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COMPOSITION AND STRUCTURE OF EPIPHYTIC ALGAE ON TWO AQUATIC MACROPHYTA SPECIESE DISTRIBUTION ON THE EUPHRATES (AL-ABASSIA) RIVER, IRAQ

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ABSTRACT

The present work included study of epiphytic algae on two species of aquatic plants (*Potomogeton crispus* and *Eusine indica*) of the Al – Abasia / Euphrates river in middle region of Iraq from March 2012 to February 2013. The investigation region encompassed four Location 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 $x10^3$was individual / g as low value on shoot of *E. indica* and 12801.12 $x10^3$individuals /gm as high value on leave 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.

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 (Hassan *et al*., 2014) 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 (Rogers and Breen, 1981), but increased epiphytic algae may reduce the diffusion of nutrients from water column to aquatic macrophyte leading to reduced plant biomass all growth (Al-Saboonchi and Al-Manshad, 2012), while, macrophytes may benefit from the reduced grazing pressure by herbivores (Gil *et al*., 2006). 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 (Verbulst, 2013; Demir *et al*., 2014). Many studies deal with epiphytie algae such as Mabrouk *et al*. (2014) how 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. Buza – Jacobucci and Pereira – Leite (2014) study the influence of particular epiphytic algae on distribution and abundance of mesoherbivores. A few studies talked about benthic algae of the Euphratos River in the middle region (Hassan *et al*., 2014), while many studies have addressed the implications to the composition and diversity of other groups of algae in different Aquatic systems such as Al. Esia, 2004 (shatt Al – Arab river); Hassan *et al*., 2012 (southern marshs); Salman *et al*., 2013 (Euphrates river); Hassan *et al*., 2008 (Hilla river); Hassan *et al*., 2010 (Euphrates river); Al-Saboonchi and Al-Manshad, 2012 (Shatt Al-Arab river); Salman, *et al*., 2012 (Euphrates river) and Hassan *et al*., 2014 (Euphrates river); Salman *et al*., 2014 (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 inside Iraq

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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 (Fig . 1) :

Site1: the settlement of Al- Kifil city, before the bronchial of rivers 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 location, the river is about affected by effluents the urban wastewater)

Qualitative study of Epiphytic algae was carried out according to (Person *et al.*, 1984). While a sedimentation method was used to quantitative study (Hadi *et al*., 1984). The identification of algae were done followed references: Desikachary, 1959; Prescott, 1973; Germain, 1981; Hinton and Moulood, 1982; Hadi *et al*., 1984; Hustedt, 1985; Hassan *et al.,* 2012 and Al- Hassany and Hassan, 2014.

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 (Parnoja *et al*., 2014). 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

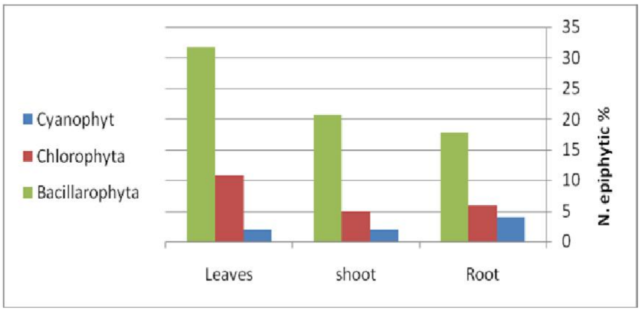

Fig. 1. Number epiphytic algae on Root, Shoot and leaves *Potamageton crispus* in Euphrates River between Al-Kifil and Al-Abbasiya city. from March, 2012 to February, 2013

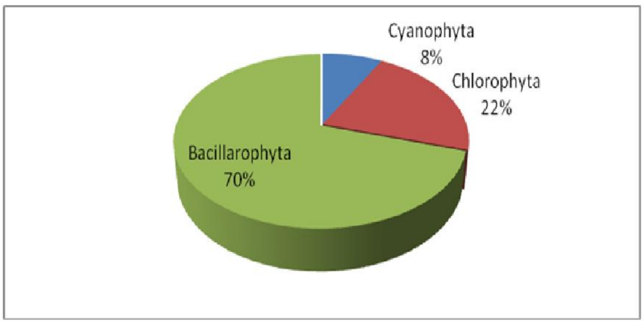

Fig. 2. percentage epiphytic algae of *Potamageton crispus* r in Euphrates River from March, 2012 to February, 2013

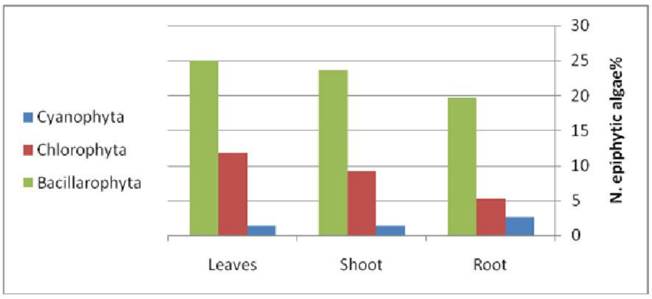

Fig. 3. Number epiphytic algae on Root, Shoot and leaves *Eulsine indica* in Euphrates River from March, 2012 to February, 2013

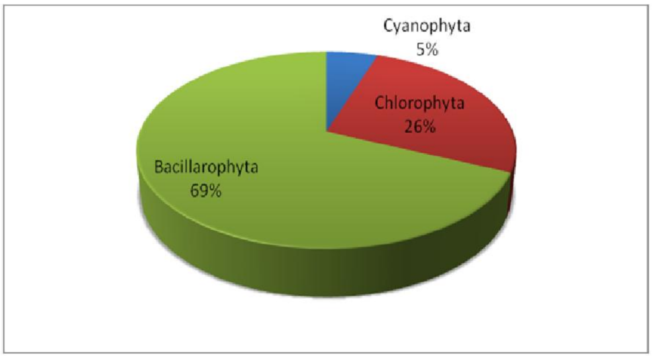

Fig. 4. percentage epiphytic algae of *Eulsine indica* in Euphrates River from March, 2012 to February, 2013

species, the results were shown by many author (Al. Eisa, 2004; Hassan *et al*., 2007; Messyasz and Kippen, 2006; Al-Fatlaw, 2011; Al- Dulaimi, 2013 and Salman *et al*., 2013 b). 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 (Mohan and Krisha, 2014). The present study was recorded highest total algal cell density (12801 cell*10^3 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 *10^3) mg/g) may be due to type of host macrophyta, growth from, variation of water quality and nutrients (Parnoja *et al*., 2014). These results were compatible with many studies (Kassim *et al*., 2000; Al- Farhan, 2010; Al-Fatlawi, 2011).

The study was 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 cynophta have many tools of defense allow to have limited losses to herbivory (Baker *et al*., 2008). The month of sampling Significantly influenced the abundance and density of all algal divisions (Verbulst, 2013). The values of Shannon index for the study area referred to low diversity according to (Chung and Lee, 2008) 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 (Demir *et al*., 2014; Pranoja *et al*.; 2014)

Table 1. Total Number (cell×10^4) of epiphytic algae Algae on *potamogeton crispus* and *Elusine indica* in Euphrates River

Epiphytic algae	*potamogeton crispus*			*Elusine indica*		
Cyanophyceae	Root	Shoot	leaves	Root	Shoot	leaves
*Anabaena cylindrica*Lemm	0.012	0.006	-	-	-	-
A.sp	-	-	-	0.006	-	-
Anacystis nidulans(Rich)Dro.and Dai.	-	-	0.21	-	-	-
Aphanocapsa elachista West and west	-	-	0.28	-	-	-
Chroococcus disperus(Keissle.)Lemm	-	-	-	0.021	-	-
C. minutus (Kütz.)Näg	-	-	-	-	-	0.022
C.turgidus (Kütz.)Näg	0.086	-	-	-	-	-
Gomphorspaeria sp.	-	-	-	-	0.017	-
Mersmopedia glauca(Her.)	0.01	-	-	-	-	-
Microcystis SP.	0.014	0.091	-	-	-	-
*Atractomorpha echinata*Hof.	0.031	-	-	-	-	-
Bryopsis hypnoides Lamour	-	-	-	-	0.038	-
*Characium ambiguum*Hermann	-	-	-	-	-	0.056
Coelastrum microporum Nägeli	-	0.022	-	-	-	-
Cosmarium botrytis Meneghinii	-	-	0.086	0.021	-	-
C. subtumidium Nordstedt	-	-	-	-	-	-
Draparnaldia judayi Prescott	-	-	-	-	-	-
Euastrum dubium Näg.	0.044	-	0.029	-	-	-
Mesotaenium kramstia Lemm.	-	-	-	-	0.023	-
Microspora pachyderma(Wil.) Lagerheim	-	-	-	-	0.011	-
Monostroma groenlandicu. Ag	-	-	0.023	-	-	-
Oedogonium cardiacum (Hass.) Wittrock	-	-	-	-	-	0.35
Netrium digitus var *.lamellosum*	0.001	-	-	-	-	-
Oedogonium cardiacum (Hass.) Witt	-	-	-	-	-	0.042
Palmodictyon sp	-	-	0.021	-	-	-
Pediastrum boryanum (Turp.)Men	-	-	0.041	-	-	0.11
Pyramimonas cirolanae	-	-	-	0.019	-	-
P. tetrahynchus Scha.	-	-	0.21	-	-	0.28
Scenedesmus quadricauda(Turp.)Brěb.	-	-	-	-	-	0.082
Selanastrum gracile (Reinsch)Korsch	-	-	-	-	-	0.11
Spirogyra fluviatilis Hilae	-	0.023	0.046	-	-	-
S. longata (Vauch.)Kuetzing	-	0.031	0.025	-	0.052	0.012
S.porticalis (Muell.)Petit	-	0.23	-	-	-	-
Spirogyra sp.	0.055	-	-	-	-	-
Staurastrum alternans	0.32	-	-	-	-	-
Staurastrum sp.	-	-	0.02	-	-	-
S.porticalis (Muell.)Petit	-	0.23	-	-	-	-
Spirogyra sp.	0.055	-	-	-	-	-
Tetraedron hastatum (Reisch)Hansg.	0.34	-	-	-	-	-
T.regulare Ktz.	-	-	-	0.034	-	-
Trochiscia reticularis (Reinsch)Hansg.	-	-	-	-	0.21	-
Ulothrix aequalis Ktz.	-	-	-	-	0.22	0.052
U. zonata (Webre and Mohr.) Ktz.	-	-	0.066	-	-	-
Zygnema conspicuum (Hassalj)Transaeu	-	-	-	-	0.021	-
Tetraedron hastatum (Reisch)Hansg.	0.34	-	-	-	-	-
Bacillariophyta(centrales)						
*Cyclotella atomus*Grunow	-	0. 25	-	-	-	-
C. comta(Ehr.)Kuetzing	-	-	0.11	-	-	-
*C. kuetzingiana*Thwaites	0.58	-	-	-	-	-
C. meneghiniana Kuetzing	0.21	-	0.22	-	-	-
Diatoma vulgar	-	-	0.44	0.11	-	-
Ditylum brightwelli (west)Grunow	-	-	-	-	0.52	-
Ellerbeckia sp.	-	-	-	-	-	0.16
Hyalodiscus sp.	-	0.62	-	-	-	-
Guinardia delicatula (Celeve)Halas	-	-	-	-	0.12	-
G.striata (Stolter.) Halas	-	-	0.13	-	-	-
Licmophoraehrenbergii (Kutz)Grunoalawa	-	-	0. 31	-	-	-
Rhizosolenia hebetata Baily	-	-	0.17	-	0.12	-
Rh. imbricata Brig.	0.15	-	-	-	-	0.21
Stephanodiscus astraea var. *intermedia* Fri.	-	0.77	0.29	-	-	-
S. niagarae Ehr.	-	0.56	-	-	-	-
S .tenuis Hust.	-	-	0.42	-	-	-
Stephanopyxis turris (Grev.)Rafls	-	-	0.31	-	-	-
T.eccentrica (Ehr.)Cleve	-	-	0.81	-	-	-
T.decipiens(Grun.)Joørg.	-	-	0.51	-	-	-
T. fluviatilis	-	-	0.31	-	-	-

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Bacillariophyta(pennales)						
Achanthes flexella	-	0.021	-	-	-	-
A. microcephala (Kütz.)Gr.	-	-	0.21	0.07	-	-
A. minutissima Kütz.	0.41	-	-	-	-	-
A. saxonica Kras.&Hust	-	-	-	-	-	0.18
Amphipora alata Kütz.	-	-	0.29	-	-	-
Amphora bullatoides Hohn et Grun	-	-	-	-	0.48	-
A. coffeaeformis (Ag.) Kütz.	0.77	-	-	-	-	-
A. holsatica Husted	-	-	0.31	-	-	-
A. ovalis kütz.	-	0.33	-	0.33	-	-
A.pediculus	0.097	-	-	-	-	-
A. veneta Kütz.	-	-	-	-	0.26	-
Anomoeoneis sp.	-	-	0.55	-	-	-
C. silicula Celve	-	0.75	-	-	-	-
C. ventricosa Meister	-	-	-	-	0.72	0.61
Cocconies placentula var.euglypta	-	-	-	-	0.81	0.43
C.placentula var.Ehrenberg	-	0.31	-	-	-	-
C. *placentula* var. *euglypta* Ehr.)Cleve	-	-	-	-	0.39	-
Cymbella affinis Kützing	0.52	-	-	-	-	-
C. *aspera* (Ehr.)Cleve	-	-	0.26	-	-	-
C. cistula (Hemp.) Grunow	-	-	-	0.64	-	-
C.microcephala Grunow	-	0.33	-	-	-	0.51
C.pusilla Grunow	-	-	0.71	-	-	-
C. tumida (Bréb.)V.Heurck	0.22	-	-	-	-	-
C.turgida (Greg.) Cleve	-	-	0.22	-	-	-
Denticula rainterensis Sov	-	-	-	-	-	0.91
Eunotia formica Ehrenberg	-	-	-	-	0.51	-
*E.validia*Hustedt	-	-	-	-	0.72	-
Eunotia sp.	0.21	-	-	-	-	-
Fragilaria brevistriata Grunow	-	-	-	0.92	-	-
*F. copucina*Desmazieres	-	0.23	-	-	-	-
Fragilaria sp	0.82	-	-	-	-	-
Gomphonema acuminatum Ehrenberg	-	-	0.09	-	0.72	-
G. angustatum var.*undulata*Grunow	-	-	-	0.71	-	-
G.augur Ehrenberg	-	-	-	-	-	0.82
G.gracile fo. *torris*(Ehr.) Hustedt	-	0.61	-	-	-	-
G.intricatum Kützing	-	-	-	-	0.25	0.24
G. intricatum var. *lunata* nov.	-	-	0.27	-	-	-
G. intricatum var. *pumila* Grunow	-	-	-	0.41	-	-
G.longiceps Ehrenberg	-	-	-	-	0.70	-
G.montonum Schumdt	0.79	-	-	-	-	-
Navicula atomus(Kuetzing)Grunow	-	0.72	-	-	-	-
N. bacillum Ehrenberg	-	0.63	-	-	-	0.39
N. cryptocephala kütz	-	-	0.63	-	-	-
N .cuspidate(Kütz) Kütz.	-	-	-	-	0.81	-
N. decussis Oestrup	0.64	-	-	-	-	-
N. dicephala W.Smith	-	-	-	0.55	-	-
N. gastrum(Ehr.) Kuetzing	-	-	0.28	-	-	-
N. gracilis Her	-	-	-	-	-	0.71
Navicula atomus(Kuetzing)Grunow	0.72	-	-	-	-	-
N. parva (Ehr.)Ra.	-	0.47	-	-	-	-
N. pseudotuscula Hust.	-	-	-	0.52	-	-
N.reinhardtii Grun.	-	0.72	-	-	-	-
N.seminulum Grun	-	-	0.61	-	-	0.73
Nedium affine (Ehr.)Pf.	-	-	-	0.43	-	-
N. acicularis(kütz.) Sm.	-	-	-	-	0.63	-
Nitzschia acuta Hantzsch	-	0.42	-	-	-	-
Ni. amphibian Grunow	-	0.62	-	-	-	-
Ni.angustata(W.Sm.)Grunow	-	-	0.55	-	-	0.73
Ni.capitellata Hust	-	-	0.90	-	-	0.51
Ni. micrcephala Grun	-	-	0.77	-	-	-
Ni. rostellate Hust.	0.31	-	-	-	-	-
Ni. sigmoidea (Ehr.) Smith	-	-	-	-	-	0.81
Ni. tryblionella Hantsch	-	-	0.72	-	-	-
N. umbonata Lang-Bertalot	-	-	0.71	0.71	-	-
*Ni. vermicularis (*Kütz.)Grun.	-	0.16	-	-	-	-
Pinnularia lata (Bréb.) Smith	0.31	-	-	-	-	-
Pleurosigma salinarum Grunow	-	-	-	0.48	-	-
Rhoicosphenia curvata (Kütz.) Grunow	-	-	-	-	0.44	-
Rhopalodia gibba (Ehr.) Müller	-	0.33	-	-	-	-
Rhopalodia gibba var. *ventricosa* (Ehr.) Grunow	-	-	0.23	-	-	-
Rhopalodia parallela (Grun.) Müller	0.38	-	-	-	-	0.44
Synedra acus var. *radians*Kützing	-	-	-	0.61	-	-

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Synedra acus var. *radians*Kützing	-	-	-	0.61	-	-
*S.affinis*Kützing	0.62	-	-	-	-	-
*S.capitata*Ehrenberg	-	-	-	-	0.51	-
S.fasciculata(Kütz.)Grunow	-	0.098	-	-	-	-
*S.rumpens*Kützing	-	-	0.66	-	-	-
S.rumpens var. *fragilarioides*Grunow	-	0.51	-	-	-	-
Tetraspora cylindrical(Whal)Agardah	-	-	-	-	-	0.63
*Trebouxia cladoniae (*Chod) Sm.	-	-	-	0.33	-	0.84
Treubaria setigerum(Archer)Sm.	-	-	0.24	-	-	-
Trebouxia cladoniae (Chod)	-	-	-	-	-	0.099

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

Aquatic maceophyta	Plant parts	March	April	May	June	July	August	September	October	November	Decmber	January	February
		2012										2013	
p. crispus	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
E.indica	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 3. Species richness index of epiphytic algae on the parts of plants under the study in site 2 between 2012-2013

Aquatic macrphyta	Plant parts	March	April	May	June	July	August	September	October	November	December	January	February
		2012										2013	
P. crispus	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
E.indica	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

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	
P.crispus	Root	0.1	0.1	0.01	0.02	0	0	7.2	3.1	4.2		9.3	
	Shoot	0	2.1	0.04	0.08	0.1	0	9.1	0	1.1	4.1	4.1	1.1
	Lea f	0	0.09	0	0.02	0	0	4.1	0	1.1	0	0	10.2
E..indica	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	
P.crispus	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
E..indica	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	
P.crispus	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
E.indica	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	
P. crispus	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
E .indica	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	
p. crispus	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
E. indica	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	arts plant	March	April	May	June	July	August	September	October	November	December	January	February
		2012										2013	
p. crispus	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
E. indica	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

Conclusion

Our results suggest 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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