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A Study of Epiphytic and Epipelic Algae in Al-Dora Site/Tigris River in Bagdad Province- Iraq

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Abstract

There is a scarcity of data regarding algal flora of Tigris River in the territory of Baghdad. The present study deals with Tigris River in Al-Dora site in Baghdad province from November 2014 to June 2015 in order to shed light on its epiphytic Algae on (*Phragmites australis*) and epipelic algae. An amount of 183 and 154 species of epiphytic and epipelic algae are identified respectfully. The Bacillariophyceae (diatoms) are the dominant algal group followed by Cyanophyceae and Chlorophyceae. Moreover, 90 species are shared between two groups of algae (epiphytic and epipelic) and identified at the study site. Additionally, the seasonal variations and diversity of algal species are noticed. The highest number of epiphytic algae is 772.05 x 10^4 (cell/gm) in winter and the lowest number is 161.13 x 10^4 (cell/gm) in Summer; where as the highest number of epipelic algae is 20.07 x 10^4 (cell/ cm^2) in Winter and the lowest number is 6.53 x 10^4 (cell/ cm^2) in Summer.

Key words: Algae, Dora Sector, Epipelic, Epiphytic, Iraq, Qualitative and Quantitative Study, Tigris River.

Introduction:

Biofouling is a complicated biological process in which the living organisms attach to different platforms such as aquatic plants, rocks, boats, and sediments [1]. Epiphytic algae attach to their hosts in various forms such as encrusting, basal, mucilage, long or short stalk, and pad forms [2, 3]. Epipelic algae grow on sediments and endure the light and Oxygen efficiency [4]. Benthic algae are regarded as an important element in the lotic water as they sufficiently contribute in the primary production, preventing sediments erosion, nutrients rotating, and energy transporting in/to water column [5, 6, 7]. Moreover, they are considered essential nutrients for zooplanktons, aquatic invertebrates, and fishes [8, 9].

Due to the sensitivity of the benthic algae, they are used as bio-indicators to gauge the aquatic environmental conditions [4].

There is a scarcity of data regarding algal flora in Tigris river of Baghdad territory; however, several ecological studies regarding the epiphytic on Reed (*Phragmites australis*) are made. [10] discusses the Epiphytic algae on two plant species: Reed and Rigid Hornwort (*Ceratophyllum* sp.) in Tigris River in

Baghdad. [11] studies the epiphytic algae on Reed and phytoplankton in Yusifiya tributary of Euphrates River. Moreover, an ecological study on epiphytic on (*Ceratophyllum demersum*) is made in Tigris River at Al-Jadrriyah sector of Baghdad province by [12]. [13] surveys the epipelic algae in five sites stationed on Tigris River in Baghdad. [14] studies the physicochemical characters and communities of the epipelic algae at three sites in Al-Aaras tourist Island Lake in Baghdad. [15] studies algal growth mechanisms on various submerged platforms (boats, Reed, Building bricks, concrete bricks, and sediment) in Tigris River at Al-Jadrriyah sector of Baghdad province.

Materials and Methods:

The sampling sites are located in Al-Dora site (33°15' N 44°22' E) on the western bank (Al-Karkh side) of Tigris River, facing University of Baghdad complex in Al-Jadriyah area eastern bank (Resafa side) of Tigris River in Baghdad Province (Fig.1). According to the World Wildlife Fund (WWF) 2014, the survey sites are situated in the Desert and Xeric Shrublands biome. The site landscape is represented by clay banks along with common river tributaries vegetations such as *Populus* sp., *Salix* sp., *Lycium* sp., *Tamarix* sp. and Reed which extend along both banks of Tigris River at Dora sector in Baghdad Province (Fig. 1).

The samples are collected for epiphytic algae from (*c.* 10 cm) of submerged stems of Reed on monthly bases between (09:00am to 02:00pm) in daylight; they are preserved in polythene bags as described in[16]. The samples are collected for epipelic algae from upper (0.5 -1.0) cm surface layer of the sediment for the sites, epipelic algae are attracted by using lens paper tissue as described by [17]. According to [18], Non-diatoms are counted by Haemocytometer while Diatoms are counted by the Micro transect method according to [19]. The identification of both epiphytic and epipelic algae during study period fallows [20, 21, 22] as taxonomic keys references. The study quantitative results are expressed as cell×10^4/g for epiphytic algae and as cell×10^4/cm² for epipelic algae.

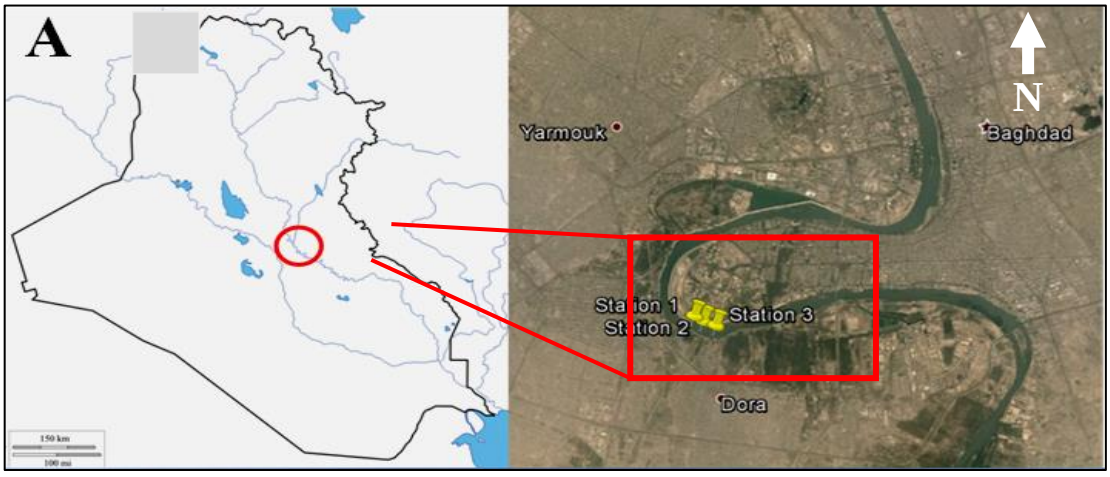

Fig. 1: Al-Dora sampling Site: (A) Al-Dora Sampling Site on Tigris River in Baghdad City.

Results and Discussion:

Qualitative Study

During the study, we are able to identify 183 epiphytic algal species on *P. australis* belonging to 57 genera. At total of 115 species (26 genera) of Bacillariophyceae; 73 species (11genera) of Cyanophyceae; 25 species

(15 genera) of Chlorophyceae; two species of Euglenophyceae; one species to each Dinophyceae, Charyophyceae, Rhodophyceae, and Xanthophyceae are recorded (Table1). However, the percentage of the Bacillariophyceae from total number of the identified species is 62.8%, 20.2% for the Cyanophyceae, and 13.7% for Chlorophyceae (Fig.2).

Regarding the epipelic algal species, a total of 154 species (38 genera) are identified. Atotal of 130 species (24 generra) of Bacillariophyceae, 15 species (seven genera) of Cyanophyceae, eight species (six genera) of Chlorophyceae, and one species of Euglenophyceae are recorded (Table 2). The percentage of the Bacillariophyceae from the total number of the identified species is 84%, 9.7% for Cyanophyceae, and 5.19% for Chlorophyceae (Fig.3).

The study indicates that the dominance is for the Bacillariophyceae due to its ability to thrive in broad range of environmental circumstances such as growing in different ranges of temperature, salinity, and various concentrations of nutrients [23]. Moreover, it is adapting to low light intensity due to the presence of Fucoxanthin pigment [24].

Moreover, the Cyanophyceae replaces second place after Bacillariophyceae according to the total number of the epiphytic epipelic species. The Cyanophyceae algae are characterized by their high endurance to extreme temperature and pH, ability to restore nitrogen and phosphorus, and producing toxic materials [25]. The genus *Oscillatoria* is the most frequent recorded species in all seasons and this might explain its ability to intake crucial nutrients, and to endure extreme high temperature [26, 6] However, the Chlorophyceae is replace later and this result has confirmed what is stated in [27, 28,13] .

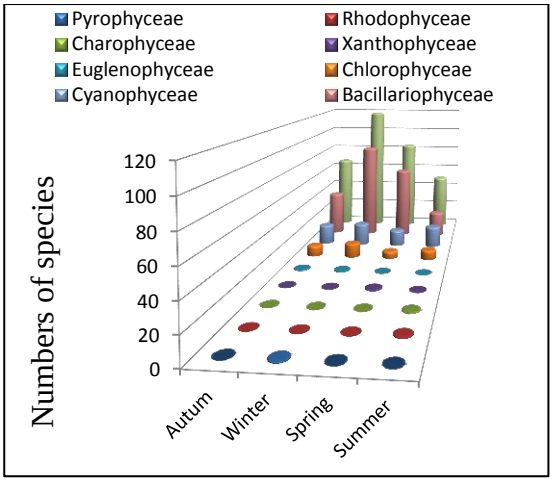

Fig. 2: The Epiphytic Algae on *Phragmites australis* in Tigris River of Al-Dora Site in Baghdad Province.

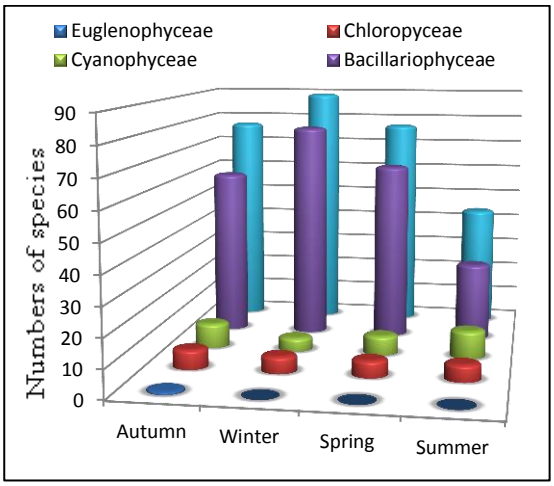

Fig. 3: The Epipelic Algae in Tigris River of Al-Dora Site in Baghdad Province.

Quantitative Study

The seasonal variations of the epiphytic and epipelic algae are notified. According to the epiphytic on *P. australis*, the highest count is recorded during winter 2015 and reaches 772.05 x 10^4 cell/g. (48.1%) from the total number of the identified species. The lowest count is noticed in summer and reaches 161.13 x 10^4 cell/g (10.4%) from the total number of the identified species. It is worth mentioning that the total count of epiphytic in autumn and spring is convergent. In autumn the count reaches 333.17 x 10^4 cell/g. (20.07%) from the total number of the

identified species; while the count reaches 337.92 x 10^4 cell/g. (21.06%) in spring (Fig. 4 & 5).

When matter concerns the epipelic algae, the survey results are contrasting during seasons. However, the highest count is recorded during winter 2015 and reaches 20.07 x 10^4 cell/ cm² (35.01%) from the total number of the identified species. In summer, the lowest count is noticed and reaches 6.53x 10^4 cell/ cm² (11.39%) from the total number of the identified species. In addition, the autumn count reaches 15.53x 10^4 cell/ cm² (27.08%) from the total number of the identified species; while the spring 15.18x 10^4 cell/ cm² (26.48%) (Fig. 6 & 7).

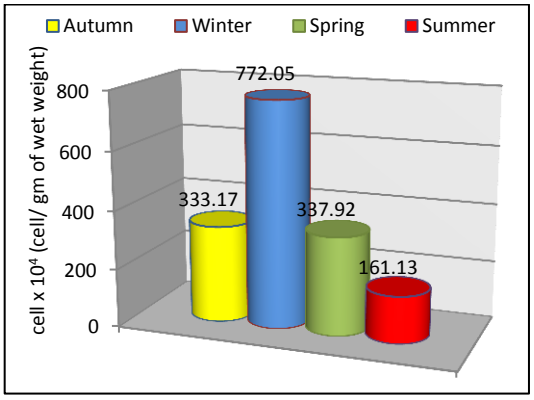

Fig. 4: The Seasonal variation of the Total Count of Epiphytic Algae on *Phragmites australis* in Tigris River of Al-Dora Site in Baghdad Province.

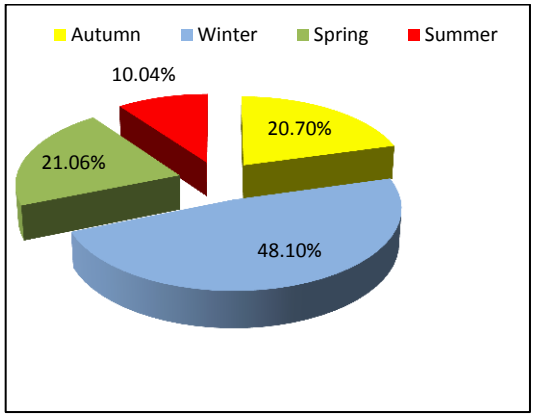

Fig.5: The Percentage of the Total Count of Epiphytic Algae on *Phragmites australis* in Tigris River of Al-Dora Site in Baghdad Province.

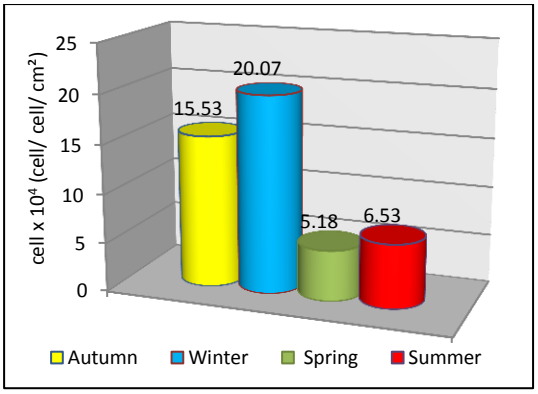

Fig. 6: The Seasonal Variation of The Total Count of Epipelic Algae in Tigris River of Al-Dora Site in Baghdad Province.

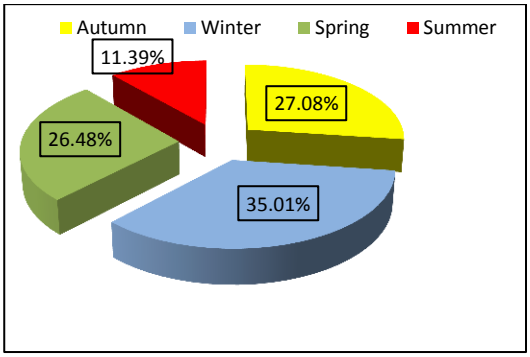

Fig. 7: The Percentage of The Total Count of Epipelic Algae in Tigris River of Al-Dora Site in Baghdad Province.

The variation in the total count of the epiphytic and epipelic algae is affected by the various environmental circumstances of the Tigris River habitat at Al-Dora site. In winter, the increase of the epiphytic algal total count is possibly explained by rain water that washes the fertilizers which are essential for algal growth. The fertilizers are considered a source of organic nutrients (Nitrogen and Phosphate) produced through agricultural activities in the nearby farms and cultivated lands [29]. Moreover, the organic materials produced by aquatic vegetations could be another reason for the algal total count increase in winter [2, 30]. Another reason is the decrease of the water temperature which increases algae biofouling [31]. Regarding the increase

of the epipelic algae total counts they may be attributed to the texture of the river bank bottom, slow water current, low turbidity, or high light penetration which all are crucial for algal growth [32, 33]. In summer, the epiphytic and epipelic algae total count are low due to the fast water current rotating the sediment particles and increasing the turbidity that affect the algal photosynthesis. In addition, there are other causes which lead to low algal total count such as fast water current and calcification due to the high temperature both inhibits the growth of many algal species [34,35,36]. According to the low epipelic algae total count, the fast water current may drift the algae into water column or presence of benthic invertebrates that feed on epipelic algae [37, 38].

List of Species

Table 1: List of Epiphytic Algae on *Phragmites australis* per Season in Tigris River of Al-Dora Site in Baghdad Province.

No.	Taxa	Season			
		Autumn	Winter	Spring	Summer
Division : CYANOPHYTA					
Clas: Cyanophyceae					
Order: Chroococales					
1	*Aphanocapsa rivularis* (Carm.) Rabenhorst	-	+	-	-
2	*Chroococcus turgidus* (Kütz.) Nägeli	-	+	-	-
3	*C. minor (*Kütz.) Nägeli	+	-	-	-
4	*C. turgidus* (Kütz.) Nägeli	+	+	-	-
5	*Merismopedia glauca* Nägeli	+	-	+	-
6	*M. tenussima* Lemmermann	+	-	+	-
7	*Microcystis aeruginosa* Kützing	+	+	-	-
8	*M. marginate* Meneghinii	+	-	+	-
Order: Oscillatoriales					
9	*Lyngbya aestuarii* Lemmermann	-	-	-	+
10	*L. taylorii* Drouet&Strick	+	-	-	-
11	*Lyngbya* sp.	+	+	-	+
12	*Oscillatoria acutissima* Kufferath	-	+	+	+
13	*O. agardhii* Gomont	-	+	-	-
14	*O. amoena* (Kütz.) Gomont	+	-	-	+
15	*O. amphibia* Agardh	-	+	+	-
16	*O. curviceps* Agardh	-	+	-	+
17	*O. formosa* Bory	-	+	-	+
18	*O. granulata* Gardner	-	-	-	+
19	*O. limnetica* Lemmermann	+	-	-	+
20	*O. limosa* (Roth.) Agardh	+	-	+	+
21	*O. minima* Gicklhorn	-	-	-	+
22	*O. princeps* Vaucher	+	+	+	+
23	*O. prolifica* Gomont	-	-	+	+
24	*O. proteus* Skuja	-	+	-	-
25	*O. rubescens* de Candolle ex Gomont	-	-	-	+
26	*O. sancta* (Kütz.) Gomont	+	+	+	+
27	*O. splendida* Greville ex Gomont	-	-	+	-
28	*O. tenuis* Agardh	+	+	-	+
29	*Phormidium ambiguum* Gomont	-	-	-	+
30	*P. tenue* (Menegh) Gomont.	+	-	-	-
31	*Phormidium* sp.	+	+	+	+
32	*Spirulina laxa* G.M.Smith	-	+	+	-
33	*S. major* Kützing	-	-	+	-
Order : Nostocales					
34	*Aulosira implex* Bornet & Flahault	-	+	+	-
35	*Aulosira* sp.	-	-	-	+
36	*Anabaena* sp.	-	+	-	-
37	*Nostoc* sp.	+	+		
Division : CHLOROPHYTA					
Class: Chlorophyceae					
Order: Chlorococcales (Chlorosphaeroles : Chlorosphaerace)					
38	*Ankistrodesmus falcatus* (Corda)Ralfs	+	+	-	-

39	*Closterium microporum* Nägeli.	-	-	-	+
40	*Kirchneriella lunaris* (Kirchner) Möbius	-	-	-	+
41	*Monoraphidium contortum* Thuret				+
42	*Pediastrum boryanum* (Turp.) Meneghini	-	-	+	-
43	*P. simplex* Meyen	-	+	-	-
44	*P. simplex var. clathratum* (Schröter) Chodat	-	-	-	+
45	*P. tetras* (Ehr.) Ralfs	-	+	-	-
46	*Scenedesmus apoliensis* P.Richter	+	+		
47	*S. bijuga* (Turp) Lagerheim.	+	+	-	-
48	*S. bijuga* var. *alterna* (Turp.) Lagerheim	+		-	-
49	*S. quadricauda* (Turp.) de Brébisson	+	+	-	-
50	*Tetraedron minimum* (A.Braun) Hansgirg	+	-	-	-
	Order : Chaetophorlaes				
51	*Aphanochaete elegans* Tupa	-	-	-	+
52	*Stigeoclonium* sp.	-	-	-	+
	Order : Oedogoniales				
53	*Bulbochaete* sp.	-	+	-	-
54	*Oedogonium cardiacum (*Hass.) Wittrock	+	+	-	-
55	*Oedogonium* spp.	-	+	+	+
	Order : Siphonocladales (Cladrophorales)				
56	*Cladophora glomerata* (L.) Kützing	+	-	-	+
57	*Cladophora* sp.	-	+	-	-
	Order : Zygnematales				
58	*Closterium dianae* Ehrnberge	-	-	+	-
59	*C. gracile* de Brébission	-	+	-	-
60	*C. lanceolatum* Kützing.	+	-	+	-
61	*Spirogyra* sp.		+	+	
62	*Zygnema* sp.	-	-	+	-
	Division: CHAROPHYTA				
	Class: Charophyceae				
	Order : Charales				
63	*Nitella* sp.	-	-	-	+
	Division: EUGLENOPHYTA				
	Class :Euglenophyceae				
	Order : Euglenales				
64	*Euglena* sp.	+	-	-	-
65	*Phacus* sp.	+	-	-	-
	Division: CHARYSOPHYTA				
	Class: Xanthophyceae (Heterokontae)				
	Order : Mischococcales				
66	*Tribonema* sp.	-	-	+	-
	Class: Bacillariophyceae (Diatomaceae)				
	Order: Centrales				
67	*Coscinodiscus curvatulus* Grunow	+	-	-	-
68	*Cyclotella meneghiniana* Kützing	+	+	+	+
69	*C. striata* (Kützi) Grunow	+	+	+	-
70	*Melosira granulata* (Ehr.) Ralfs	+	+	+	-
71	*M. granulata var. angustissima* Mueller	-	-	+	-
72	*M. italica* (Ehr.) Kützing	-	+	-	-
73	*M. varains* Agardh	-	+	+	-
74	*Stephanodiscus hantzschii* Grunow	+	-	-	-
75	*Stephaenodiscus* sp.	-	+	-	-
	Order: Pennales				
76	*Achnanthes affinis* Grunow	-	+	+	-
77	*A. biasolettiana* Kützing	-	+	-	-
78	*A. brevipes* Agardh	-	+	+	-
79	*A. exigua* Grunow	-	+	+	-
80	*A. hungarica* Grunow	+	+	-	-
81	*A. lanceolata* (Bréb.) Grunow	-	+	-	-
82	*A. minutissima* Kützing	-	+	+	-
83	*Amphora coffeaeformis*(Ag.) Kützing	-	+	-	-
84	*Bacillaria paradox* Gmelin	+	+	+	+
85	*Cocconeis placentula* Ehrenberg	+	+	+	+
86	*C. ventricosa* (Ehr .) Meister	-	-	+	-
87	*C. pediculus* Ehrenberg	+	+	+	+
88	*C. placentula* var. *euglypta* (Ehr.) Cleve	+	+	+	+
89	*C. placentula* var. *lineata* (Ehr.) Cleve	-	-	+	-
90	*Cymatopleura solea* (Bréb.) W.Smith	+	+	-	-
91	*Cymbella affinis* Kützing	+	+	-	-
92	*C. cistula* (Ehr.) O.Kirchner	-	-	-	+
93	*C. cymbiformis* (Kütz) Van Heurck	-	+	-	-

94	*C. lacustris* var . *inflata* Mayer	-	+	-	-
95	*C. leptoceros* (Ehr.) Grunow	-	-	+	-
96	*C. obtusa* Gregory	-	-	+	-
97	*C. tumida* (Bréb.) van. Heurck	+	+	+	+
98	*C. ventricosa* Kützing	+	+	+	-
99	*Diatoma vulgare* Bory	+	+	+	-
100	*D. vulgare* var. *breve* Grunow	-	+	-	-
101	*D. vulgare* var. *linearis* Grunow.	-	-	-	-
102	*D. vulgare* var. *producta* Grunow	-	+	+	-
103	*D. vulgare* var *ovalis* (Fricke) Hustedt	-	-	+	-
104	*Diploneis ovalis* (Hilse) Cleve	-	+	-	-
105	*D. papula* (A.W.F.Schmidt) Cleve	+	-	-	-
106	*D. pseudovalis* Hustedt	+	+	+	-
107	*Eunotia pectinalis* Kützing	-	+	-	-
108	*Fragilaria capucina* Desmazières	-	+	+	-
109	*F. construens* (Ehr.) Grunow	-	+	-	-
110	*F. intermedia* Grunow	+	+	-	-
111	*F. pinnata* Ehrenberg	+	+	-	-
112	*F. vaucheriae* (Kützing) J.B.Petersen	+	-	-	-
113	*Fragilaria* sp.	+	+	+	+
114	*Gomphonema acuminatum var. coronata* (Ehr.) W.Smith	-	+	-	-
115	*G. constrictum* var. *capitata* (Ehr.) Grunow	-	+	+	-
116	*G. gracile* Ehrenberg	-	+	+	-
117	*G. intricatum* Kützing	-	+	+	+
118	*G. intricatum* var. *pumila* Grunow	-	-	+	-
119	*G. lanceolatum* Ehrenberg.	-	+	-	+
120	*G. longiceps* Ehrenberg.	-	+	-	-
121	*G. olivaceum* (Lyng.) Kützing	+	+	+	-
122	*G. olivaceum var. minutissima* Hustedt	-	+	-	-
123	*G.* parvulum (Ehr.) Grunow	-	+	+	+
124	*G. sphaerophorum* Ehrenberg.	-	+	-	-
125	*G. ventricosum* Gregory	+	+	+	-
126	*Mastogloia smithii* var. *amphicephale* Grunow	+	-	-	-
127	*Navicula atomus* (Kütz.) Grunow	-	+	+	-
128	*N. capitata* Ehrenberg.	-	+	-	-
129	*N. cincta* Ehrenberg	+	+	+	-
130	*N. cryptocephale* Kützing	-	+	+	+
131	*N. crptocephale* var. *intermedia* Grunow	-	+	+	-
132	*N. crptocephlae* var. *veneta* (Kütz.) Cleve	+	-	-	-
133	*N. exigua* Grunow	+	+	-	-
134	*N. gregaria* Donkin	-	+	-	-
135	*N. hungarica* Grunow	-	+	+	-
136	*N. mutica* Kützing	-	-	-	+
137	*N. parva* (Menegh.) Cleve	-	+	+	-
138	*N. psuedotuscula* Hustedt	+	+	-	-
139	*N. radiosa* Kützing	-	+	+	-
140	*N. radiosa* var. *tenella* (Bréb.) Grunow	-	-	+	-
141	*N. rhycocephala* Kützing	-	+	+	+
142	*N. salinarum* Grunow	-	-	+	-
143	*N. subhamelata* var. *subhamelata* Grunow	-	-	+	-
144	*Navicula* sp.	-	-	+	-
145	*Nitzschia acicularis* W.Smith	-	+	-	-
146	*N. amphibia* Grunow	+	+	-	-
147	*N. apiculata* (Greg.) Grunow	-	+	+	-
148	*N. dissipata* (Kütz.) Grunow	-	+	+	-
149	*N. fasciculata* Grunow	-	+	-	-
150	*N. filiformis* (W.Smith)Van Heurck	-	+	+	-
151	*N. fonticola* Grunow	+	-	+	-
152	*N. frustulum* (Kütz.) Grunow	-	+	-	-
153	*N. frustulum* var. *perminuta* Grunow	+	+	-	-
154	*N. gracilis* Hantzsch	-	+	-	-
155	*N. hungarica* Grunow	-	-	+	-
156	*N. microcephala* Grunow	-	-	+	-
157	*N. obtusa* W.Smith	+	-	-	+
158	*N. palea* (Kütz.) W.Smith	+	+	+	+
159	*N. recta* Hantzsch ex Rabenh.	-	+	-	-
160	*N. sigma* (Kütz) W.Smith	+	+	+	+
161	*N. sigmoidea* (Ehr.) W.Smith	-	+	-	+
162	*N. tryblionella var. debilis* (Arnott) Hustedt	-	+	-	-
163	*N. vermicularis* (Kütz.) Hantzsch	-	+	-	-
164	*N. vitrea* Norman	-	-	+	-

165	*Peronia fabula* (Brébisson ex Kützing) R.Ross	-	+	+	-
166	*Pinnularia biceps* W.Gregory	-	+	+	-
167	*P. leptosoma* (Grun.) Cleve	-	-	-	+
168	*Pleurosigma delicatulum* W.Smith	-	-	-	+
169	*P. salinarum* Grunow	-	+	-	-
170	*Rhoicosphenia curvata* (Kütz.) Grunow	+	+	+	+
171	*Stauroneis anceps* Ehrenberg	-	+	-	-
172	*Surirella angusta* Kützing	-	+	+	-
173	*S. capronii* de Brébission ex. Kütz.	-	+	+	-
174	*S. ovalis* de Brébission	+	+	-	-
175	*S. ovata* Kützing	-	+	+	-
176	*Synedra amphicephala* Kützing	+	-	-	-
177	*S. fasciculata* (Ag.) Kützing	+	+	+	-
178	*S. parasitica* (W.Smith) Hustedt	-	-	+	-
179	*S. ulna* (Nitzs.) Ehrenberg	+	+	+	+
180	*S. ulna var. biceps* (Kütz.)	-	+	-	-
181	*S. ulna var. oxyryhnchus* (Kütz.) Van Heurck	-	-	+	-
Division: PYRROPHYTA					
class: Dinophyceae					
182	*Peridinium* sp.	-	+	-	-
DIVISION: RHODOPHYTA					
Class: Rhodophyphyceae					
Order: Bangiales					
183	*Compsopogon* sp.	-	-	-	+
TOTAL		67	118	84	50

Table 2: List of Epipelic Algae per season in Tigris River of Al-Dora Site in Baghdad Province.

No.	Taxa	Season			
		Autumn	**Winter**	**Spring**	**Summer**
Order: Chroococales					
1	*Aphanocapsa delicatissma* West & G.S.West	-	+	-	+
2	*Chroococcus turgidus* (Kütz.) Nägeli	+	-	+	-
3	*Merismopedia glauca*(Ehr.) Nägeli	-	-	+	+
4	*M. tenussima* Lemmermann	+	-	-	-
Order: Oscillatoriales					
5	*Lyngbya limnetica* Lemmermann.	-	-	+	+
6	*L. major* Meneghini	+	-	+	-
7	*Oscillatoria amoena* (Kütz.) Gomont	-	+	+	+
8	*O. amphibia* Agardh	-	-	-	+
9	*O. formosa* Bory	+	-	-	-
10	*O. limnetica* Lemmermann	+	+	+	+
11	*O. limosa* (Roth.) Agardh	+	-	-	+
12	*O. princeps* Vaucher	+	-	+	+
13	*O. sancta* (Kütz.) Gomont	+	+	-	+
	Order : Nostocales				
14	*Anabaena affinias* Lemmermann	-	+	-	-
15	*Nostoc* sp.	+	-	-	+
Class: Chlorophyceae					
Order: Chlorococcales (Chlorosphaeroles : Chlorosphaerace)					
16	*Coelastrum microporum* Nägeli .	+	+	+	+
17	*Scenedesmus bijuga* (Turp.) Lagerheim	+	+	+	-
18	*S. quadricauda* (Turpin) Brébisson	+	+	-	+
Order : Siphonocladales (Cladrophorales)					
19	*Cladophora glomerata* (Li) Kützing	+	+	+	+
Order : Zygnematales					
20	*Closterium tumidulum* F.Gay	-	+	+	-
21	*C. meneghinii* de Brébisson	+	+	-	+
22	*Cosmarium* sp.	+	-	+	+
23	*Mougeotia capucina* (Bory) Agardh	+	-	+	+
Class: Euglenophyceae					
Order : Euglenales					
24	*Euglena* sp.	+	-	-	-
Division					
Class: C. Bacillariophyceae (Diatomacea)					
25	*Aulecoseira granulata* Ehrenberg	-	-	+	-
26	*Coscinodiscus asteromphalus* Ehrenberg	+	+	+	-
27	*C. lacustris* Grunow	+	-	-	-
28	*Cyclotella meneghiniana* Kützing	+	-	+	-
29	*C. ocellata* Pantocsek	+	-	+	-

30	*C. striata* (Kütz) Grunow	+	+	+	+
31	*Melosira granulata* (Ehr.) Ralfs	+	+	-	-
32	*M. italica* (Ehr.) Kützing	+	+	-	-
	Order: Pennales				
33	*Achnanthes biasolettiana* Kützing	-	+	-	-
34	*A. brevipes* Agardh	-	+	-	-
35	*A. exigua* Grunow	-	-	-	+
36	*A. hungarica* Grunow	+	+	+	+
37	*A. lanceolata* (Bréb.) Grunow	-	+	+	-
38	*A. minutissima* Kützing	+	-	+	+
39	*Amphora coffeiformis* (C.Agardh) Kützing	+	-	-	-
40	*A. commutata* Grunow	+	-	-	-
41	*A. veneta* Kützing	+	+	+	-
42	*Bacillaria paxillifero* J.F.Gmelin	+	+	+	+
43	*Caloneis placentula* Ehrenberg	-	+	+	-
45	*Cocconeis pediculus* Ehrenberg	+	+	+	-
46	*C. placentula* Ehrenberg	+	-	+	-
47	*C. placentula* var. *euglypta* (Ehr.) Cleve	+	+	+	+
48	*Cylindrotheca solea* (Bréb.) W.Smith	-	+	+	-
49	*Cymbella affinis* Kützing	+	-	-	-
50	*C. cistula* (Ehr) O.Kirchner.	+	+	-	+
51	*C. lanceolata* (Eherenberg.)	-	-	+	-
52	*C. leptoceros* (Ehr.) Grunow	-	-	+	-
53	*C. microcephale* Grunow	+	-	-	+
54	*C. sinuata* (Greg) Cleve	+	-	-	-
55	*C. tumida* (Bréb.) van. Heurck	-	+	+	-
56	*C. ventricosa* Kützing	+	+	+	-
57	*Diatoma vulgare* Bory	+	+	+	+
58	*D. vulgare* var. *producta* Grunow	+	+	+	+
59	*D. vulgare* var *ovalis* (Fricke) Hustedt	-	+	-	-
60	*Diploneis ovalis* (Hilse) Cleve	+	-	-	-
61	*D. pseudovalis* Hustedt	+	-	+	-
62	*Fragilaria acus* Kützing	+	-	-	-
63	*F. brevistriata* Grunow	-	+	-	-
64	*F. capucina* Desmazieres	-	-	+	-
65	*F. construens* (Ehr.) Grunow	-	+	+	-
66	*F. intermedia* Grunow	-	+	+	-
67	*F. vaucheriae* (Kütz.) Boye-Peters	-	+	-	-
68	*Fragilaria* sp.	-	-	+	-
69	*Gomphoneis olivaceum* (Horne,) P. Dawson ex Ross et Sims.	+	-	-	-
70	*Gomphonema angustatum* (Kütz.) Rabenhorst	-	-	-	+
71	*G. angustatum* var. *productum* Grunow	+	-	-	-
72	*G. constrictum* Ehrenberg	-	+	-	-
73	*G. constrictum* var. *capitata* (Ehr.) Grunow	+	-	+	-
74	*G. gracile* Ehrenberg	-	+	-	+
75	*G. intricatum* Kützing	+	-	-	+
76	*G. intricatum* var. *vibrio (Ehr.)Cleve*	+	-	-	-
77	*G. intricatum* var. *pumila* Grunow	+	-	+	-
78	*G. kuetzingii* (Grun.) Cleve	-	+	-	-
79	*G. lanceolatum* Ehrenberg.	+	-	-	-
80	*G. olivaceum* Langby	-	+	-	-
81	*G. olivaceum* var. *calcarea* Cleve	-	+	-	-
82	*G. parvulum* (Kütz.) Kützing	+	+	-	-
83	*G. tergestinum* Grunow	-	+	-	-
84	*G. ventricosum* Gregory	+	+	+	-
85	*Gyrosigma attenuatum* (Kütz.) Rabenhorst	-	+	-	-
86	*G. distortum* (W.Smith) Griff. Et Henfr.	+	-	-	-
87	*G. scalproides* (Rabenhorst) Cleve	+	+	+	+
88	*G. spencerii* (W.Smith) Griffith & Henfrey	-	-	+	-
89	*G. spenceri* var. *nodifera* Grunow	+	-	+	-
90	*Navicula atomus* (Kütz.) Grunow	-	+	-	-
91	*N. bacillum* Ehrenberg	+	-	-	-
92	*N. capitata* Ehrenberg.	-	+	-	-
93	*N. cincta* Ehrenberg	+	+	+	-
94	*N. cryptocephale* Kützing	+	+	+	+
95	*N. crptocephale* var. *intermedia* Grunow	-	+	-	-
96	*N. dicephala* Ehrenberg	+	+	-	-
97	*N. exigua* Grunow	-	+	+	-
98	*N. gregaria* Donkin	-	-	+	-
99	*N. hungarica* Grunow	-	-	+	-
100	*N. parva* (Menegh.) Cleve	+	+	+	-

101	*N. phyllepta* Kützing	-	+	-	-
102	*N. psuedotuscula* Hustedt	-	-	+	-
103	*N. pupula* var. *capitata* Skvortzov & Meyer	-	+	-	-
104	*N. pygmaea* Kützing	+	-	+	-
105	*N. radiosa* Kützing	+	+	+	+
106	*N. radiosa* var. *tenella* (Bréb.) Grunow	+	-	+	-
107	*N. rhycocephala* Kützing	+	+	-	+
108	*N. salinarum* Grunow	-	-	+	-
109	*N. subhamelata* var. *subhamelata* Grunow	-	-	+	-
110	*N. tuscula* Ehrenberg	-	+	-	-
111	*N. viridula* (Kütz.) Ehrenberg	-	-	+	-
112	*Nitzschia acicularis* (Kütz.) W.Smith	-	-	+	-
113	*N. acicularis* W. Smith.	-	-	+	+
114	*N. amphibia* Grunow	-	+	-	-
115	*N. apiculata* (Greg.) Grunow	+	+	+	+
116	*N. clausii* Hantzsch	-	-	-	+
117	*N. dissipata* (Kütz.) Grunow	+	+	+	-
118	*N. fasciculata* (Grun.) Grunow	-	+	+	-
119	*N. filiformis* (W.Smith)Van Heurck	+	+	+	-
120	*N. fonticola* Grunow	-	+	+	-
121	*N. frustulum* (Kütz.) Grunow	+	+	-	-
122	*N. frustulum* var. *perminuta* Grunow	-	+	-	-
123	*N. gracilis* Hantzsch	-	-	+	-
124	*N. granulata* Grunow	-	+	-	-
125	*N. hungarica* Grunow	+	+	+	+
126	*N. microcephala* Grunow	+	-	+	-
127	*N. navicularis* (Bréb.) Grunow	-	+	-	-
128	*N. obtusa* W.Smith	-	+	-	-
129	*N. palea* (Kütz.) W.Smith	+	+	+	+
130	*N. parvula* W.Smith	-	+	-	-
131	*N. recta* Hantzsch ex Rabenh.	-	-	+	-
132	*N. sigma* (Kütz) W.Smith	+	+	-	-
133	*N. sigma* var. *rigidula* Grunow	+	-	-	-
134	*N. sigmoidea* (Ehr.) W.Smith	+	-	+	-
135	*N. sublinearis* Hustedt	-	+	-	-
136	*N. thermalis* Kützing	-	+	-	-
137	*Pinnularia globiceps* W.Gregory	-	-	+	-
138	*P. leptosoma* (Grun.) Cleve	-	+	-	-
139	*Pleurosigma elongatum* W.Smith	-	-	-	+
140	*Rhoicosphenia curvata* (Kütz.) Grunow	-	+	-	+
141	*Scolipleura anceps* Ehrenberg	-	-	+	-
142	*Surirella angusta* Kützing	-	+	-	+
143	*S. capronii* de Brébisson ex. Kütz.	-	+	-	-
144	*S. ovalis* de Brébisson	+	+	-	-
145	*S. ovata* Kützing	+	+	+	+
146	*S. robusta* var. *splendida* (Ehr.) Van Heurck	-	+	-	-
147	*S. turgida* W. Smith	-	-	+	-
148	*Synedra affinis* Kützing	-	+	-	-
149	*S. amphicephala* Kützing	-	+	-	-
150	*S. parasitica* (W.Smith) Hustedt	-	-	+	-
151	*S. tabulata* var. *fasciculata* (Kütz) Grunow	-	-	+	-
152	*S. ulna* (Nitzs.) Ehrenberg	+	+	+	+
153	*S. ulna* var. *biceps* (Kützing)	-	+	-	-
154	*S. ulna* var. *oxyryhnchus* (Kütz.) Van Heurck	-	-	+	-
TOTAL		77	89	77	44

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دراسة الطحالب الملتصقة على النبات و الطين في موقع الدورة نهر دجلة ضمن مدينة بغداد – العراق

جنان شاوي الحساني **مروة ثامر هندي**

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الخلاصة:

هناك ندرة(قلة) من الدراسات حول تنوع الطحالب في نهر دجله ضمن منطقة بغداد. قمنا بدراسة الطحالب الملتصقة على نبات القصب (*Phragmites australis*) وطحالب الطين في موقع الدورة على نهر دجلة في بغداد من شهر تشرين الثاني 2014 ولغايه حزيران 2015. تم تسجيل 183 نوعا من الطحالب الملتصقة على القصب و 154 نوعا من طحالب الطين . كانت السيادة لصف الطحالب العصوية (الدايتومات) تليها صف الطحالب الخضر المزرقة ثم صف الطحالب الخضر. أضافة الى ذلك، تم تسجيل 90 نوعا مشتركاً بين الطحالب الملتصقة على القصب و طحالب الطين ، وقد لوحظت التغيرات الفصلية وتنوع الطحالب في موقع الدراسة. كان اعلى عدد من الطحالب الملتصقة على القصب 772.05×10^4 (خلية/غم) في الشتاء واقل عدد 161.13×10^4(خلية/غم وزن رطب) في الصيف، أما بالنسبة لطحالب الطين فقد سُجل اعلى عدد 20.07×10^4 (خلية/سم 2) في الشتاء واقل عدد 6.53×10^4 (خلية / سم 2) في الصيف.

الكلمات المفتاحية : الطحالب، موقع الدورة، طحالب الطين، طحالب ملتصقة على النبات، دراسة كمية ونوعية، نهر دجلة.