

Study of Environmental and Biological characteristics of AL-Chibaish marshes and their effect to the biodiversity of southern Iraq

Faiza Kadhim Emran¹, Israa A. Al-Temimy², Dunya Al-sadee³
 Biology Department, Collage of Science, University of Baghdad

Abstract

The Mesopotamian marshlands faced a massive destruction from many years and this lead to effect to ecosystem. In this study a survey was made on the physical chemical and heavy metals characteristics and microbiological analysis of AL Chibaish marsh during the two months. Water analyses revealed unacceptable values for almost all physiochemical and biological properties, according to WHO standard limits for drinking water. Almost all major ions and heavy metal concentrations in water showed a distinct decreasing trend at the marsh outlet station compared to other stations. In general, major and minor ions, as well as heavy metals exhibit higher concentrations in location 1 than in location 3. The concentrations of heavy metals in water showed that all samples were contaminated by Pb, Fe, Zn, Cd and Cu. element concentration decreasing trend at the marsh outlet station compared to other stations indicate that the marsh plays an important role as a natural filtration and bioremediation system. Then format a relationship between water salinity and electrical conductivity and another relationship between turbidity. In this study many species of fungi were isolated from marsh water (WQ-1, WQ-2 and WQ-3 points) such as *Trichoderma spp.*, *Trichoderma korizanium*, *Aspergillus fumigates*, *Rhizoctina spp.*, *Talaromyces flavus* and *Neosetophoma samarorum*. The fungus *Neosetophoma samarorum* was the isolated from Iraq at the first time in this study. So the results of present study showed No growth of bacteria in all media were used.

Key Word: Marsh, Mesopotamian, Heavy metal, Fungi in marsh water, fungi in Iraq.

INTRODUCTION

The Iraqi marshes lands which created by tiggers and Euphrates. River system in the lower oart and Mesopotamian basin where the longitudinal slope in very weak. During seasonal flood the waste over flows the plain and creates complex of marshes [1][2]. Iraqi marshes lie in the south of Iraq in the biggest wet land in the Middle East with area reach to 4500 km in the seasonal in the water in the marsh is very low due to dissolved oxygen as wall as filtering of most organic waste which comes by these two revers [3]. Marshlands are the ecosystems that contain Varieties of organisms, fungi form large ratio of the most organisms widespread in different aquatic environments. It can be said there is no water level don't have a kind of Fungus [4]. The study of Al-Jawhary and Hakeem [5], Nineteen filamentous fungi have been isolated from sediments collected in different sites of the Suqalshuyokh marshes of Governorate of Thi- Qar such as *Aspergillus niger*, *Fusarium solani*, *Aspergillus fumigates*, *penicillium funiculosum* and *A. flavus*. So in similar study by Al-Maiah *et al.*[6] was isolated and identified 20 species of fungi which grow on immersed residual plants in marshes water of the Thi-Qar governorate (Al-sayh,Mukadam Al-haffar,Al-chebaish,Al-fuhud, Al-hmmar). The aims of this study to determine physical, chemical, and biological (fungi and bacteria) properties and study the effect of ecosystem and biodiversity.

MATERIAL AND METHODS

Sample collection

In this study thirty sample of water were collected from Al-Chibaish marsh water from three different regions at different periods from 15/3/2016 to 15/5/2016 as in (Table 1 and Fig. 1). For the isolation of bacteria, fungi and study physical-chemical and biological properties. The samples were collected randomly from this region superficial layer of water (5-10 cm in depth), using pre-sterilized containers, the samples were stored at 4⁰C storage until use.

Table 1: GPS of the WQ sampling in the Central Marshes

Sampling Point	Name of the area	Coordinates	
		North	East
WQ-1	Hmara Al-Kabeera	31.051823°	46.995315°
WQ-2	Al-Baghdadiya	31.044463°	47.034643°
WQ-3	Zichri	31.006482°	47.197045°

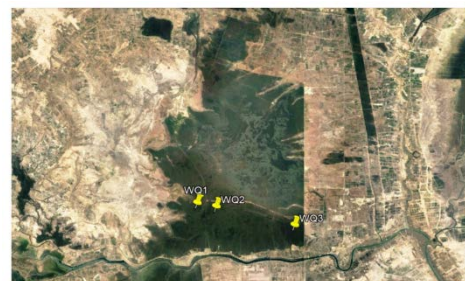


Figure.1. Sat image of the site in Al- Al-Chibayish Maarsh bacterial isolation

Each sample was cultured in different culture media for isolation and identification of bacteria such as maCconkey agar and blood agar (Himedia/ India). All media were prepared according to manufacturing companies and sterilized by autoclaving at 121° C/15 lb for 15 minutes.

Fungi isolation

Each sample was cultured on Potatoes Dextrose Agar (PDA) (Himedia/ India) and Sabouraud's Dextrose Agar (SDA) (Himedia/ India) (with antibiotic Procaine penicillin) for 3-5 days at 25-28° (Ali, 2017).

Physicochemical properties of Al-Chibaish marsh

Water depth, turbidity, Electrical Conductivity (EC) of marsh water was measured in the field with a portable multimeter which was previously calibrated, while the other physical and chemical characteristics of the water samples were analyzed in the lab according to the methods of the American Public Health Association (APHA). The important physicochemical properties, pH, temperature, cations metal for certain cation metallic (Na⁺,K⁺,Ca⁺⁺,Mg⁺⁺) and anionic metal Cl⁻ and available phosphate ,nitrate, sulphur and bicarbonate of the water were determined. The details of these methods are as described by [7]. NO₂⁻,Ca₂⁺,Mg₂⁺ were determined using Ethylene diaminetetra acetic acid (EDTA) method .Flam Photometry method was used to determine Na⁺ and K⁺ ions. HCO₃⁻ was determined via titration method using indicator titrated with HCl.SO₄²⁻ was determined via the Turbidimetric method. Cl⁻ was determined via Silver Nitrate method. NO₃⁻ was determined via Ultraviolet Spectrophotometry method .PO₄³⁻ was determined via Ascorbic Acid method using a spectrophotometer [8].

Heavy metals in water samples were determined by Flam Photometry method. Five of heavy metals (Cu, Cd, Pb, Fe, and Zn) were measured in Al-Chibayish marsh water.

RESULTS AND DISCUSSION

Bacterial identification

The results of present study showed No growth of bacteria in all media were used, this may be occur high concentration of saline and the water in marshes in the location of sampling was continuous motion.

Fungal identification

In this study 6 species of fungi were isolated and diagnosis from marsh water (WQ-1, WQ-2 and WQ-3 points). Ascomycota was the prevalent fungi 66.6% include 6 genus returns to 4 species. Followed by Basidomycota 16.6% include one genus returns to one species and Zygmycota 16.6% include one genus returns to one species (Table2). *Talaromyces flavus* was giving most frequently fungi 100% followed by *Trichoderma spp.* 90%, while *Neosetophoma samarorum* was give the low frequently 43.3% from the total samples of marsh water (table 3). The table (4) shows the Varity of fungi with the Varity of samples location. All fungi were diagnosis depending on the morphology, color on the medium and microscopic characteristic. The *Neosetophoma samarorum* was isolated from Iraq at the first time in this study. Many previous studies were have done about the isolated fungi from the marsh south of Iraq, one of them the study of [5][8], they were isolated and diagnosed 19 species of fungi, Deuteromycota were dominant 94.5% were included 17 species, followed by Ascomycota 2.5% and Zygomycota 2.5% They belong it 1 species for both, *A. niger* and *Fusarium solani* were most species appearance 100% followed by *A. fumigatus* and *Penicillium funiculosum* 83%. While another study was recorded 33 species of marine fungi have been isolated from various submerged wood and dead plants in saline and freshwater of southern Iraq [9][10]. The study of Al-Saadoon and Al-Dossary (2014) sixty seven 67 species of fungi were isolated from fresh water and marine in different locations of Iraq, include 46 species of Ascomycota, 19 species of Hyphomycetes, and two species of Coleomycetes, of these 11 species were reported as the first time in Iraq. The ecological similarity in the study locations (pH, temperature,

Solti, physical and chemical properties) do not have large effect of fungal diversity in marsh water or sediment [11][12][13][14].

Table-2: Fungi group frequency in water marsh samples.

Division of Fungi	No. of Species	Fungi frequency %
Ascomycota	4	66.6
Basidomycota	1	16.6
Zygomycota	1	16.6

Table -3: Species of fungi with No. of fungi growth in samples and it frequently in this study.

Fungi isolated	No. of samples with fungi growth	Fungi frequently%
<i>Trichoderma spp.</i>	27	90
<i>Trichoderma korizanium</i>	16	53.3
<i>Aspergillus fumigates</i>	22	73.3
<i>Rhizoctina spp.</i>	24	80
<i>Talaromyces flavus</i>	30	100
<i>Neosetophoma samarorum</i>	13	43.3

Table-4: fungi isolated depending to the location of water samples from marsh water.

Isolated Fungi	Locations		
	WQ-1	WQ-2	WQ-3
<i>Trichoderma spp.</i>	+	+	+
<i>Trichoderma korizanium</i>	+	-	+
<i>Aspergillus fumigates</i>	-	+	+
<i>Rhizoctina spp.</i>	+	-	-
<i>Talaromyces flavus</i>	+	-	+
<i>Neosetophoma samarorum</i>	+	+	+

Physic-chemical properties of Al- Chibayish marshes

Physical properties

Mean values ± standard deviation of Al-Chibayish marshes pH, temperature (°C), E.C (µs,cm), and both T,D,S and salinity (mg,l) concentrations collected from three different locations are given in Table (5).

Table 5: Mean values ± SD of Al-Chibayish marshes pH, temperature (°C), E.C (µs/cm), T.D,S (mg,l) and salinity (mg/l) concentrations

Location No.	Mean ± standard deviation				
	pH	Temperature 0C	E.C µs/cm	T.D.S.(mg/l)	salinity(mg/l)
WQ-1	6.9 ± 0.11	32.4 ± 0.03	2360 ± 1.2	14.75 ± 1.4	1.476 ± 1.89
WQ-2	6.8 ± 0.2	36.3 ± 0.1	2360 ± 1.2	14.80 ± 1.1	1.480 ± 1.02
WQ-3	6.8 ± 0.11	33.3 ± 0.02	2407 ± 2.5	15.044 ± 1.5	1.505 ± 0.08

Table 6: Mean values ± SD of NO₃, NO₂, PO₄, SO₄, HCO₃, Cl, Ca, Mg, Na and K ions in different samples collected from three locations in Al-Chibayish marshes .

Locations	Mean ± standard deviation									
	No ₃ ⁻ mg/l	No ₂ ⁻ mg/l	Po ₄ ⁻ mg/l	SO ₄ ⁻ mg/l	Hco3 mg/l	CL ⁻ mg/l	Ca ⁺⁺ mg/l	Mg ⁺⁺ mg/l	Na ⁺ mg/l	K ⁺ mg/l
WQ-1	3.454 ± 2.6	0	5.691 ± 0.1	767.969 ± 0.3	332.45 ± 2.3	963.825 ± 0.01	525 ± 0.1	710 ± 0.5	528.4 ± 1.02	13.2 ± 0.4
WQ-2	2.851 ± 1.3	0	5.691 ± 0.2	791.406 ± 0.1	439.2 ± 3.4	928.325 ± 0.02	535 ± 0.1	805 ± 0.4	521.7 ± 1.18	13.6 ± 0.3
WQ-3	3.253 ± 2.1	0	0	760.165 ± 0.3	381.25 ± 3.6	923.000 ± 0.01	460 ± 0.1	742.5 ± 0.1	517.4 ± 1.68	12.2 ± 0.2

Table 7: Mean values ± SD of Al-Chibayish marshes heavy metals Cu, Pb, Cd, Fe, Zn (mg/l) concentrations.

Location No.	Mean ± standard deviation				
	Cu	Pb	Cd	Fe	Zn
WQ-1	0.145 ± 0.1	0.426 ± 0.3	0.059 ± 1.0	0.528 ± 0.4	0.129 ± 0.4
WQ-2	0.032 ± 0.02	0.31 ± 0.01	0.017 ± 0.2	0.334 ± 0.1	0.007 ± 0.3
WQ-3	0.062 ± 0.1	0.125 ± 0.2	0.025 ± 0.3	0.319 ± 0.4	0.035 ± 0.06

This study has found that pH samples collected from location 1 had the highest pH mean value (6.9 ± 0.11) while the lowest in location 2,3 (6.8 ± 0.2) mean value. the temperature range between 32.4-36.3. Electrical conductivity in location 3 found had the highest (2407 ± 2.5) EC mean value while 1,2 samples recorded the lowest (2360 ± 1.2) mean value. T.D.S concentrations range between 14.75-15.044 while salinity range between 1.476-1.505 .

High turbidity values that exceed WHO standard limits for water observed in the current study due to the high turbidity of Al-Chibayish Marsh feeders(e.g., Euphrates River), as these water supplies carry large quantities of clay, silt, plankton and other microscopic organisms [15] .

All TDS and salinity values in water samples were considered unacceptable according to WHO standard limits for drinking water .The pH values were within the acceptable limits of WHO standards [16][17][18].

Chemical properties

Mean values \pm SD of NO_3^- , NO_2^- , PO_4^{3-} , SO_4^{2-} , HCO_3^- , Cl, Ca, Mg, Na and K ions in different Al-Chibayish marshes samples collected from three locations are given in Table 6

It has been found that the highest mean value of NO_3^- ions was 3.454 ± 2.6 mg/l in located 1 while the lowest mean value was 2.851 ± 1.3 mg/l in 2 samples. NO_2^- has been no concentration in all location Al-Chibayish marshes. PO_4^{3-} conducted similar concentration in 1,2 location and none in location three. SO_4^{2-} ions was highest mean value 791.406 ± 0.1 mg/l in located 2 while the lowest mean value was 760.165 ± 0.3 mg/l in 3 location. The highest mean value 439.2 ± 3.4 mg/l in HCO_3^- ions in location 2 while the lowest mean value 332.45 ± 2.3 mg/l in location 1. Cl^- and Na^+ ions recorded highest mean value in location 1 (963.825 ± 0.01 , 528.4 ± 1.02) mg/l while the lowest mean value was conducted in location 3 (923.000 ± 0.01 , 517.4 ± 1.68) mg/l respectively. Both Ca^{++} & K^+ ions recorded highest mean value in location 2 (535 ± 0.1 , 13.6 ± 0.3) mg/l while the lowest mean value in location 3 (460 ± 0.1 , 12.2 ± 0.2) mg/l respectively. Mg^{++} ions concentration recorded highest mean value was 805 ± 0.4 mg/l in location 3 while the lowest mean value 710 ± 0.5 mg/l in 1 location.

All Mg^{2+} , Ca^{++} , Na^+ , K^+ concentration wer beond acceptble limets for all station. generally, concentration for the allowable limits in (WHO,2008).

Concentrations accumulation of the heavy metals in Al-Chibayish marshes shows the samples in location 1 were highest contaminated heavy metals while in location 3 showed lowest contaminated by heavy metals. Heavy metals analyses revealed ions such as Cu, Pb, Cd, Fe, and Zn have concentrations that generally exceed Maximum Contaminant Level (MCL) standards[19][20] . Analyzes reveal that the heavy metals in the study presint an increase in concentration station 1 (marsh inlet), while nearly all these metals exhibited a distinct decrease in their concentration sat 3 (marsh outlet), indicating that the marsh works as a filtering sink for metals (S. Fiedler et al 2009). The heavy metals accumulated and might be toxic for the living ecosystem in the marshes. This problem is our major problem we decide to solve through another research [5][21][22][23].

REFERENCES

- 1- D.C. Harris, Chapter 21, Quantitative Chemical Analysis, Fourth ed., W.H Freeman and Company, New York, 1995.
- 2- Al-Jawhary, I. F. and Hakeem , N.H. (2014). A Study of Isolation and Identification of Habitated Fungi in Sediments of Suq Al-Shuyokh Marshes. Al-Qadisiya Journal for Agriculture Science, Vol. 4, No. 1, Pp.: 54-61.
- 3- Al-Maiah, A.H.; Abd Alhassan, A. S. Al-Mussawy, M. H. (2006). Isolation and Identification the fungi from plants residual of submerged in some marshes of Thi-Qar. Journal of University of Thi-Qar, Vol. 2, No. 2, pp.: 112-120.
- 4- APHA, Standard Methods, the Examination of Water and Wastewater, Twentysecond ed., (2012), pp. 1496.
- 5- F. K. Emran, 2017. THE APPLICATION OF BIOREMEDIATION OF OIL SLUDGE IN AL-DURA REFINERY IN SOME PLANT. Rasayan J. Chem., 10(1), 117-123. DOI: <http://dx.doi.org/10.7324/RJC.2017.1011569>.
- 6- Abed, Salwan Ali, Altaey, Maysoun M, Salim, Mudhafar A, 2014. THE STATUS AND CONSERVATION OF THE VULNERABLE MARBLED TEAL MARMARONETTA ANGSTIROSTRIS, MENETRIS (AVES-ANSERIFORMES) IN AL-DALMAJ WETLANDS, IRAQ. Bulletin Iraq Nature History Museum Bull. Iraq Nat. Hist. Mus.13 (2): 113-120.
- 7- Al-Thahab, Azhar Omran and Al-Awsi, Ghaidaa Raheem Lateef, 2018. DETECTION OF *HELOCOBACTER PYLORI* IN PREGNANT WOMEN BY STOOL CULTURE METHOD, *Biochem. Cell. Arch.* Vol. 18, No. 1, pp. 49-54.
- 8- Salwan Ali Abed, Maysoun M. Altaey, Mudhafar A. Salim (2014); STATUS AND CONSERVATION OF DUCKS IN DALMAJ WETLANDS, SOUTHREN IRAQ *Int. J. of Adv. Res.* 2 (8). 0] (ISSN 2320-5407). www.journalijar.com.
- 9- S. Fiedler, C. Siebe, A. Herre, B. Roth, S. Cram, K. Stahr, Contribution of Oil Industry Activities to Environmental Loads of Heavy Metals in the Tabasco Lowlands, Mexico, *Water Air Soil Pollut.* 197 (2009) 35
- 10- Al-Nasrawi, H. G and Hughes, A. R.(2012). Fungal Diversity Associated With Salt Marsh Plants *Spartina alterniflora* And *Juncus roemerianus* In Florida. Jordan Journal of Biological Sciences. Volume 5, Number 4, ISSN 1995-6673 Pages 247 – 254.
- 11- Muhsin, T. M. (2012). Aquatic fungi of Iraq: A review. *Marsh Bulletin*, 7(1)Pp.: 39-47.
- 12- Salwan Ali Abed & Mudhafar A. Salim (2017) Breeding observations of the Black-winged Kite *Elanus caeruleus* (Desfontaines, 1789) in Iraq, *Zoology and Ecology*, 28:1, 21-24, DOI: 10.1080/21658005.2017.1415833
- 13- Al-Heety, A.Turky, E.Al-Othman, Physico-Chemical Assessment of Euphrates River between Heet and Ramadi Cities: Iraq,*J.Water Resource Prot.* 3(2011)812–823.
- 14- Salwan Ali Abed, 2014. Bio-Ecological Study of Marbled Teal *marmaronetta angustirostris* in Hor Al-Dalmaj / Iraq. Ph.D. Thesis, College of Science, University of Baghdad, DOI: 10.13140/RG.2.2.27874.22725.
- 15- Ghaidaa Raheem Lateef Al-Awsi, 2017. Immunological and Molecular Study on *Helicobacter Pylori* in Pregnant Woman, Ph.D. thesis, College of Science, University of Babylon, Iraq. DOI: 10.13140/RG.2.2.36634.54726.
- 16- WHO, Guidelines for drinking water quality recommendations, Volume 1, recommendations, Third ed., World Health Organization, Geneva, 2008, pp. 51.
- 17- Salim, Mudhafar A and Abed Salwan Ali, 2017. Avifauna Diversity of Bahr Al-Najaf Wetlands and the Surrounding Areas, Iraq. Jordan Journal of Biological Sciences. Vol. 10 (3), Pages 167 – 176.
- 18- Ghaidaa Raheem Lateef Al-Awsi, 2012. Isolation and Identification of microbiological from AL-Diwanya hospitals and Controlled by Antiseptic and Antibiotic, M.Sc. Thesis, University of Al-Qadisiyah. DOI: 10.13140/RG.2.2.14299.87844.
- 19- EPA, Current National Recommended Water Quality Criteria, Environmental Protection Agency, United States, 2009.
- 20- Ghaidaa Raheem Lateef Al-Awsi, 2013. Isolate and diagnose the bacteria present in the hospital in the city of Diwaniyah and the statement of the mechanisms to control the use of antibiotics and antiseptics, Al-Qadisiyah journal of pure science, 3 (18) 11-20.
- 21- Ali, I.A. (2017). Isolation, identification and determination of antifungal sensitivity of fungi isolated from a sample of patients with Rhinosinusitis in Baghdad city. *IJMS*, Vol. 15(1): 64-70. Doi: 10.22578.
- 22- Abed, Salwan Ali, 2017. Occurrence of Anadidae in Sawa Lake: A Ramsar Wetland Site in Southern Iraq, *Journal of Advanced Zoology*, J. Adv. Zool. 38 (1) 43-51.
- 23- Ibraheem, Lujain Hussein and Abed, Salwan Ali (2017) Accumulation detection of some heavy metals in some types of fruits in the local market of Al-Diwaniyah City, Iraq. *Rasayan J. Chem.*10 (2), 339 -343. DOI: <http://dx.doi.org/10.7324/RJC.2017.1021641>.
- 24- Abd Qader A. M. (1985). Ecological and classification mycological study of fungi companion to *Typha australis* plant in marshes south of Iraq. M.Sc. thesis. Collage of Science, University of Basra.