Hawlyat Al-Montada مجلة حولية المنتدى

I. S. S. N. Print :1998 - 0841 I. S. S. N. onlie :2958 - 0455 Doi 10.35519 /0828

Doi 10.35519/0828-000-065-019

Evaluation of the quality of Main River water in Babylon and Najaf provinces

تقييم جودة مياه نهر الفرات في محافظتي بابل والنجف

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تاريخ الإستلام: 2025/6/30 تاريخ القبول: 2025/7/19 تاريخ النشر: 2026/1/1

Recevied: 30 / 6 / 2025 Accepted: 19 / 7 / 2025 Published: 1 / 1 / 2026

Abstract

This study included to evaluate the quality of main river water for irrigation uses. Water samples were collected from six different locations along the river, namely Al-Kafel, Al-Abasia, Al-Kufa, Al-Manadra, Al-Meshkhab and Al-Qadesia on 12/10/2024. Samples were collected from the sites on the same day, placed in plastic bottles, sealed tightly and brought directly to the laboratory to test total hardness, turbidity , temperature, potential of hydrogen , Electrical conductivity , Dissolved oxygen (O_2), total suspended solids , sulfur , iron Sodium and potassium ions . The dissolved O_2 values ranged from 8.5 to 8.7 mg /l . Turbidity results showed that its values in all locations of the main

القيم في الكوفة (NTU 17) وأعلاها في المشخاب 96 (NTU), كانت تراكيز الكالسيوم والصوديوم ضمن الحدود المسموح بها محليًا وعالميًا للري، وسجلت القادسية أدنى تركيز للكالسيوم (24.8 ملغم/لتر)، والمشخاب الأعلى (191 ملغم/لتر). لوحظ أن قيم نسبة امتصاص الصوديوم (SAR) ترتفع تدريجيًا مع الابتعاد عن مصدر النهر. تشير نتائج الدراسة إلى أن المياه تعتبر جيدة من حيث SAR وفقًا للتصنيف المحلي، ولكنها تُعد متوسطة وفقًا للتصنيف العالمي مما قد يسبب مشاكل مستقبلية. توصي الدراسة بضرورة المراقبة الشهرية لجودة مياه النهر، خاصة من حيث الملوحة والعكارة والصوديوم.

الكلمات المفتاحية: جودة المياه، الري، النهر الرئيسي، بابل، نسبة الصوديوم،الكوفة , التوصيل الكهربائي، العكارة، العناصر الذائبة

river were higher than the critical limit allowed for all determinants, whether Iraqi or international (Table 1 and 2).

الملخص:

شملت هذه الدراسة تقييم جودة مياه النهر الرئيسي لأغراض الري. تم جمع عينات المياه من ستة مواقع مختلفة على طول النهر وهي الكفل،العباسية, الكوفة، المناذرة، المشخاب والقادسية في 12/10/2024. جُمعت العينات في نفس اليوم، ووضعت في زجاجات بلاستيكية محكمة الإغلاق ونقلت مباشرة إلى المختبر لتحليل الصلابة الكلية، العكارة، درجة الحرارة، الرقم الهيدروجيني، التوصيل الكهربائي، الأوكسجين الذائب، المواد العالقة الكلية، الكبريت، الحديد، أيونات الصوديوم والبوتاسيوم. تراوحت قيم الأوكسجين الذائب بين 8.5 إلى 8.7 ملغم/لتر، وكانت نتائج العكارة أعلى من الحد المسموح به في جميع المواقع، حيث سُجلت أدنى

Table 1 Ghliem (1997) guide for irrigation water in Iraq based on EC , SAR ratio, boron B concentration and chloride ion activity Cl.

Irrigation water quality						Classification factors
Poor	Acceptable	moderate	Good	V. Good	Excellent	
4.5>	3-4.5	1.5-3	0.75-1.5	0.25-0.75	0.25<	EC ($dS.m^{-1}$)
26>	19-26	13.5-19	8-13.5	2.5-8	2.5<	SAR
64>	48-64	32-48	16-32	-	16<	B ($uM.l^{-1}$)
29>	15-29	8-15	5-8	-	5<	Cl ($mM.L^{-1}$)

Table 2: FAO, 1999 Guidelines for Irrigation water Quality

property	unit	Permissible limits
EC	dS/m	0-3
T.D.S	mg/l	O-2000
pH	...	5-9
Ca	mg/l	0-400
Mg	mg/l	0-150
Na^{+}	mg/l	0-920
K	mg/l	0-78
Cl	mg/l	0-250
$SO\square^{2-}$	mg/l	0-500

The lowest values were recorded in the Kufa location, reaching 17 NTU, and the highest in the Meshkhab location, reaching 96 NTU. The Calcium ion concentration is less than the critical limit allowed for irrigation according to local and international classification. The lowest values were recorded in the Qadisiyah location, reaching 24.8 mg /l, while the highest values were recorded in the Meshkhab location, reaching 191 mg/ l. As for Sodium ion, the lowest values were recorded, reaching 53.0 mg/ l in the Al-Kifl location. The highest values were recorded in the Meshkhab location, recording 63 mg/l, while this location recorded the lowest concentration for Ca. It was noted that the SAR values gradually increased with increasing distance from the main river. According to the local classification , the water is good in terms of SAR values, but according to the global classification, this will cause a problem in the future. The results of the data analysis showed that the specifications of Shatt Al-Kufa water are somewhat consistent with the Iraqi standards (Table 1).

Introduction

The quality of water depends on the chemical, physical and biological properties, which make its use for a certain purpose possible "directly" or not possible except after carrying out a specific treatment to modify one or more of those properties. On this basis, standard specifications for the quality of water were built for different uses, and perhaps the most common uses of water in our daily life are for domestic and agricultural purposes.

Many studies have been conducted to evaluate the quality of water on the main river. (Najah et al. 1999) and (Jalut 1998) Some studies relied either on applying different statistical models or comparing with some standard specifications. The results reached by the researchers on the quality of main river water were a noticeable increase in the values of TDS, TH and chloride (Cl^{-1}) (Jalut 1998) and an increase in the concentration of Tu, TDS and Cl^{-1}

for most months of the year . The results of the study showed that the main river water is considered average water, but it is less than the critical limit for salinity and may cause future damage in the event of excessive use in terms of salinity and hardness.

Materials and methods

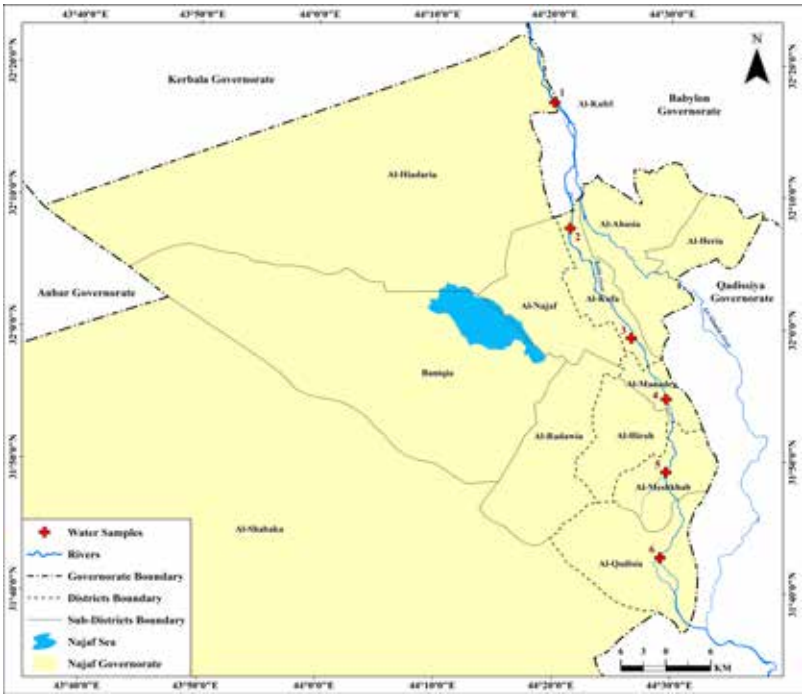
This study included analyzing many characteristics of water quality in the main river (in Babylon and Najaf) on 12/10/2024 and for six specific sites within the GBS technology within the borders of Najaf Governorate along the main river, namely Al-Kafel , 44.333732 32.286191, Al-Abasia (2 km from Al-Kafel City), Al-Kufa 44.356685 32.127634 , Al-Manadra 44.493669 31.91227, Al-Meshkhab 44.49346 31.820184 and Al-Qadisia 44.485826 31.712359, where the variables were compared with the upper limits allowed in the Iraqi standard specifications, the World Health Organization (WHO) specifications and the US Environmental Protection Agency specifications for drinking purposes and with Different international classifications for irrigation purposes

Sample collection

Samples were collected from six sites on the same day as shown in Map (1), placed in plastic bottles, sealed tightly and brought directly to the laboratory for the required laboratory tests total hardness (TH) , turbidity (Tu), temperature, potential of hydrogen (pH), Electrical conductivity (EC), Dissolved oxygen (O2), total suspended solids (TDS), sulfur (S), iron (Fe), Sodium (Na) and potassium (K), (Table 3)

Table 3: physical and chemical properties of water

property	Symbol	Measurement
Total hardness	TH	The TH was estimated by titration method with Na_2EDTA solution using EBT dye as an indicator
Turbidity	Tu	Turbidity (Tu) was measured in NTU units using HACH2100, Meter Turbidity.
Temperature:	°C	Temperature was measured locally using a mercury thermometer
potential of hydrogen	pH	pH was measured locally using Hanna meter.
Salinity properties:	(EC) and (TDS)	Electrical conductivity were measured using Cam lab.
Total suspended solids	TSS	The Total suspended solids were measured using a Japanese multi-measurement field device
Sodium and potassium	Na and K	were measured using Flame Photometer.



Map (1) shows the sampling sites of the main river in Babylon and Al-Najaf provinces

Results and Discussion

Results shown in Figure (1) that the water conductivity values reached less than the critical limit of salinity for use in irrigation and reached (0.95, 1.4, 1.4, 1.4, 1.4) dS/m, which is consistent with the results of Ayers and West cot (1985), that the degree of salinity is medium and causes the problem of salinity and alkalinity when used continuously, and good according to the guide of Ghliem (1997).

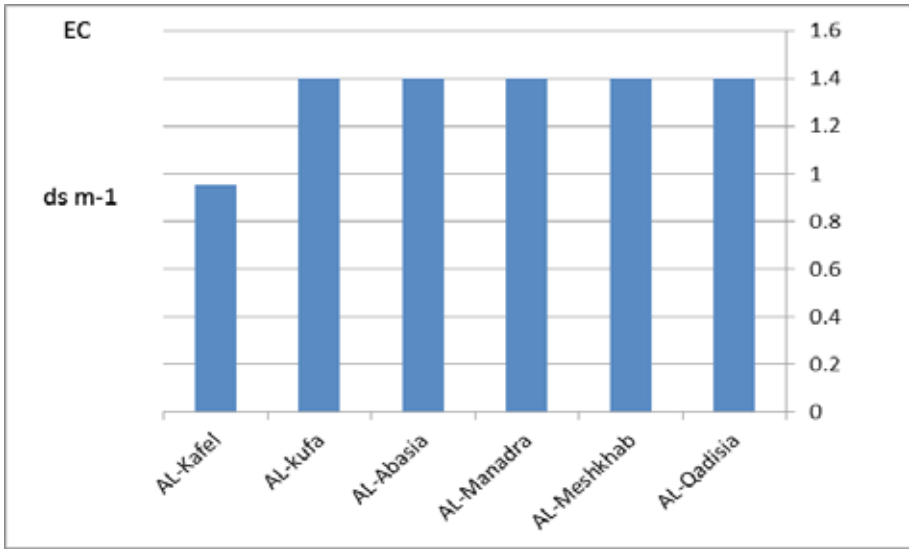


Figure (1) Salinity values for sample sites in the main river

As for the total dissolved salts (Figure 2), which reached (200, 100, 110, 0.12, 120, 140) mg/l, respectively, for the mention sites, which is almost less than the permissible limit for using water in irrigation, according to Iraqi and international specifications. Regarding pH (Figure 3), the results indicated that it is neutral tending to alkaline, and this is due to the nature of Iraqi soils.

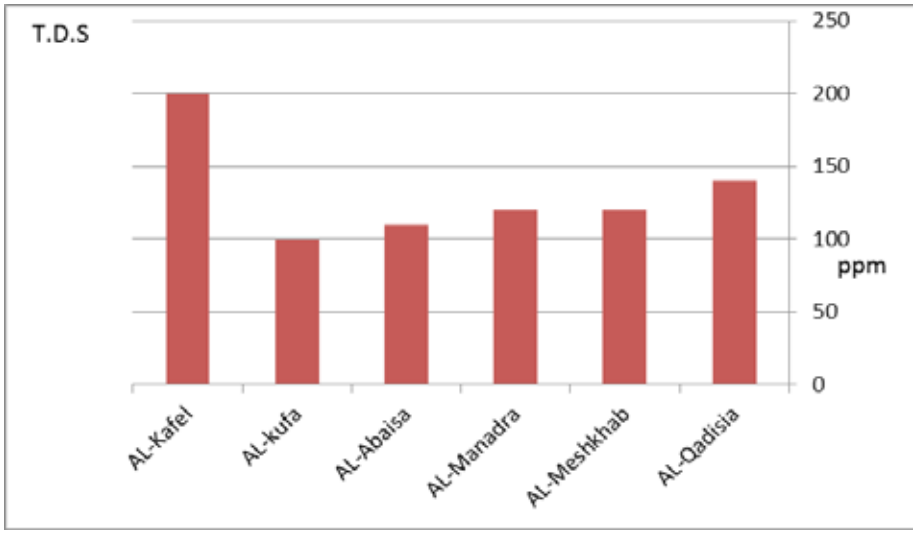


Figure (2) Total dissolved salts values

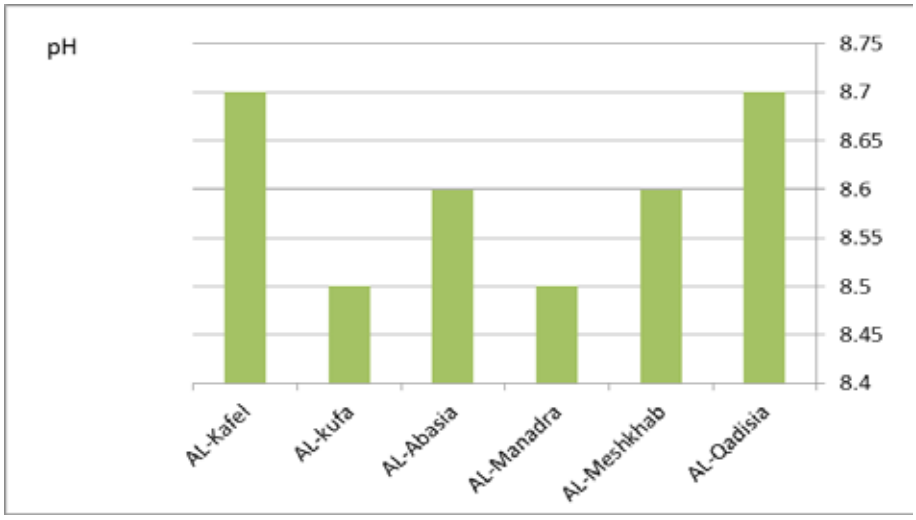


Figure (3) pH values in the studied sites of the main river

Result of Dissolved O_2, Figure (4), shows the ratio is 8.5 to 8.7 mg/ l, which is a very good ratio because it does not fall below the critical limit, which is 6.0 mg / l, according to Iraqi specification s . This is due to the fact that river water is constantly moving, in addition to the fluidity of water movement as a result of the river's height above sea level, which is 45 m, in addition to the inputs of organic materials that are found in rivers, which cause oxygen depletion as a result

of their depletion by microscopic organisms that decompose organic materials (Al-Gasimi et al. 2018) .

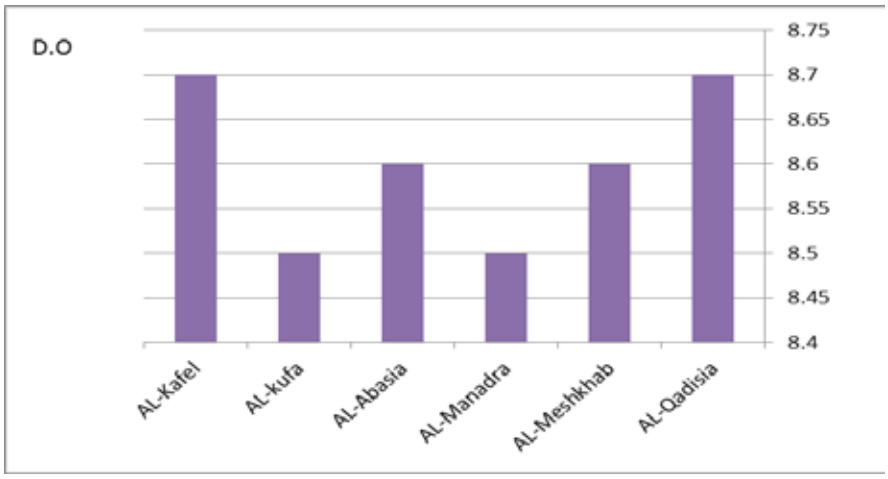


Figure (4) Dissolved oxygen values for the studied sites in the main river

Turbidity results (Figure 5) showed that its values in all locations of the main river were higher than the critical limit allowed for all determinants, whether local or international. The lowest values were recorded in the Kufa location, reaching 17 (Nephelometric Turbidity unit (NTU), and the highest in the Meshkhab location, reaching 96 NTU. This increase is due to the pollution of the main river with the water of the city of Kufa, as approximately four main enclosures of heavy irrigation water coming from the cities flow into this river, in addition to the weakness of the filtration enclosures, as well as the small streams that flow directly into this river, in addition to the sewage water coming from the agricultural lands before the city of Meshkhab. All of this has led to the inability of the river, microorganisms and aquatic organisms to carry out the process of filtering suspended materials, and thus the level of turbidity in the Meshkhab location has increased.

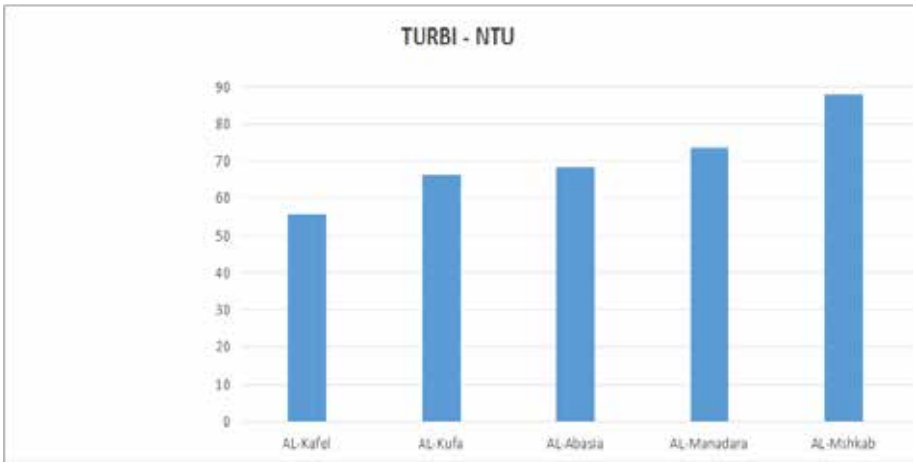


Figure (5) Turbidity values in the studied sites of the main river

Figure (6) shows that the Ca^{+2} concentration is less than the critical limit allowed for irrigation according to local and international classification. The lowest values were recorded in the Qadesia site, reaching 191 mg/ l, while the highest values were recorded in the Al-Meshkhab site, reaching 24.8 mg/ l. This is due to the low level of salinity in the Kefl site, which is lower than other sites. The values for Mg^{+2} were the lowest in the Qadesia site and the highest in the Meshkhab site, the Mg^{+2} values are related in terms of the rise and fall in concentration with the Ca^{+}. As for Na^{+}, the lowest values were recorded, reaching 53.0 mg/ l in the Al-Kafel site. This is due to the low salinity values in this site, and it confirms the close association of Na^{+} in contributing to the rise in salinity concentration and thus the rise in its degree. The highest values were recorded in the Meshkhab site, recording 63 mg/ l, while this site recorded the lowest concentration for Ca^{+2} and Na^{+} .

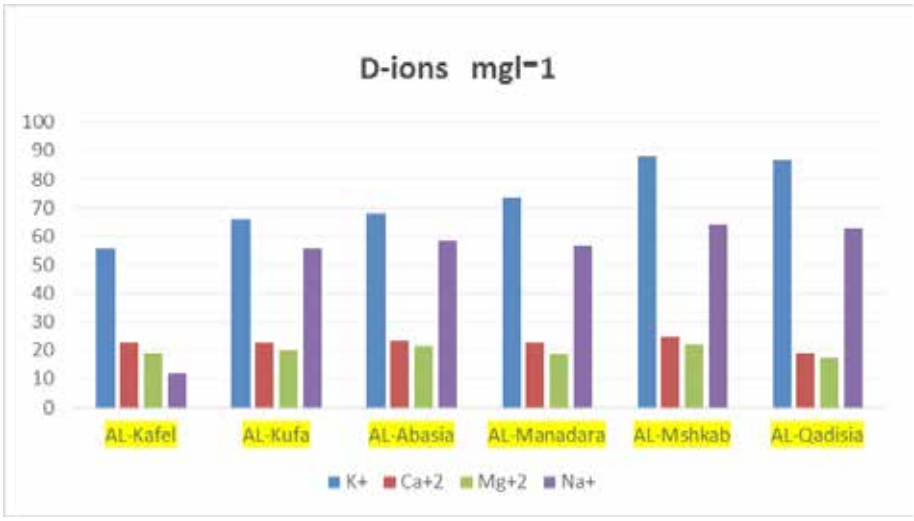


Figure (6) Values of some dissolved ions in the main river

Potassium ion (K^+) is one of the highest concentration ions compared to the rest of the estimated ions with increasing distance to the river, and this is due to the effect of sewage water coming from the main drainage of Al-Kufa city, in addition to the industrial district water, which does not treat these ions, as well as the effect of the city of Al-Manadra, which is located on the banks of the river, as well as the city of Al-Meshkhab

It was noted from Figure (7) that the Sodium Adsorption Ratio (SAR) values gradually increase with increasing distance from the main river, and this is evidence that Na^+ increases with increasing the distance of the river, and this is due to the effect of the drains that pass through agricultural lands and then return them to the main river, as well as the effect of sewage water, especially since the high content of sewage water from cleaning materials of various types that contain Na^+ compounds.

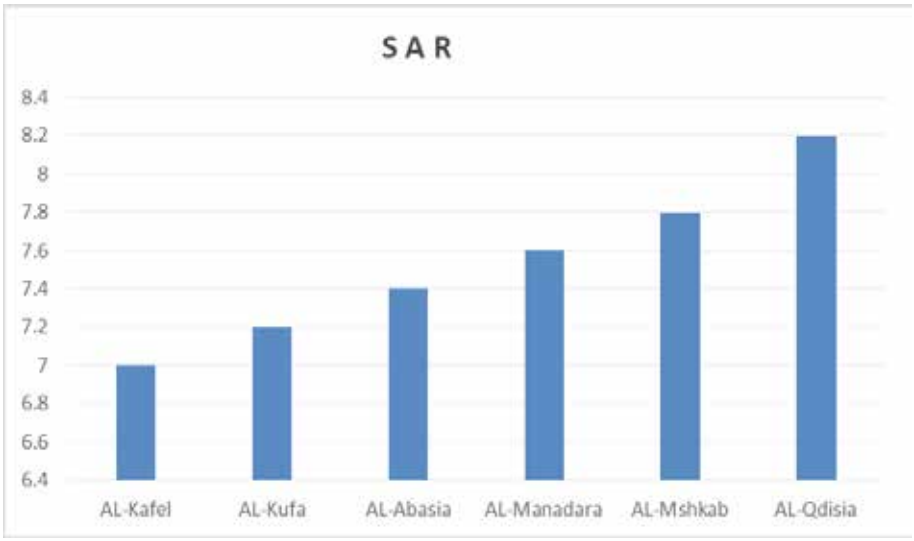


Figure (7) SAR values for the studied sites in the main river

According to the local classification of Ghliem (1997), the water is good in terms of SAR values, but as for the global classification, it is close to average and causes a problem in the future.

The most important findings of the research is that most of the water in the sites is suitable for irrigation in relation to the degree of salinity, so it is necessary to monitor the quality of the main river water monthly in terms of salinity. High turbidity rate above the critical limit, in addition to the low SAR values below the critical limit according to local specifications (Ghliem 1997). It is necessary to observe Na^+ values and try to reduce its water consumption by addressing the official authorities to prevent the discharge of sewage into the river.

References

Al-Gasimi, A.S., Yeaser, A.K., Soheep, M.W., Bhiah, K.M. 2018. Effect of adding different levels of fermented Nile flower plant (organic fertilizer) in some soil chemical properties, nutrients contents and wheat plant growth. Plant Archives. 18(2), pp. 1767–1770

FAO, 1999 Guidelines for Irrigation water Quality

Ghliem J. D. 1997. The proposed guide for evaluating the quality of irrigation water in Iraq. Doctoral dissertation. Soil Department, College of Agriculture, University of Basra. p. 138

Jalut Q. H. 1998. Evaluation of water quality parameters of water supply stations in Babylon Governorate" Journal of Babylon University , Engineering Sciences 3(5).

Najah K., Abdul-Hassan K., Al-Shukur. , 1999. Study of qualitative properties of Shatt Al-Hilla river for domestic , industrial and irrigational uses" Journal of Babylon University , Engineering Sciences 4 (5) .


حول المبتدى