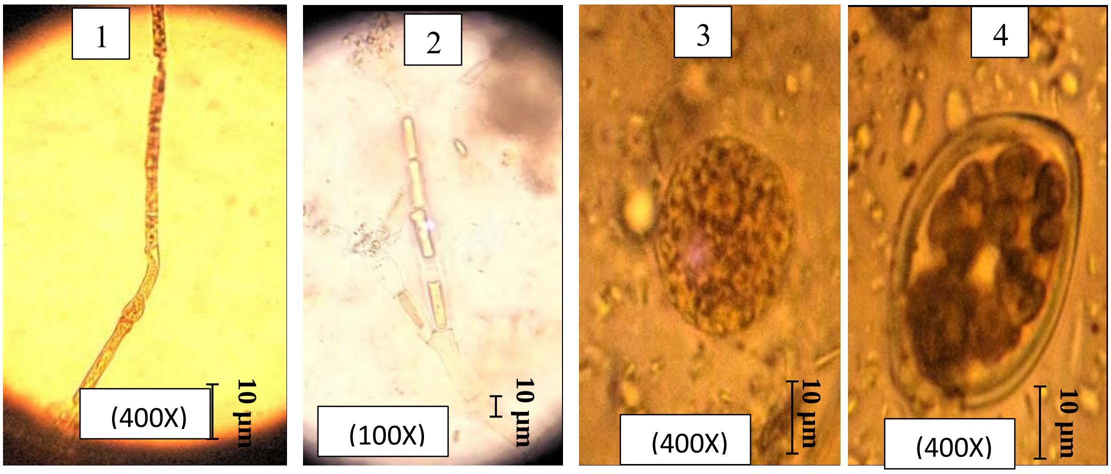


Plate (2): Some the isolated Cyanobacteria from different parts of *P. australis*
1- *Phormediumtenue* 2- *Spirulina laxa* 3- *Spirulina subsalsa*
4- *Spirulinanordstedtii* 5- *Spirulinamajar* 6- *Anabaena sp*
7- *Oscillatoriaprinceps* .



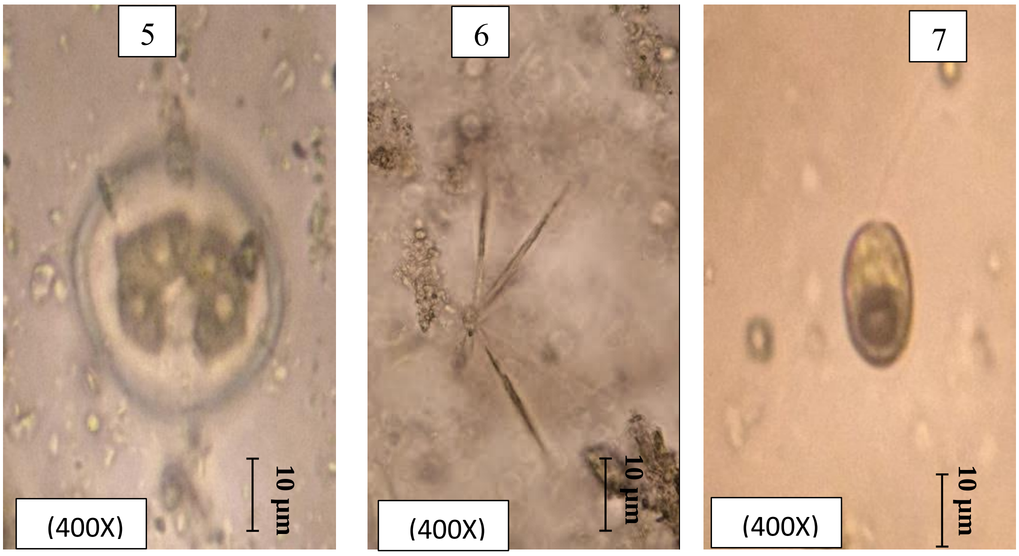


Plate (3): Some the isolated green algae from different parts of *P. australis*
1- *Ooedogonium* sp 2- *Cladophora glomerata* 3- *Coelastrum microporum*
4- *Oocystissolitaria* 5- *O. elliptica* 6- Actinastrum gracilimum
7- *Clamydomonas* sp

Conclusions:

The results show that spatial and temporal variations of epiphytic algae on aquatic macrophyta (*Phragmite saustralis*) depend on morphology of host plant and seasonal water level variations. Factors, such as temperature, light intensity, turbidity and nutrient plant are acting important roles as limited factors for distribution and density of epiphytic algae. Diversity of epiphytic algae on dead part of host plant was high in all seasons except spring which showed high diversity in living parts of plant.

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تشخيص نوعية للطحالب الملتصقة على نبات القصب *Phragmites australis* المستوطن في نهر دجلة في منطقة الجادرية بغداد – العراق

جنان شاوي الحساني **هند ابراهيم البياتي**

قسم علوم الحياة، كلية العلوم للبنات، جامعة بغداد، بغداد، العراق .

الخلاصة:

تضمن البحث الحالي دراسة نوعية للطحالب الملتصقة على السيقان والاوراق الحية والميتة لنبات القصب المستوطن في نهر دجلة ضمن منطقة الجادرية خلال خريف (2014) ، شتاء (2015)، ربيع (2015)، صيف (2015). بالاضافة الى دراسة الخواص الفيزيائية والكيميائية لمياه نهر دجلة خلال مده الدراسه(درجة حرارة الماء و الهواء، الاس الهيدروجيني، التوصيلية الكهربائية، المواد العالقة الصلبة، المواد الذائبة الصلبة الكلية، سرعة جريان الماء، شده الاضاءه، التعكير، الاوكسجين المذاب، التطلب الحيوي للاوكسجين، القاعدية، العسرة، الكالسيوم، المغنيسيوم، والمغذيات النباتية). تم رصد 142 عزله من الطحالب الملتصقة خلال مده الدراسه و كانت السيادة فيها للطحالب العصوية (117 عزله) تليها الطحالب الخضراء المزرقة (13عزله) والخضر (11عزله) والطحالب الحمراءعزله واحده. سجل تنوع في اعداد الطحالب الملتصقة على الاجزاء المختلفة من النبات العائل وخلال المواسم المختلفة. و كان فصل الربيع 2015 هو انسب الفصول لنمو الطحالب الملتصقه يليه الخريف فالصيف ثم الشتاء 2015. وسجلت الدراسة 8 عزلات جديدة من الطحالب (*Achnanthes hesexigue* var. *Heterovalvata* Krasske ،*Navicula exilissima* Grunow ،*Navicula falaisiensis* var. *lanceola* Grunow ،*Navicula microcephalo* Grunow ،*Pleurosigma obscurum* W. Smith ،*Stauroneis amphioxys* var. *amphioxys* Gregory ،*Stenopterobia intermedia* Lewis و *Audouinella hermannii* Roth) اضيفت الى الفلورا العراقية.

الكلمات المفتاحية : الطحالب الملتصقة، نبات القصب، نهر دجلة.