

Environmental study of epiphytic algae on some aquatic plants in Al-Abasiya River, Iraq

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Abstract

The present work included study of epiphytic algae on two species of aquatic plants (*Potamogeton crispus* and *Eusine indica*) of Al – Abasia / Euphrates river in the middle region of Iraq from March 2012 to February 2013.

The investigation region encompassed four sites along 28 Km of the river course the study was recorded 152 species of epiphytic algae on both host plants species and comprised of Bacillariophyta (70%) , Chlorophyta (22%) and Cyanophyta (8%) ,Total number of epiphytic algae was ranged between 117.03×10^3 was individual /g as low value on shoot of *E. indica* and 12801.12×10^3 individuals /gm as high value on leaves of *P.crispus* .

Some species were recorded as dominance during most of the study period on both host plant species , such as *Osillatoria* sp . ; *Scendesmus* sp . ; *Cyclotella comta* ; *Nitzshia* sp . ; *Melosera italic* and *Navicula easpidata*. The results showed high species richness and low diversity of epiphytic algae according to Shannon index in all study sites.

Keywords: Epiphytic algae, river, Aquatic plants , AlAbasiya River .

Introduction

Epiphytes are organisms attached to aquatic and are responsible for the majority of primary productivity in aquatic systems , Epiphytic algae are dominant species in lotic system and play a major role in ecological balance between various groups of living organism (Macrophytes) and their environment [1] when epiphytic algae attach to vegetation , mobility is restricted and the ability to capture nutrients from the water column is limited Macrophytes may provide epiphytes with dual the benefits of substrate and a nutrient source [2] , but increased epiphytic algae

may reduce the diffusion of nutrients from water column to aquatic macrophyte leading to reduced plant biomass all growth [3], while , macrophytes may benefit from the reduced grazing pressure by herbivores [4]

Biomass of epiphytic algae may affected by many factors such as morphology of host macrophytes , water level , seasonal changes water depth , temperature and abundance of macrophytes [5,6].

Many studies deal with epiphytic algae such as Mabrouka et.al. [7] was studied the variability in the structure of epiphytic microalgae and investigated the impact of sewage discharge and changes in biometric plant parameters and composition of epiphytic algae. In other hand ,Puza-Jacobucc and Pererira-Liete [8] was study the influence of particular epiphytic algae on distribution and abundance of mesoherbivores .

A few studies talked about benthic algae of the Euphrates River in the middle region [1] , while many studies have addressed the implications to the composition and diversity of other groups of algae in different Aquatic systems such as [9](Shatt Al – Arab river) ; [10](Tigris river) ; [11](Euphrates river) ; [12] (Hilla river) ; [13](Euphrates river); [3](Shatt Al-Arab river) ; [14] (Euphrates river) and [1] (Euphrates river); [15] (Euphrates River) .

The purpose of the study was to determine the spatial and temporal distribution of Epiphytic algae along the Euphrates river in the middle region in Iraq.

Materials and Methods

The investigations were performed during periods from March 2012 to February 2013. in order to investigate composition of epiphytic algae on two aquatic plants species (*Potomageton erispus* and *Elusine indica*) in AL-Abasia (Euphrates) River , middle region , inside of Iraq , four sites were selected along of the river measuring 28 Km in length :

Site1 : The settlement of Al- Kifil city , before the branching of rivers to Al- Abasia and Al-Kufa River

Site 2: Al- Abasia bridge, at distance 3 Km of site1 (at this site, water quality is also affected by effluents of soft drink factory)

Site 3: Al- Abasia barrage

Site 4: The settlement of Al- Abasia city 13 Km at Longitude (at this site, the river is affected by effluents the urban wastewater) .

Qualitative study of Epiphytic algae was carried out according to Parsons et al. [16]

While a sedimentation method was used to quantitative study [17] . The identification of algae were done followed references: [10, 17, 18, 19, 20, 21, 22, 23].

Results and Discussion

The results of quantitative and qualitative of epiphytic algae on two species of macrophyta (*P. crispus* and *E. indica*) were showed in Table (1) and Figures (1-4).

Many studies deal with the epiphytic algae because the important role of this organisms in primary productivity [24] .

The study was recorded 152 species of epiphytic algae on both macrophyta species under study.

Bacillariophyta was recorded a highest number of species compared with other divisions of epiphytic algae (70% ; 69%) respectively on two host plant species , the results were shown by many author [9, 25, 26, 27, 28 and 29] .

The results of this study has showed a clear variation in the total account number of epiphytic species among host macrophyta and the density and distribution of this type of algae according to the arrangement of leaves , growth form , geometric morphology orientation and the age of host plant [30].

The present study was recorded highest total algal cell density (12801 cell*10³ mg / g) on leaves of aquatic plant *P. erispus* , while the lowest total algal cell density was recorded on shoot of *E. indic* (1117 cell *10³)mg/g) may be due to type of host macrophyta, growth from , variation of water quality and nutrients [24]. These results were compatible with many studies [27, 31, 32].

The study showed high value of species richness index of epiphytic algae (8-9) on the shoot of *E. indica* at site 3 during Feb . 2013. Diatom and green algae provide a nutrient rich food source to grazing herbivores, which may caused the overall low species richness of these two divisions , but cynophyta have many tools of defense allow to have limited losses to herbivory [33].

The month of sampling Significantly influenced the abundance and density of all algal divisions [5] .

The values of Shannon index for the study area referred to low diversity according to [34] these values ranged between (0.02 – 0.84 bit/ind.) during Feb . 2013 on *E. indica* , and ranged between (0.02-0.76 bit/ind) on *P.crispus* during Jan . 2013 .

Many factors affected on the epiphytic algae such as density of host macrophyta , growth form of plant , light penetration , suspended materials and nutrients [6, 35,36].

Table1. Total Number (cell×10⁴) of epiphytic algae on *potamogeton crispus* and *Elusine indica* in Euphrates River.

Epiphytic algae	<i>potamogeton crispus</i>			<i>Elusine indica</i>		
	Root	Shoot	leaves	Root	Shoot	leaves
Cyanophyceae						
<i>Anabaena cylindrica</i> Lemm	0.012	0.006	-	-	-	-
<i>A.sp</i>	-	-	-	0.006	-	-
<i>Anacystis nidulans</i> (Rich)Dro.and Dai.	-	-	0.21	-	-	-
<i>Aphanocapsa elachista</i> West and west	-	-	0.28	-	-	-
<i>Chroococcus disperus</i> (Keissle.)Lemm	-	-	-	0.021	-	-
<i>C. minutus</i> (Kütz.)Näg	-	-	-	-	-	0.022
<i>C.turgidus</i> (Kütz.)Näg	0.086	-	-	-	-	-
<i>Gomphorspaeria sp.</i>	-	-	-	-	0.017	-
<i>Mersmopedia glauca</i> (Her.)	0.01	-	-	-	-	-
<i>Microcystis SP.</i>	0.014	0.091	-	-	-	-
<i>Atractomorpha echinata</i> Hof.	0.031	-	-	-	-	-
<i>Bryopsis hypnoides</i> Lamour	-	-	-	-	0.038	-
<i>Characium ambiguum</i> Hermann	-	-	-	-	-	0.056
<i>Coelastrum microporum</i> Nägeli	-	0.022	-	-	-	-
<i>Cosmarium botrytis</i> Meneghinii	-	-	0.086	0.021	-	-
<i>C. subumidium</i> Nordstedt	-	-	-	-	-	-
<i>Draparnaldia judayi</i> Prescott	-	-	-	-	-	-

<i>Euastrum dubium</i> Näg.	0.044	-	0.029	-	-	-
<i>Mesotaenium kramstia</i> Lemm.	-	-	-	-	0.023	-
<i>Microspora pachyderma</i> (Wil.) Lagerheim	-	-	-	-	0.011	-
<i>Monostroma groenlandicu.</i> Ag	-	-	0.023	-	-	-
<i>Oedogonium cardiacum</i> (Hass.) Wittrock	-	-	-	-	-	0.35
<i>Netrium digitus</i> var . <i>lamellosum</i>	0.001	-	-	-	-	-
<i>Oedogonium cardiacum</i> (Hass.) Witt	-	-	-	-	-	0.042
<i>Palmodictyon</i> sp	-	-	0.021	-	-	-
<i>Pediastrum boryanum</i> (Turp.)Men	-	-	0.041	-	-	0.11
<i>Pyramimonas cirolanae</i>	-	-	-	0.019	-	-
<i>P. tetrahynchus</i> Scha.	-	-	0.21	-	-	0.28
<i>Scenedesmus quadricauda</i> (Turp.)Brëb.	-	-	-	-	-	0.082
<i>Selanastrum gracile</i> (Reinsch)Korsch	-	-	-	-	-	0.11
<i>Spirogyra fluviatilis</i> Hilae	-	0.023	0.046	-	-	-
<i>S. longata</i> (Vauch.)Kuetzing	-	0.031	0.025	-	0.052	0.012
<i>S.porticalis</i> (Muell.)Petit	-	0.23	-	-	-	-
<i>Spirogyra</i> sp.	0.055	-	-	-	-	-
<i>Staurastrum alternans</i>	0.32	-	-	-	-	-
<i>Staurastrum</i> sp.	-	-	0.02	-	-	-
<i>S.porticalis</i> (Muell.)Petit	-	0.23	-	-	-	-
<i>Spirogyra</i> sp.	0.055	-	-	-	-	-
<i>Tetraedron hastatum</i> (Reisch)Hansg.	0.34	-	-	-	-	-
<i>T.regulare</i> Ktz.	-	-	-	0.034	-	-
<i>Trochiscia reticularis</i> (Reinsch)Hansg.	-	-	-	-	0.21	-
<i>Ulothrix aequalis</i> Ktz.	-	-	-	-	0.22	0.052
<i>U. zonata</i> (Webre and Mohr.) Ktz.	-	-	0.066	-	-	-
<i>Zygnema conspicuum</i> (Hassalj)Transaeu	-	-	-	-	0.021	-
<i>Tetraedron hastatum</i> (Reisch)Hansg.	0.34	-	-	-	-	-
Bacillariophyta(centrales)						
<i>Cyclotella atomus</i> Grunow	-	0.25	-	-	-	-
<i>C. comta</i> (Ehr.)Kuetzing	-	-	0.11	-	-	-
<i>C. kuetzingiana</i> Thwaites	0.58	-	-	-	-	-
<i>C. meneghiniana</i> Kuetzing	0.21	-	0.22	-	-	-
<i>Diatoma vulgare</i>	-	-	0.44	0.11	-	-
<i>Ditylum brightwelli</i> (west)Grunow	-	-	-	-	0.52	-
<i>Ellerbeckia</i> sp.	-	-	-	-	-	0.16
<i>Hyalodiscus</i> sp.	-	0.62	-	-	-	-
<i>Guinardia delicatula</i> (Celeve)Halas	-	-	-	-	0.12	-
<i>G.striata</i> (Stolter.) Halas	-	-	0.13	-	-	-
<i>Licmophoraehrenbergii</i> (Kutz)Grunoalawa	-	-	0.31	-	-	-
<i>Rhizosolenia hebetata</i> Bailly	-	-	0.17	-	0.12	-
<i>Rh. imbricata</i> Brig.	0.15	-	-	-	-	0.21

<i>Stephanodiscus astraeva</i> var. <i>intermedia</i> Fri.	-	0.77	0.29	-	-	-
<i>S. niagarae</i> Ehr.	-	0.56	-	-	-	-
<i>S. tenuis</i> Hust.	-	-	0.42	-	-	-
<i>Stephanopyxis turris</i> (Grev.)Rafls	-	-	0.31	-	-	-
<i>T.eccentrica</i> (Ehr.)Cleve	-	-	0.81	-	-	-
<i>T.decipiens</i> (Grun.)Joørg.	-	-	0.51	-	-	-
<i>T. fluviatilis</i>	-	-	0.31	-	-	-
Bacillariophyta(pennales)						
<i>Acanthes flexella</i>	-	0.021	-	-	-	-
<i>A. microcephala</i> (Kütz.)Gr.	-	-	0.21	0.07	-	-
<i>A. minutissima</i> Kütz.	0.41	-	-	-	-	-
<i>A. saxonica</i> Kras.&Hust	-	-	-	-	-	0.18
<i>Amphipora alata</i> Kütz.	-	-	0.29	-	-	-
<i>Amphora bullatoides</i> Hohn et Grun	-	-	-	-	0.48	-
<i>A. coffeaeformis</i> (Ag.) Kütz.	0.77	-	-	-	-	-
<i>A. holsatica</i> Husted	-	-	0.31	-	-	-
<i>A. ovalis</i> kütz.	-	0.33	-	0.33	-	-
<i>A.pediculus</i>	0.097	-	-	-	-	-
<i>A. veneta</i> Kütz.	-	-	-	-	0.26	-
<i>Anomoeoneis</i> sp.	-	-	0.55	-	-	-
<i>C. silicula</i> Celve	-	0.75	-	-	-	-
<i>C. ventricosa</i> Meister	-	-	-	-	0.72	0.61
<i>Cocconies placentula</i> var. <i>euglypta</i>	-	-	-	-	0.81	0.43
<i>C.placentula</i> var.Ehrenberg	-	0.31	-	-	-	-
<i>C. placentula</i> var. <i>euglypta</i> Ehr.)Cleve	-	-	-	-	0.39	-
<i>Cymbella affinis</i> Kützing	0.52	-	-	-	-	-
<i>C. aspera</i> (Ehr.)Cleve	-	-	0.26	-	-	-
<i>C. cistula</i> (Hemp.) Grunow	-	-	-	0.64	-	-
<i>C.microcephala</i> Grunow	-	0.33	-	-	-	0.51
<i>C.pusilla</i> Grunow	-	-	0.71	-	-	-
<i>C. tumida</i> (Bréb.)V.Heurck	0.22	-	-	-	-	-
<i>C.turgida</i> (Greg.) Cleve	-	-	0.22	-	-	-
<i>Denticula raintierensis</i> Sov	-	-	-	-	-	0.91
<i>Eunotia formica</i> Ehrenberg	-	-	-	-	0.51	-
<i>E.validia</i> Hustedt	-	-	-	-	0.72	-
<i>Eunotia</i> sp.	0.21	-	-	-	-	-
<i>Fragilaria brevistriata</i> Grunow	-	-	-	0.92	-	-
<i>F. copucina</i> Desmazieres	-	0.23	-	-	-	-
<i>Fragilaria</i> sp	0.82	-	-	-	-	-
<i>Gomphonema acuminatum</i> Ehrenberg	-	-	0.09	-	0.72	-
<i>G. angustatum</i> var. <i>undulata</i> Grunow	-	-	-	0.71	-	-
<i>G.augur</i> Ehrenberg	-	-	-	-	-	0.82

<i>G.gracile</i> fo. <i>torris</i> (Ehr.) Hustedt	-	0.61	-	-	-	-
<i>G.intricatum</i> Kützing	-	-	-	-	0.25	0.24
<i>G. intricatum</i> var. <i>lunata</i> nov.	-	-	0.27	-	-	-
<i>G. intricatum</i> var. <i>pumila</i> Grunow	-	-	-	0.41	-	-
<i>G.longiceps</i> Ehrenberg	-	-	-	-	0.70	-
<i>G.montonum</i> Schumdt	0.79	-	-	-	-	-
<i>Navicula atomus</i> (Kuetzing)Grunow	-	0.72	-	-	-	-
<i>N. bacillum</i> Ehrenberg	-	0.63	-	-	-	0.39
<i>N. cryptocephala</i> kütz	-	-	0.63	-	-	-
<i>N. cuspidate</i> (Kütz) Kütz.	-	-	-	-	0.81	-
<i>N. decussis</i> Oestrup	0.64	-	-	-	-	-
<i>N. dicephala</i> W.Smith	-	-	-	0.55	-	-
<i>N. gastrum</i> (Ehr.) Kuetzing	-	-	0.28	-	-	-
<i>N. gracilis</i> Her	-	-	-	-	-	0.71
<i>Navicula atomus</i> (Kuetzing)Grunow	0.72	-	-	-	-	-
<i>N. parva</i> (Ehr.)Ra.	-	0.47	-	-	-	-
<i>N. pseudotuscula</i> Hust.	-	-	-	0.52	-	-
<i>N.reinhardtii</i> Grun.	-	0.72	-	-	-	-
<i>N.seminulum</i> Grun	-	-	0.61	-	-	0.73
<i>Nedium affine</i> (Ehr.)Pf.	-	-	-	0.43	-	-
<i>N. acicularis</i> (kütz.) Sm.	-	-	-	-	0.63	-
<i>Nitzschia acuta</i> Hantzsch	-	0.42	-	-	-	-
<i>Ni. amphibian</i> Grunow	-	0.62	-	-	-	-
<i>Ni.angustata</i> (W.Sm.)Grunow	-	-	0.55	-	-	0.73
<i>Ni.capitellata</i> Hust	-	-	0.90	-	-	0.51
<i>Ni. micrcephala</i> Grun	-	-	0.77	-	-	-
<i>Ni. rostellate</i> Hust.	0.31	-	-	-	-	-
<i>Ni. sigmoidea</i> (Ehr.) Smith	-	-	-	-	-	0.81
<i>Ni. tryblionella</i> Hantsch	-	-	0.72	-	-	-
<i>N. umbonata</i> Lang-Bertalot	-	-	0.71	0.71	-	-
<i>Ni. vermicularis</i> (Kütz.)Grun.	-	0.16	-	-	-	-
<i>Pinnularia lata</i> (Bréb.) Smith	0.31	-	-	-	-	-
<i>Pleurosigma salinarum</i> Grunow	-	-	-	0.48	-	-
<i>Rhoicosphenia curvata</i> (Kütz.) Grunow	-	-	-	-	0.44	-
<i>Rhopalodia gibba</i> (Ehr.) Müller	-	0.33	-	-	-	-
<i>Rhopalodia gibba</i> var. <i>ventricosa</i> (Ehr.) Grunow	-	-	0.23	-	-	-
<i>Rhopalodia parallela</i> (Grun.) Müller	0.38	-	-	-	-	0.44
<i>Synedra acus</i> var. <i>radians</i> Kützing	-	-	-	0.61	-	-
<i>Synedra acus</i> var. <i>radians</i> Kützing	-	-	-	0.61	-	-
<i>S.affinis</i> Kützing	0.62	-	-	-	-	-

<i>S.capitata</i> Ehrenberg	-	-	-	-	0.51	-
<i>S.fasciculata</i> (Kütz.)Grunow	-	0.098	-	-	-	-
<i>S.rumpens</i> Kützing	-	-	0.66	-	-	-
<i>S.rumpens</i> var. <i>fragilarioides</i> Grunow	-	0.51	-	-	-	-
<i>Tetraspora cylindrical</i> (Whal)Agardah	-	-	-	-	-	0.63
<i>Trebouxia cladoniae</i> (Chod) Sm.	-	-	-	0.33	-	0.84
<i>Treubaria setigerum</i> (Archer)Sm.	-	-	0.24	-	-	-
<i>Trebouxia cladoniae</i> (Chod)	-	-	-	-	-	0.099

Table 2.Species richness index of epiphytic algae on the parts of plants under study site 1 between 2012-2013

Aquatic macrophyta	Plant parts	March	April	May	June	July	August	September	October	November	December	January	February
		2012										2013	
<i>P. crispus</i>	Root	0	0	0	0.67	1.3	0	0	0	2.3	1.6	0.4	3.7
	Shoot	1.3	0	0	0	2.9	3.2	0	0	0.77	2.7	1.6	1.1
	Leaf	0.1	0	0	1.1	0	0.03	0	3.1	0	0	0	2
<i>E.indica</i>	Root	0.5	0.3	0.4	0	0	0.8	2.1	2.3	1.1	9.4	4.8	9.5
	Shoot	0	0	1.1	0.03	0	2.2	0.07	0	0	1.0	2.9	4.3
	Leaf	0.01	0.02	0.2	0.5	1.2	1.1	0	1.1	2.1	0	2.1	0.3

Table3.Species richness index of epiphytic algae on the parts of plants under the study in site 2 between 2012-2013

Aquatic macrophyta	Plant parts	March	April	May	June	July	August	September	October	November	December	January	February
		2012										2013	
<i>p. crispus</i>	Root	0	0.6	0.6	1.2	0.6	1.8	2.4	3.08	0.6	0.04	4.9	2.4
	Shoot	1.03	2.07	0.011	1.5	5.2	2.5	3.1	4.14	4.6	5.1	7.2	9.3
	Leaves	2.4	1.9	1.4	1.4	2.4	1.9	0.98	4.4	6.9	4.9	7.4	8.8
<i>E.indica</i>	Root	0	0	0	0	0	0	0	0	1.5	0.76	0.76	3.07
	Shoot	0	0	0	0	0.6	0	0	0.63	0.63	8.9	5.7	9.5
	Leaves	2.1	2.1	1.07	0.5	0	0	0	0	0	2.6	3.2	2.6

Table 4. Species richness index of epiphytic algae on the parts of plants under study in site 3 during 2012-2013

Aquatic	Parts plant	March	April	May	June	July	August	September	October	November	December	January	February
		2012										2013	
<i>P.crispus</i>	Root	0.1	0.1	0.01	0.02	0	0	7.2	3.1	4.2		9.3	10.07
	Shoot	0	2.1	0.04	0.08	0.1	0	9.1	0	1.1	4.1	4.1	1.1
	Leaf	0	0.09	0	0.02	0	0	4.1	0	1.1	0	0	10.2
<i>E..indica</i>	Root	0	0.5	0.12	0	0.8	0	2.7	5.1	3.4	3.4	21.5	9.3
	Shoot	0.04	0.5	0.3	0	0.5	0	3.2	0	3.3	3.7	3.3	11.3
	Leaf	2.1	0.7	0.5	0	2.1	2.1	1.1	0	4.3	3.1	0	4.1

Table 5. Species richness index of epiphytic algae on the parts of plants under study in site 4 during 2012- 2013

Aquatic macrophyta	Parts plant	March	April	May	June	July	August	September	October	November	December	January	February
		2012										2013	
<i>P.crispus</i>	Root	0	2.1	0	0.18	0.72	0	0.58	0	0.1	0	0	0.7
	Shoot	0	0.5	0	0	0	0.14	0	0.35	0.5	0	1.5	0.1
	Leaf	0.2	0	0.5	0	0.38	0	0	0.18	1.1	0.07	0.8	0.6
<i>E..indica</i>	Root	0	0.09	0	0.1	0.3	0	0	0.1	0.2	0.6	2.9	0.3
	Shoot	0	0	0.8	0.04	0	0	0	0	0.12	0.5	0.6	0.6
	Leaf	0	0	0.2	0	0	0.2	0	0	0	4.9	9.4	4.7

Table 6. Shannon- wiener diversity index of epiphytic algae on the parts of plants under study in site 1 during 2012- 2013

Aquatic macrophyta	Parts plant	March	April	May	June	July	August	September	October	November	December	January	February
		2012										2013	
<i>P.crispus</i>	Root	0.08	0.14	0.14	0.18	0.14	0.22	0.25	0.30	0.14	0.18	0.33	0.27
	Shoot	0.11	0.11	0.88	0.35	0.36	3.91	0.31	0.34	0.20	0.33	0.35	0.26
	Leaf	0.34	0.36	0.32	0.27	0.13	0.34	0.35	0.54	0.32	0.54	0.43	0.43
<i>E.indica</i>	Root	0.03	0.12	0.17	0.11	0.18	0.33	0.36	0.12	0.04	0.33	0.33	0.
	Shoot	0.51	0.11	0.10	0.11	0.12	0.12	0.26	0.10	0.42	0.23	0.11	0.11
	Leaf	0.32	0.21	0.14	0.16	0.12	0.32	0.12	0.13	0.24	0.20	0.32	0.32

Table 7. Shannon- wiener diversity index of epiphytic algae on the parts of plants under the study in site 2 between 2012- 2013

Aquatic macrophyta	Parts plant	March	April	May	June	July	August	September	October	November	December	January	February
		2012										2013	
<i>P. crispus</i>	Root	0.36	0.35	0.36	0.26	0.16	0.32	0.21	0.44	0.22	0.11	0.08	0.021
	Shoot	0.27	0.31	0.35	0.31	0.33	0.33	0.44	0.16	0.25	0.13	0.032	0.05
	Leaf	0.12	0.09	0.12	0.65	0.23	0.14	0.11	0.32	0.31	0.13	0.03	0.01
<i>E .indica</i>	Root	0.22	0.17	0.13	0.15	0.12	0.18	0.33	0.36	0.29	0.09	0.52	0.21
	Shoot	0.31	0.26	0.14	0.11	0.32	0.32	0.11	0.13	0.14	0.42	0.13	0.05
	Leaf	0.22	0.15	0.17	0.15	0.24	0.31	0.06	0.22	0.26	0.25	0.22	0.035

Table 8. Shannon- wiener diversity index of epiphytic algae on the parts of plants under study in site 3 during 2012- 2013

Aquatic macrophyta	Parts plant	March	April	May	June	July	August	September	October	November	December	January	February
		2012										2013	
<i>p. crispus</i>	Root	0.32	0.11	0.36	0.27	0.32	0.28	0.34	0.28	0.20	0.28	0.09	0.11
	Shoot	0.33	0.36	0.38	0.27	0.20	0.35	0.33	0.22	0.27	0.14	0.18	0.08
	Leaf	0.33	0.12	0.22	0.33	0.32	0.13	0.22	0.13	0.33	0.23	0.43	0.07
<i>E. indica</i>	Root	0.22	0.41	0.13	0.28	0.17	0.41	0.11	0.32	0.38	0.33	0.44	0.05
	Shoot	0.24	0.33	0.22	0.22	0.23	0.22	0.11	0.31	0.22	0.44	0.31	0.05
	Leaf	0.32	0.33	0.34	0.33	0.41	0.31	0.33	0.62	0.42	0.08	0.86	0.027

Table 9. Shannon- wiener diversity index of epiphytic algae on the parts of plants under study in site 4 during 2012- 2013

Aquatic macrophyta	Parts plant	March	April	May	June	July	August	September	October	November	December	January	February
		2012										2013	
<i>p. crispus</i>	Root	0.34	0.32	0.12	0.32	0.23	0.23	0.16	0.44	0.11	0.33	0.24	0.05
	Shoot	0.32	0.21	0.33	0.31	0.21	0.32	0.23	0.12	0.22	0.23	0.02	0.08
	Leaf	0.43	0.32	0.32	0.33	0.23	0.33	0.22	0.33	0.23	0.12	0.45	0.34
<i>E. indica</i>	Root	0.32	0.22	0.21	0.43	0.22	0.22	0.26	0.44	0.32	0.33	0.5	0.06
	Shoot	0.31	0.32	0.32	0.22	0.21	0.24	0.44	0.13	0.21	0.43	0.33	0.08
	Leaf	0.24	0.32	0.32	0.21	0.33	0.23	0.33	0.23	0.44	0.32	0.33	0.06

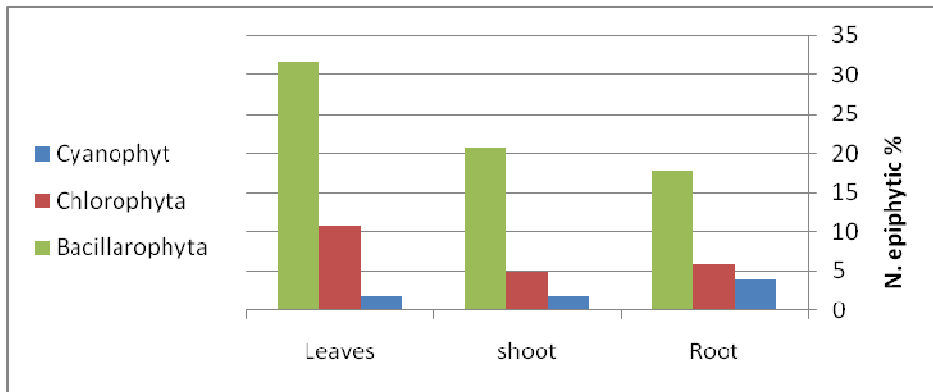


Figure 1. Number epiphytic algae on Root , Shoot and leaves *Potamageton crispus* in Euphrates River between Al-Kifil and Al-Abbasiya city. from March, 2012 to February,2013.

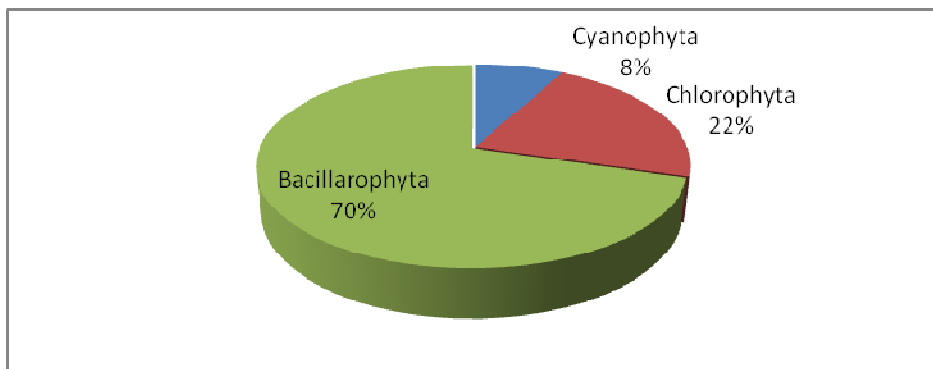


Figure 2. Percentage epiphytic algae of *Potamageton crispus* in Euphrates River from March, 2012 to February,2013



Figure 3. Number epiphytic algae on Root , Shoot and leaves *Eulsine indica* in Euphrates River from March, 2012 to February,2013.

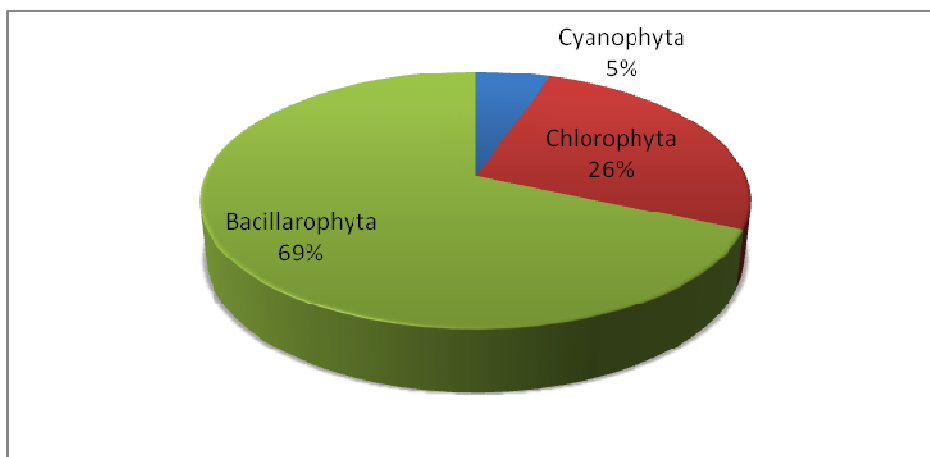


Figure 4. percentage epiphytic algae of *Eulsine indica* in Euphrates River from March, 2012 to February,2013.

Conclusion

The results revealed that spatial and temporal variation of epiphytic algae on two species of aquatic macrophyta dependent to growth form of host plant ; parts of plant under study plant morphology and seasonal water level variations the results were showed low diversity according the shanon index .

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