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Study of the quality of attach algae to the concrete supports of some bridges within Baghdad city

Zainab Faleeh Moussa[1*], Buthaina Abdul Aziz Hassan Al-Magdamy[2]

[1],[2] Department of Biology, College of Education for Pure Sciences/ Ibn Al-Haytham- University of Baghdad/ Iraq
EM: buthena.a.h@ihcoedu.uobaghdad.edu.iq

*Corresponding author: Zainab Faleeh Moussa (buthena.a.h@ihcoedu.uobaghdad.edu.iq)

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Abstract

A study of taxonomic quality of algae attaching Three concert bridges built on the Tigris River within city of Baghdad including Al-Jadriyah Bridge in Al-Jadriyah area and the Bab Al-Mu'adam Bridge in Al-Shalajiya area, while the third site included Al-Muthanna Bridge in north of Baghdad city, for the period from Autumn 2021 and Winter 2022. The study identified 114 species of 32 Genus in which the predominance of Bacillariophceae (74 species, 14 Genus) Followed by Cyanophyceae (30species, 12 Genus) and 10 species (6 Genus) of Chlorophyceae. The study showed an increase in species of Bacillariophceae, Cyanophyceae which has the ability to secretion gelatinous substances that enable it to stick to solid stand, the number of the largest species recorded in Bab Al-Mu'adam Bridge for all species followed by the Al-Jadriyah Bridge and the least few species recorded in the Al-Muthanna Bridge.

Keywords
Concert bridges, Bacillariophceae , attache algae, bridge.

Water is a necessary element of life as most living organisms live in water and occupy almost 90% of the water area in addition to its use in many areas of daily life and these waters include rivers, salt, still, snow and moisture (Al-Muthanani and Al-Salman, 2009). Despite the importance of fresh water, its proportion low compared to salt water and as a result of the constant movement of rivers this has helped the constant mixing of the upper and lower layers of water and has helped to spread nutrients and organic matter, making the river environment highly biodiverse (Bere and Tundisi, 2012). Due to the increase in traffic problems and the increase in economic losses due to road congestion and slow water transport, this led to finding solutions to these obstacles by establishing bridges, which are one of the best ways to overcome these problems and therefore they help to connect cities and governorates with each other in addition to the transport of goods, gas and oil, for this reason bridges are one of the most important anchor structures that are closely related to the transport (Al-Obeidi et al., 2020). Benthic algae are prokaryotic or eukaryotic algae found at the bottom or attach to the objects submerged inside the water and an important source of oxygen, benthic algae characteristic their response to changes in water quality as contaminated water helps greatly in the diversity of attach algae (Al-Salman et al., 2018).

The results of studies carried out by the researchers also found that the benthic algae diagnosed at those sites secrete many substances according to their type, where some of them work to secrete substances of a protein nature that help them attach to objects submerged in water, which may cause damage to those objects

(Abowei, 2010; Sharma et al., 2012;Al-Dulaimi, 2013; Al-Hassany and Al-Bayati 2017).
In order to preserve the structure of bridges, minimize the causes that may damage bridges and minimize damage to the economic structure of society, the aim of the current research is to study the quality of algae attaching to the concrete supports of some bridges of the city of Baghdad on the Tigris River

Materials and Methods

Three sites were identified for bridges built on the Tigris River within the city of Baghdad to collect samples of algae attaching to their concrete supports, including Al-Jadriyah Bridge in Al-Jadriyah area and the Bab Al-Mu'adam Bridge in Al-Shalajiya area, while the third site included Al-Muthanna Bridge in the Figure (1) area, and the samples of the attaching algae were collected using a PVC delimiter device (Fetscher et al., 2010) from the study sites monthly during the months of autumn 2021 and winter 2022. The species of attach algae have been diagnosed by preparing temporary algae slides (APHA, 2005). These slides were examined in light microscope by using magnified bower 100x, 400x, 1000x and was adopted in the diagnosis of algae on some global and local references, Nural-Islam and Nahar (1969); Prescott (1982), Nural- Islam and Haroon (1982). Use the SPSS V. 16, and the use of one Way Anova test one-way contrast testing of the least LSD to find moral differences between group averages and has been Adopt the value of P <0.05 as a significant differences.

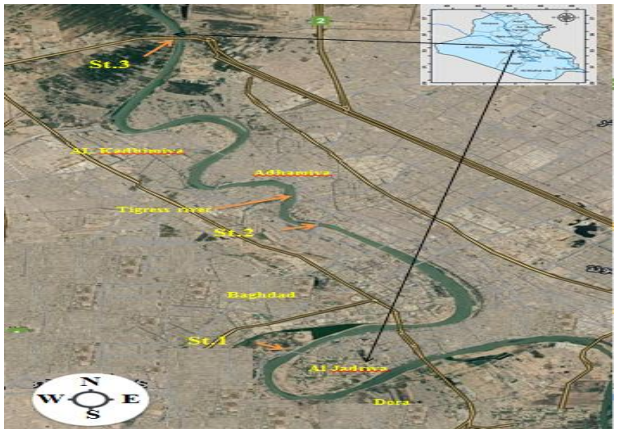

Fig.1: map showing the studied area with sampling stations:1. Al-Jadriyah Bridge 2. Bab Al-Mu'adam Bridge 3. Al-Muthanna Bridge

Results

The study showed the predominance of Bacillariophceae on the rest of the species and increased numbers of species in winter compared to autumn. The present study identified 114 species of 32 Genus, the percentage of blue-green algae 26% (12 Genus, 30 species), with 9% of Chlorophyceae (6 Genus, 10 species) and the Bacillariophceae 65% (14 Genus, 74 species) (Figure 2). The results also showed the predominance of pennales diatoms compared to the number of centrales diatoms, which were recorded very few, Diatoms were followed by the number of Cyanophyta , as most of the species diagnosed belonged to the species Oscillatoria and Lyngbya. When comparing the number of species between different sites (Figure 3) we note that the number of the largest species recorded in the second site for all species of algae followed by the first site and the least species recorded in the third site, The results of the statistical analysis showed that there were significant differences between the three sites of the study during tow seasons , It was also noted that there were significant differences between the two seasons of the study during the same site and at the level of probability($p > 0.05$).

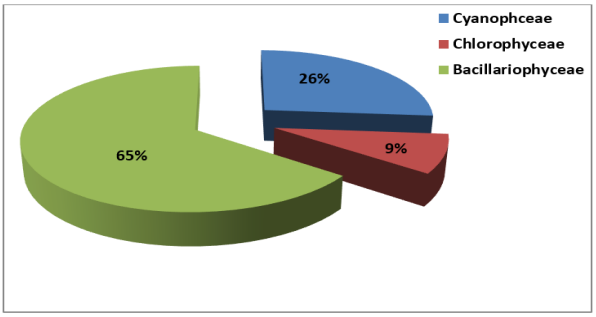

Fig 2: Percentages of division algae were diagnoses from all study site.

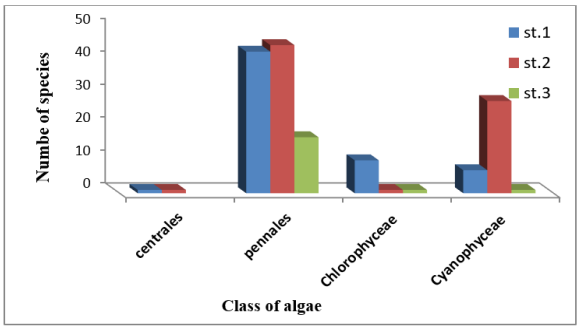

Fig. 3: Distribution of number species attach algae within the three site for bridges in Baghdad city.

Discussion

The results showed that diatoms prevail over other algae species because diatoms can grow and reproduce in a wide range of environmental changes such as temperature, light intensity, phytonutrients and salinity, and the composition of the diatoms community responds quickly to physical changes, chemical factors and biological agents (Kasim and Mukai, 2006; Lili ;Lusan, 2010 and Ali et al.2018).

The results also showed the predominance of pennales diatoms compared to the number of centrales diatoms, , and this may be due to the possibility of most types of pennales diatoms to form adaptations that allow them to attach to the substrates, or by modifying the surfaces that make them home by adding mucilaginous substances or adhesive molecules that help them stick to these surfaces (Stevenson et al., 1996; Liboriussen and Jeppesen, 2003). Diatoms were followed by the number of Cyanophyta , as most of the species diagnosed belonged to the species Oscillatoria and Lyngbya. These species are characterized by their ability to stick moreover, all the blue green algae have a gelatinous shell that helps them stick and skate on solid media. (Al-Saeady,2014 ; AL − Magdamy and Al − Salman, 2021) .pointed out that the number of species of algae attaching to artificial surfaces more than living surfaces such as adhesion to other plants, as this may be due to the surrounding environmental conditions and to the nature of the surface, where competition between living organisms in general and algae in particular on these surfaces is less compared to it of host aquatic plants, as artificial surfaces do not prepare any adaptation of the algae attaching to their surface, but they are considered as a place of adhesion, i.e. the relationship between the attach species and the surface of artificial adhesion here is a relationship Non-competitive coexistence which in turn leads to an increase in the numbers of diagnosed species attaching to it. Unlike what the natural plant surface prepares for algae attaching to its surface of organic matter (which is a source of phytonutrients or a substance that helps to attach), this makes the relationship of competition stronger between the host and the attach algae and the results of the current study are consistent with Rodusky and Anderson (2013). The results showed that the lowest proportions were for Chlorophyta, as most of their species prefer to exist in a wandering way and a few of them are conjoined and do not have the means of adhesion characteristic of sticking algae (Fricke et al., 2011). It also prefers adhesion to less rigid mediums such as clay and sand (Al-Saadoon, 2021).

When comparing the number of species between different sites , we note that the number of the largest species recorded in the second site for all species of algae followed by the first site and the least species recorded in the third site may be due to the increase in organic pollution in the second station compared to other areas as represented by the presence of the city of medicine and the shrine of Khader Elias on the right side of the Tigris River and the large number of arrivals to this place and the presence of a children's play city in the same place helps to increase the waste that reaches water River. In addition to the lack of flow in the same river water station as the speed of flow helps to reduce adhesion on the concrete supports of bridges.

This is the main reason for the lack of species in the third station (Youssef, 2018). Concrete cushions for bridges built within the riverbed are a good medium for the growth of many species of algae that benefit from non-competition during adhesion (Al-Dulaimi, 2013) and in order to be able to adhesion they secrete gelatinous substances with a protein nature (Al-bdulameer, 2013). These detached substances work with environmental variables of river water and increase alkalinity on the erosion of the surface of the concrete submerged in water, and this is what some sources have indicated (Saad and Al-Sanbany,2019).

The increase in the species of diatomic algae, which is characterized by its silicate structure, that the end of the life cycle of these algae and their death, their silicates structures do not corrosion over time and remain deposited within the gelatinous substance to which they attached to concrete, and since the Iraqi water is an alkalinity water containing high concentrations of calcium carbonate that reacts with silica

compounds, which causes cracks over time on the surface of concrete, which facilitates the entry of adhesive algae and water in addition to sulfate compounds, which in its entirety help to corrode and weaken resistance of supporting concrete for bridges(Hassan;al-Jibouri; and Hakman,2017).

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