Evaluation of Different Water Quality Parameters for Tigris River and Compare with Tap Water for Different Areas in Baghdad

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Abstract

In this research effect of some chemical and physical parameters for Tigirs river in Baghdad City in Summer for April mouth -٢٠١٢ was studied.(١١) samples had been taken for this river and tap water. Water samples were collected from different depths. PH, electrical conductivity (EC),and total dissolved salts(TDS) were studied ,nitrate ion was evaluated by spectroscopic method while chloride , carbonate , bicarbonate , magnesium and Calcium where evaluated by titration method . Sodium, Potassium ions were evaluated by Flame Photometer. The concentrations of ions were found to being the ranges (٠,١٥-٤,٣) for nitrates in river,(٠,١-٩,٢٧) in tap water. And for calcium and magnesium were found to being the ranges (٦٥-١٤٥),(٢٠٥-٢٦٥) mg /L respectively in river,(٦٩-٨٧),(٢٣٢,٥-٣١٨,٥) mg /L in tap water.(٨٤,٢-١١٩,٦) mg /L for chlorides in river,(٦٢.٠٤-٨٨,٦) in tap water.(٤-٨),(٤-٣٠) mg /L for carbonate and bicarbonate in river respectively.(٤-١٠),(١٠-٢٠) mg /L in tap water .(١٤٢-٣٤٥),(٢-٩) mg /L for Sodium and Potassium respectively in river,(١٤٢-١٩٠)),(١,٥٩-٦) mg /L in tap water. And PH values
(٦,٦٩-٩,٠٤), EC (٠,٤٤-١,٠٧) µs/cm and TDS (٢٢٧,٢٢-٥٧٣,٣) mg/L. From this research many parameters were studied to know quality of water. Value for River in maximum that lead to a pollution in these area . The River water was alkanity and environmental pollution.

Key words: river water and tap water in some areas in Tigris river in Baghdad city; UV- Spectrophotometry, PH- meter, EC, Flame photometry and Titration.

Introduction

It has been known for years that the quality of irrigation water directly influences the quality of the soil and the crops grown on this soil. The Tigris River is ١٨٥٠ km long, rising in the Taurus Mountains Eastern Turkey. The river flows about ٤٠٠km through Turkey and then it enters Iraq. The total length of the river in Iraq is ١٤١٨ km. No major tributary joins River Tigris south of Baghdad. Few

canals draw water from the Tigris in this region for irrigation purposes. For this reason the mean annual daily flow of the river falls below its value at Baghdad (١١٤٠m٣ s–١) in Kut and Amara cities at the south [١], also concluded that war on Iraq in ١٩٩١, affected the bacteriological quality of the Tigris River in Baghdad especially down river at Dora site, as a result of discharging the material sewage to the river [٢]. The nature of the energy of deposition is determined by the river where the sand deposited first at the bottom of the river bed, which represents the beginning of the sediment cycle, the more fine grains to the top phenomenon fining upwards, a phenomenon characteristic of the fluvial meandering environments [٣]. In monitoring programs, generally relevant chemical, physical, and biological factors are annually (or with less intervals) sampled and analyzed to sort out governing factors for the water quality variations. Generally, such monitoring gives a clue about the status of water quality that might be valid for a limited time and prespecified objectives. Traditional approaches to assessing water quality are frequently based on a comparison of experimentally determined parameter values with existing guidelines. In many cases, monitoring allows proper identification of contamination sources and may face legal compliance. However, it does not easily give an overall vision of the spatial and temporal trends in the overall water quality in a watershed [٤]. The advantage of this approach, besides getting the information and data necessary, is also determined the general health or status of the system of concern. In this way, the index can be used to assess water quality relative to its desirable state (as defined by water quality objectives) and to provide insight into the degree to which water quality is affected by human activity [٥]. Tigris River one of the rivers that suffer from the effect of conservative pollutants. Many studies have been done to know these effects [٦].

Water may be temporarily or permanently impaired in quality as a result of these actions. Water pollution arising from the presence of foreign substances (organic, inorganic, bacteriological orradiological) which tends to degrade the quality of water [٧].

Present study reports the analysis of selected metals (Cd, Cu, Mn, Ni, Pb and Zn) in the Zayandeh Rood River in Isfahan, central part of Iran [٨]. Water quality indices are generally calculated in two steps. The selected water quality characteristics having different units of measurement are transformed into sub index values. These sub indices are then aggregated to give a water quality index value. Various water quality indices were reviewed by many researchers; [٩, ١٠,١١,١٢,١٣]. The wastewater contains chromium, acids, sulfides, and chlorides. Textile and dye industries emit a liquid effluent that contains toxic residues from the cleaning of equipment. Waste from petrochemical

manufacturing plants contains suspended solids, oils and grease, phenols, and benzene. Solid waste generated by petrochemical processes contains spent caustic and other hazardous chemicals implicated in cancer. [١٤].

Experimental Part

Study area

Water samples from different area in Tigris river in Baghdad City in sequence:-

١- River (Hospital Medical City).
٢- River (Adhamiyah) - Tab water Adhamiyah .
٣- River (Abu- nu'as) - Tab water (Abo- nu'as).
٤- River (Jadiriyah) - Tap water (Jadiriyah).
٥- River (Doura) - Tap water Doura.
٦- River (Yousefah) - Tap water Yousefah.

Collected all samples in summer for April ٢٠١٢.

Prepare and stored the sample:-

Different samples were taken from study area in plastic bottle of size ٥L from different depths of river and afew drops of chloroform were added for each sample to store them, filter the samples by filter paper and keep it in refrigerator for measure.

Apparatus:-

UV- Visible spectrophotometer measure molecules absorption type DR٣٠٠٠ made company HACH, Flame Photometer ٤١٠ device type Cornining , pH-meter Hana type Italian made and Conduct meter type Jenway.

Procedures

-Nitrates:

Nitrates ions were measured by taking ٢٥ml from each sample and adding ٢ml of ١N HCl solution to it and were completed the volume to ١٠٠ml with distilled water and measure at ٢٠٦ nm wave lengths

- Chlorides:

Chlorides ions were measured by titration method by taking ٥٠ml from each sample and titrate them against silver nitrate ٠,١N by using potassium dichromate as indicator.

- **Potassium and sodium:**These ions were meusured by taking different volumes of samples and measure at wave lengths (٧٦٦, ٥٨٩) nm respectively by flame photometer. - -**Carbonate and bicarbonate:**these ions were measured by titration method by taking ١٠٠ml from each sample and titrate them against ٠,١ N HCL by using phenolphthalein and methyl orange as indicators.

- **Calcium and magnesium:** these ions were measured by titration method by taking ٥٠ml from each sample and titrate them against EDTA in the presence of Erochrom blak T and Meroxide .

-Total dissolved salts(TDS):were measured by Dryiny and sublimation

- **PH,Electrical conductivity(EC):**were measured by pH-meter device and conductmetric devices type Hana respectively.

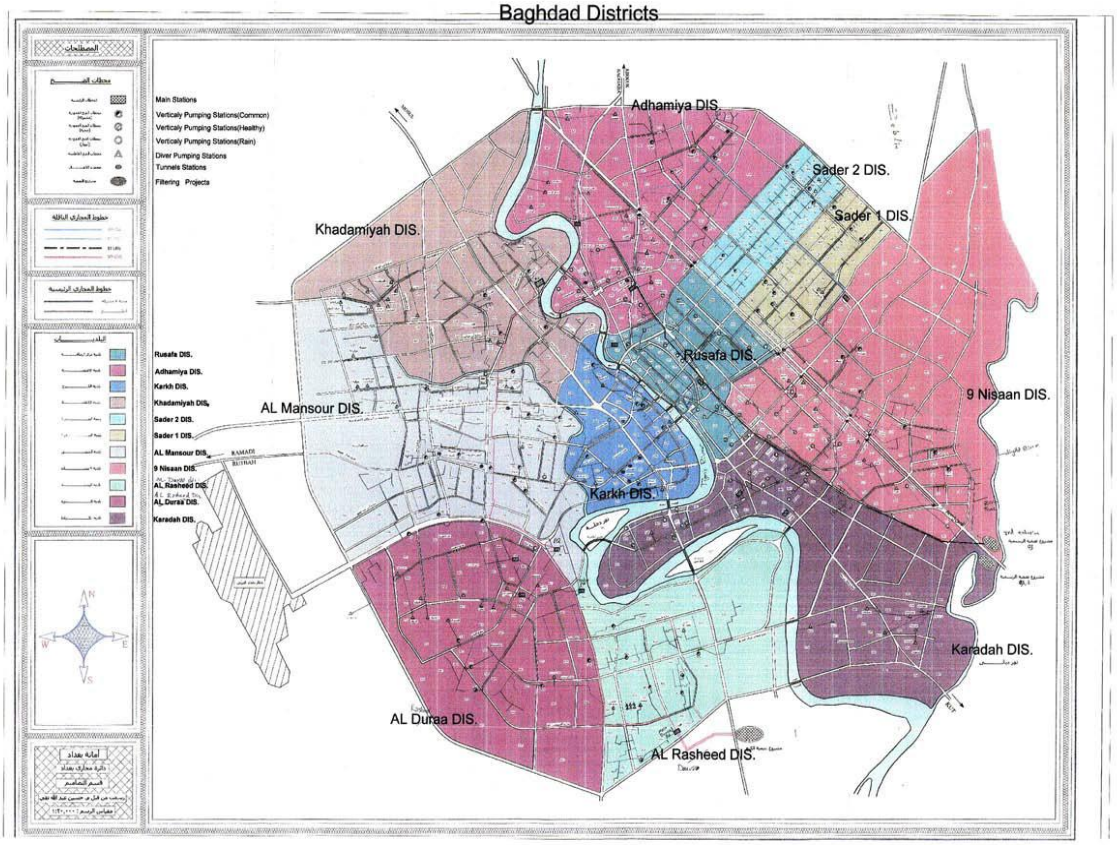

Fig (١) map showing the study site

Results and Discussion

This search shows the physical and chemical change to the water of the sectors of Tigris river in Baghdad city in Table١.

High pH values were detected in the study areas because of high dissolved salts and release of carbon dioxide gas and this lead to increase basic properties.[١٥]

EC values were studied and were between (٠,٤٤-١,٠٧µs/cm), these values were considered high compare with International Specification[١٦] , ١.٠٧ µs/cm were reported as the highest value in the study areas, it was found that these high values of EC because of high salts in the study areas.[١٧]

The TDS was estimated in the study areas, showing that the lowest value is ٤٤٠ppm and highest value is ١٠٧٠ ppm , the lowest value in Douro tap, while the highest value in hospital medical city river and this will be outside the allowed boundaries and classified as water and make water unfit for drinking because increase the concentration of chloride, magnesium, and calcium.[١٨]

Determination of nitrate study, the range value (٠,١٥-٩,٢٧) ppm, notice the high value of nitration in Adhamiyah tap because the areas infested agriculture

land which is used by the fertilizer nitrogen for the purpose of increasing agriculture production and thus enter the fertilizer into the river to increase the nitrate level in river, but lower concentration in these area because lower agriculture area.[١٩]

Also studied concentration of chloride ion, the high value ١١٩,٦ppm in Yousefah tap, and the lower value is ٦٢,٠٤ ppm in Doura tap, attributed the cause for this increase in the proportion of the salts in the soil as a result of evaporation and the flow of these salts to the river, because increase TDS, causing the increase of concentration chloride.[٢٠]

The air is considered as the major source of Carbonate and bicarbonates o, in addition to minerals and carbonate rocks, the rate of concentration carbonate (٤-١٠) ppm, but bicarbonate (٤-٣٠)ppm, the high value were recorded in Jadiriyah river, the lowest value in Jadiriyah tap and Adhamiyah tap; the high value in carbonate and bicarbonate led to increase the PH and attach basic medium [٢١].

The concentration of magnesium and calcium for water sample had been studied showing the range value (٢٠٥-٣١٨,٥, ٦٥-١٤٥) ppm respectively. Notice the decrease value in hospital medical city river and al-jadiriyah river, because gradually due to consumption by the aquaticuture while there increase in al-Doura tap and Abo-nu'as river, because sedimentary rocks and the lack of aquatic life consumed , increase the calcium and magnesium lead to increase the basicity.[٢٢]

The range of sodium and potassium concentration was about (١٤٢-٢٩٢, ١,٥٩-٩) ppm, the upper value of sodium concentrded in Adhamiyah river, because the presence of the halite rock .Tthe concentration of potassium is lower for international specification because decrease the clay soil that the special source potassium. [٢٣]

Table (١)
Value of chemical and physical changes of Tigris River in Baghdad city in April month

Region	EC µs/cm	PH	TDS ppm	$CO_3^{=}$	HCO_3^{-}	CL- ppm	No_3^{-} ppm	K^{+} ppm	Na^{+} ppm	Ca^{++} ppm	Mg^{++} ppm
Yousefah river	٠,٩	٧,٠٤	٤٧٦,٩	٨	١٠	١١٥,٢	٠,١٥	٨	١٨٥	٧٠	٢٥٥
Yousefah tap	٠,٩٧	٦,٦٩	٥١٦,٥٩	٦	١٢	١١٩,٦	٠,١	٦	١٩٠	٨٧	٢٣٨
Doura river	٠,٦٨	٨,٨٦	٣٥٣,١٩	٦	١٢	١١٠,٨	٠,٢٨	٥,٣	٣٤٥	٨٢	٢٣٠,٥
Doura tap	٠,٤٤	٧,٢٢	٢٢٧,٢٢	١٠	١٤	٦٢,٠٤	٠,٤٤	٤,٣	١٨٧	٦٩	٣١٨,٥
Jadiriyah river	٠,٨٣	٧,١٣	٤٣٧,٢٢	٦	٣٠	٨٤,٢	٠,٦	٢	١٤٢	٦٥	٢٦٠
Jadiriyah tap	٠,٨٩	٧,٠٦	٤٧١,٢٣	٤	١٠	٨٨,٦	٠,٢	١,٥٩	١٤٢	٨٠	٢٣٢,٥
Abo-nu'as river	٠,٧٦	٨,٣٥	٣٩٧,٥٦	٦	١٨	٨٤,٢	١,٧	٣	١٤٥	٨٠	٢٦٥
Abo-nu'as tap	٠,٨٣	٨,٤٥	٤٣٧,٢٢	٦	٢٠	٨٤,٢	٢,٠٦	٢,٥	١٥٠	٧٨	٢٤٥,٥
Hospital medical city river	١,٠٧	٦,٩٢	٥٧٣,٣٢	٦	١٠	٩٣,١	٤,٣	٩	١٤٩	١٤٥	٢٠٥
Adhamiyah river	٠,٥٨	٩,٠٤	٣٠٦,٠٥	٤	٤	٧٣,٣٣	٠,١٦	٥	٢٩٢	٨٥	٢٤٠
Adhamiyah tap	٠,٥٤	٧,٦٨	٢٢٧,٢٢	١٠	١٦	٧٩,٧٦	٩,٢٧	٤,٨	١٩٠	٨٥	٢٣٥

Refrences

[١] Mohammed M.; Quality Assessment of Tiger River by using Water Quality Index for Irrigation Purpose; pp. ١٥-٢٨ (٢٠١١).
[٢] Ayat H. Al-Obaidi; Evaluation of Tigris River Quality in Baghdad for the period between (November ٢٠٠٥-October٢٠٠٦); Vol. ٢٧, No. ٩, ٢٠٠٩.
[٣] Moaied J. Rasheed; the Tigris River Creep Phenomenon Relationship With Bank Stone Cladding Within Baghdad City; ٢٠١٢.
[٤] Debels P., Figueroa R., Urrutia R., Barra R. and Niell X., "Evaluation of Water Quality in the ChillaLn River (Central Chile) Using Physicochemical Parameters and a Modified Water Quality Index," Environmental Monitoring and Assessment, Vol. ١١٠, No. ١/٣, pp. ٣٠١-٣٢٢, ٢٠٠٥.
[٥] Radwn N., "Evaluation of Different Water Quality Parameters for the Nile River and the Different Drains," ٩th International Water Technology Conference, Sharm El-Sheikh, Egypt, ٢٠٠٥.
[٦] Ibtihaj A. Abdul Razzak* & Dr.Abbas H. Sulaymon; Effects of Discharging Sewage of Baghdad To Tigris River on The Water Quality; Vol. ٢٧; No. ١٦; ٢٠٠٩.
[٧] Eletta O.; Determination of some trace metal levels in Asa river using AAS and XRF techniques; Vol. ٢ (٣), pp. ٠٥٦-٠٦٠, March, ٢٠٠٧.
[٨] Sanayei Y., Norli I.and; Taleb M.; Determination of Heavy Metals in Zayandeh Rood River, Isfahan-Iran; pp. ١٢٠٩-١٢١٤, ٢٠٠٩.
[٩] Stambuk-Giljanovi N., "Water Quality Evaluation by Index in Dalmatia," Water Research, Vol. ٣٣, No. ١٦, , pp. ٣٤٢٣-٣٤٤٠; ١٩٩٩.
[١٠] Hallock D., "A Water Quality Index for Ecology's Stream Monitoring Program," Technical Report, Washington Department of Ecology,Environmental Assessment Program, Olympia, ٢٠٠٢.
[١١] Pesce S. F. and Wunderlin D. A., "Use of Water Quality Indices to Verify the Impact of Cordoba City (Argentina) on Suquia River," Water Research, Vol. ٣٤, No. ١١, pp. ٢٩١٥-٢٩٢٦, ٢٠٠٠.
[١٢] Bordalo A. A., Nilsumranchit W. and Chalermwat K., "Water Quality and Uses of the Bangpakonk River (Eastern Thailand)," Water Research, Vol. ٣٥, No. ١٥, pp. ٣٦٣٥-٣٦٤٢, ٢٠٠١.
[١٣] Liou S. M. and Wang S. H., "A Generalized Water Quality Index for Taiwan," Environmental Monitoring and Assessment, Vol. ٩٦, No. ١-٣, pp. ٣٥-٥٢, ٢٠٠٤.
[١٤] Ali S.; J.Sci. of Qadysiah,Vol ٣ (٣),No. ١١٠,٢٠٠٠.
[١٥] Hassan M. L. Alsudani, Redha I. Al-Bayati and Mahmood M. Barbooti Determination of anions by ion chromatography in water samples of Baghdad; Vol. ٣(٩), pp. ١٦٥-١٦٩, September, ٢٠٠٩.
[١٦]World Health Organizatoin (WHO)"for drinking water quality"٢nd ED Geneva ٢٠٠٠.
[١٧]AL-Shawi,I.J.,.Hmood A.Y ,.Easa E.M andAL-Imarah F.j,Thi-Qar University Conference of Iraq Marshlaands, ٢٥-٢٦ Sep.٢٠٠٤.
[١٨] Jead.J.H, J.Bio.Sci.Res, Vol. ١٥, No. ١, ٢٠٠٧.
[١٩] AL-Maliki.A.D, M.Sc. thesis, University of Basrah, ٢٠٠٦.
[٢٠] Ali S.A., J.Sci. of Qadysiah, Vol.٣(٣), No. ١٠, ٢٠١٠.
[٢١] Ahmed H.A.; J. Tech, Res., Vol. ١٨,No. ٤٠, ٢٠٠٩.
[٢٢] Abaychi J.K., and AL_Obaidy S.Z.; Marine Science Center, Teach. Rep No.١١, ٢٠٠٧.
[٢٣] EC, WEDC, Developing World water, Grosvenor Press International, UK, ٢٠٠٧.

دراسة بعض المتغيرات البيئية لمياه نهر دجلة في بعض مناطق محافظة بغداد ومقارنتها مع مياه الاسالة في المناطق ذاتها

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الخلاصة

تناول البحث تقييم بعض المتغيرات الكيميائية والفيزيائية لمياه نهر دجلة مباشرة في بعض المناطق في محافظة بغداد ومقارنة تلك القيم من المتغيرات مع ماء الاسالة من نفس تلك المناطق خلال فصل الصيف لشهر نيسان ٢٠١٢ لغرض تقييم التاثير البيئي لبيان مستويات التلوث فيها .تم اخذ ١١ عينة من النهر وماء الاسالة. تم قياس الاس الهيدروجيني(pH) والتوصيلية الكهربائية (EC) ومجموع الاملاح المذابة بالاضافة الى ذلك تم قياس بعض الايونات الرئيسية في مياه تلك المناطق والمتمثلة بالكلوريدات والكاربونات والبيكاربونات والنترات والصوديوم والبوتاسيوم والمغنيسيوم والكالسيوم . تم تقدير كل من الصوديوم والبوتاسيوم باستخدام Flame Photometer بينما تم اتباع الطرائق الطيفية لتقدير ايونات النترات , وقدرت ايونات الكلوريدات والكاربونات والبيكاربونات والكالسيوم والمغنيسيوم بواسطة الطرق التحليلية وقيست الاملاح الذائبة الكلية بالتبخير والوزن. وجد ان تركيز الايونات في مياه نهر دجلة كانت للنترات تتراوح بين (٤,٣-٠,١٥) جزء في المليون وماء الاسالة(٩,٢٧-٠,١) جزء في المليون والكالسيوم والمغنيسيوم لمياه نهر دجلة (١٤٥-٦٥, ٢٦٥-٢٠٥) جزء في المليون على التوالي ولمياه الاسالة (٨٧-٦٩, ٢٣٢,٥ – ٣١٨,٥)جزء في المليون والكلوريد لنهر دجلة (٨٤,٢-١١٩,٦) جزء في المليون ولمياه الاسالة (٦٢- ٨٨,٦) جزء في المليون والكاربونات والبيكاربونات لمياه نهر دجلة (٤ - ٨ ,٤ -٣٠) جزء في المليون على التوالي ولمياه الاسالة للكاربونات وللبيكاربونات (٤ -١٠, ١٠- ٢٠) جزء في المليون على التوالي والصوديوم والبوتاسيوم لمياه نهر دجلة (١٤٢ -٣٤٥ , ٢ - ٩) جزء في المليون على التوالي ولمياه الاسالة (١٤٢ -١٩٠، ١,٥٩–٦) جزء من المليون , بينما كانت قيم التوصيلية الكهربائية (٠,٤٤- ١,٠٧) مايكروسيمنز/سم وقيمة الاس الهيدروجيني (٦,٦٩ - ٩,٠٤) لمياه نهر دجلة في حين كانت قيم مجموع الاملاح المذابة (٥٧٣,٣٢-٢٢٧,٢٢) جزء في المليون . وجد من خلال الدراسة بان قيم بعض الايونات تكون عالية وغير مطابقة للمواصفات العالمية في حين يقع البعض الاخر ضمن المدى المسموح به من قبل المنظمات العالمية وهذا يدل على تلوث بعض المياه في تلك المناطق كما تبين بان لتلك المياه سلوكا قاعديا.