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Tigris River water Qualitative characteristics between Salah al-Din and Baghdad governorates

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Abstract

This research dealt with the study of the natural and human characteristics of the Tigris River in the study area in terms of surface resources, including the Tigris River and the Adhaim river , and its impact on the qualitative characteristics (physical, chemical and biological) of surface water as measured by the quality and suitability of various uses. The qualitative characteristics of surface water resources in the study area are affected by several factors, including the nature of the rocks themselves and the soil of the area in which the rivers run, as well as the seasonality of the discharge of water, especially the Adhaim river , as well as the nature of human activity (agricultural, civil, industrial) and the waste it poses that affect the characteristics of rivers water.

Keywords

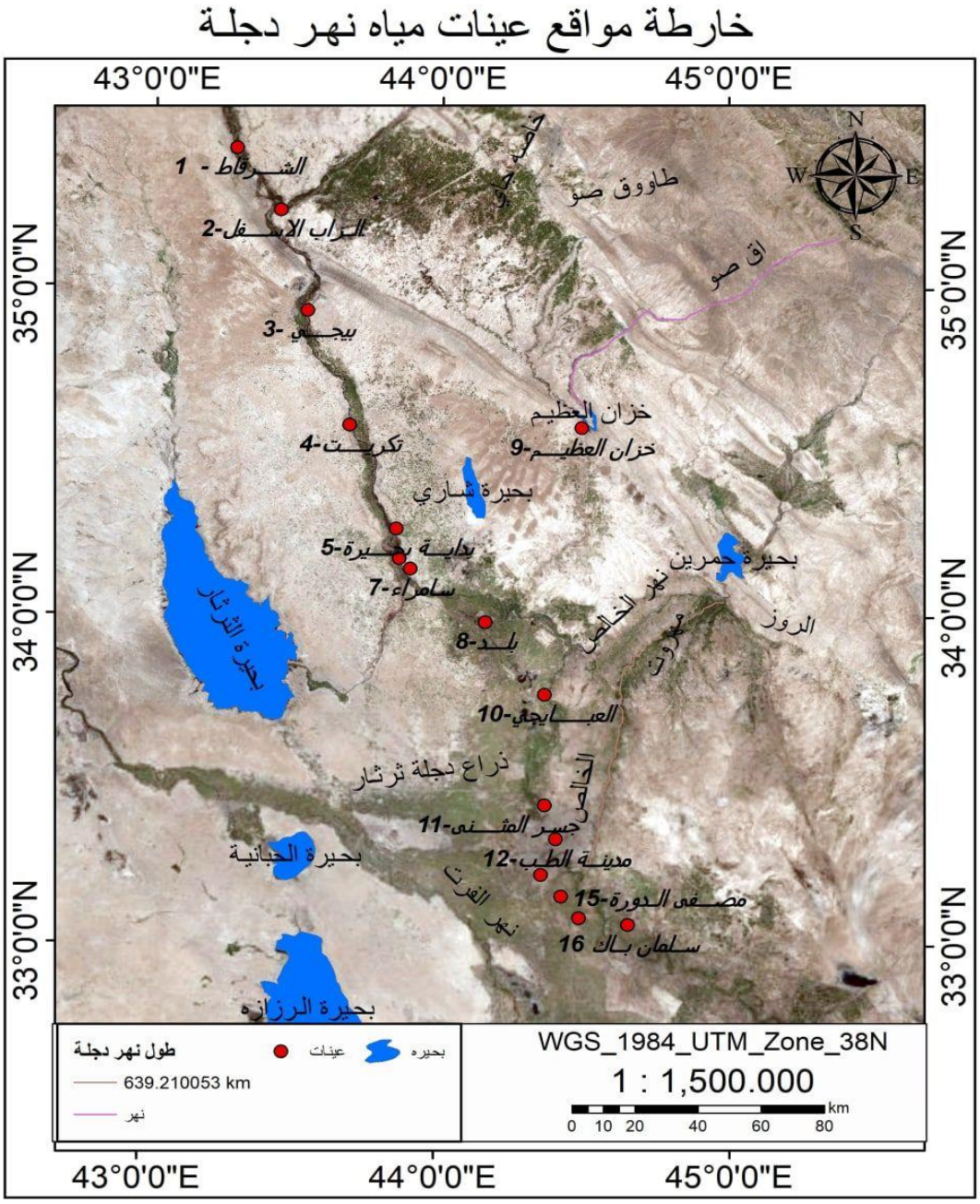
surface resources, qualitative characteristics, water drainage

Introduction

The study of the natural and human characteristics of the Tigris River in the study area in terms of surface resources, including the Tigris River and the Adhaim river , and its impact on the qualitative characteristics (physical, chemical and biological) of surface water, as measured by the quality and suitability of various uses. The qualitative characteristics of the surface water resources in the study area are affected by several factors, including the nature of the rocks themselves

and the soil of the area in which the rivers run, as well as the seasonality of the water discharge, especially the Adhaim river , as well as the nature of human activity (agricultural, civil, industrial) and the waste it poses that affect the characteristics of the river waters. [1] In order to know the qualitative characteristics of surface water and its suitability for irrigation, various human uses and drinking animals, (16) models were collected and analyzed from the Tigris River, as shown in map No. (11) and analyzed (11) chemical elements and compound to know some of the chemical and physical haracteristics as in Table (14), including:

Map No. (11)



Tigris River core samples sites map
Source: Ministry of Water Resources, National Centre for Water Resources Management, unpublished data,2022.

Table (14) Results of analysis Tigris River samples

Sr. No.	Sample Area	EC Ds\M	pH	T.D.S.	Ca+2 ppm	Mg+2 ppm	Na+1 ppm	SO4-2 ppm	Cl-1 ppm	K+1 ppm	T.H. ppm	Turb NTU
1	Sheikh Hamad Village Before Sharqat 5-3-2022	482	75,7	308	60	24	21	144	36	82.2	250	229
2	After the Sharqat, the lower Zap estuary 5-3-2022	615	04,8	394	64	4,26	42	211	36	0.54	270	2-17
3	Before Peggy Hole Area 5-3-2022	518	98.7	332	60	24	29	182	28	0.54	250	3,43
4	Almohazm village before Tikrit 5-3-2022	522	7,32	334	64	6/21	29	182	28	0.54	250	76,3
5	Samarra District after Tikrit 10-3-2022	682	81,7	436	68	24	69	230	43	0.54	270	00.6
6	Before Samarra Towards Baghdad 15-3-2022	59.0	00.8	378	64	6/21	39	192	28	0.54	250	7×42
7	Samarra Lake and Dam 15-3-2022	483	00.8	309	60	24	26	163	28	0.54	250	8,74
8	Before bald 15-3-2022	616	98.7	394	60	4,26	60	197	36	0.54	260	101
9	After the ʿAdhaimEstuary 18-3-2022	547	11,8	350	60	8, 28.	37	197	28	0.54	270	2,82
10	Before Baghdad Al Abba Yeji 15/3/2022	63	67,7	403	60	4,26	55	221	43	0.54	260	35
11	Muthanna Bridge 22-3-2022	959	11,8	614	76	4,38	94	307	64	0.54	350	2,50
12	Baghdad Medicine City 9-3-2022	927	85,7	593	80	2:43	89	326	64	3.1	380	6:27
13	Jadiriyah Bridge 9-3-2022	966	80,7	618	80	36	92	298	71	3.1	350	2,24
14	Al Kadhimiya Sewage Pipe 22-3-2022	09.1	01, 8	698	96	6,45	97	6,393	71	3.1	430	You know, 7, 11.
15	Al dawra Filter 9-3-2022	959	70,7	614	80	2,43	69	2,307	64	3.1	380	06,7
16	Al Madaen 10-3-2022	02.1	55,7	653	92	4,50	100	8, 412	71	06,2	440	78,9

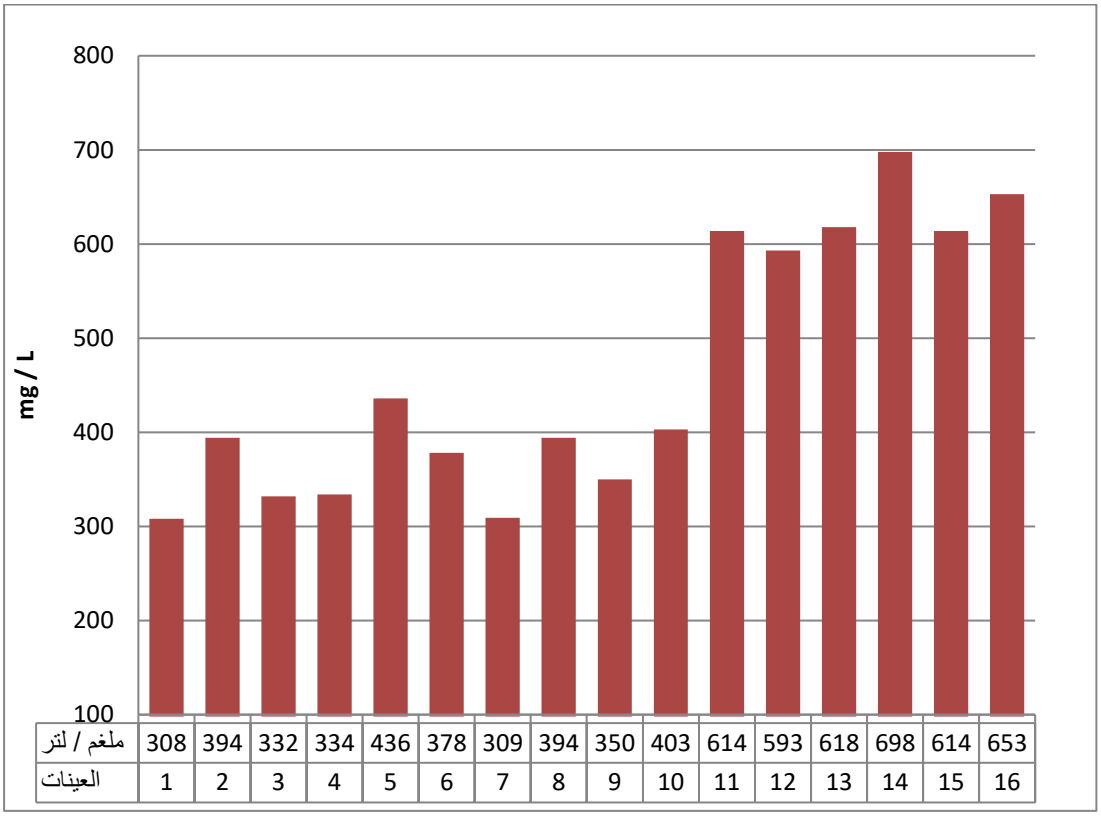
Source,Results of Laboratory Analysis,Ministry of Water Resources, National Center, Laboratory Department,2022

1-Total dissolved salts (TDS): -

It expresses the amount of salt dissolved in the water, and this term is often used to describe the potability of water for drinking and the amount of agricultural crops with salts, and it indicates the amount of organic and inorganic materials contained in the water, as the organic compounds include the activities resulting

from2 human, industrial and agricultural activities () and from Table No. (14) values and rates of concentrations of solids dissolved in the Tigris River, where the highest value was in Sample No. (14) in the sewage pipe in Al Kadhimiya and reached (698) mg /L, while the lowest concentration was in Sample No. (1) in Sheikh Hamad Village before Al-Shurqat and reached (308) mg /L.

As shown in Figure No. (1), the reason for the difference in ratios between the highest sample is the presence of the percentage of sewage pollutants released to the Tigris River compared to sample No. (1).

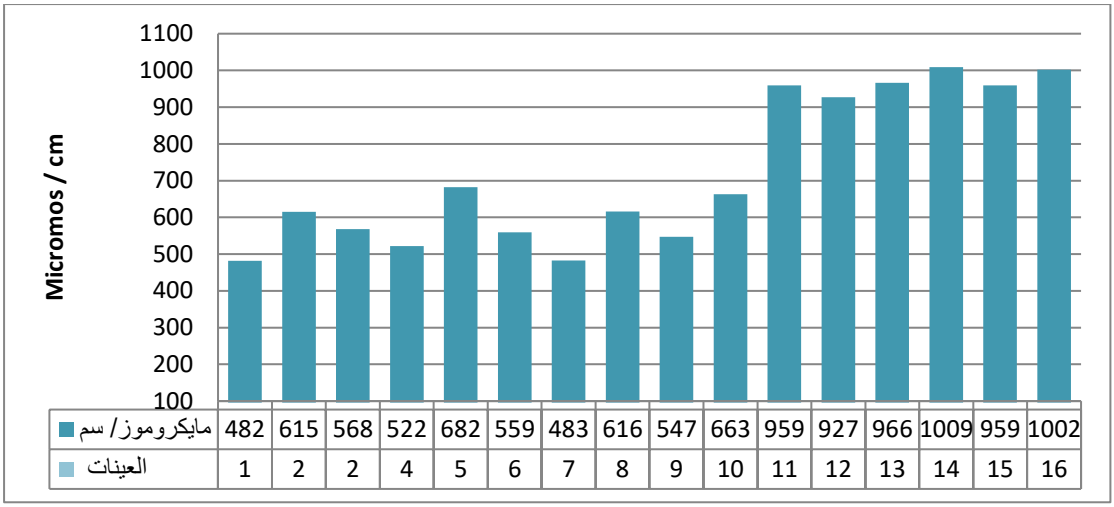


ملغم / لتر	308	394	332	334	436	378	309	394	350	403	614	593	618	698	614	653
العينات	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Figure (1)S. D. T. Values the total dissolved salts in the Tigris River

2- Electrical connection (E.C) : -

Electrical conductivity is a criterion for the concentrations of the total ions of the total dissolved salts in the water, which is a numerical value that indicates the water's ability to deliver the electrical current (3),as its height indicates the high percentage of salts in the water, and the electrical conductivity of the water depends on the total dissolved solids, the temperature of the water, and the concentration of the ions because the pure water[4] is poorly connected to the electrical current (), and from Table (14) it is clear to us that the values of the electrical conductivity in the Tigris River reached its highest concentration in Sample No. (13) in Jadiriyah Bridge and reached (966.0) micro-mos/cm,while it reached its lowest concentration in Sample No. (16) in the cities and reached (02.1) micro-mos/cm as shown in Figure(2), as it was found that the reason for the difference in the electrical conductivity ratios of the presence of electrical stations and the cycle filter released to the Tigris River.



Figure(2)E.C. Values of the electrical connection in the Tigris River

3- Acidic scale of pH (PH) :_

The pH scale is a logarithmic and inversely indicates the concentration of the hydrogen ion in the water, which is a measure of the base and acidity, and can be measured by the pH index, as the liquids are considered to have a pH less than(7) acids, and the liquids have a pH higher than(7) alkaline solution or bases. The pH (7) is considered neutral and is equal to the pH of pure water at a temperature of (25) °C[(5)]. From Table (14), it was found that the highest concentration of ph in the Tigris River in Sample No. (9) in the Great Estuary and Sample No. (11) in the Muthanna Bridge amounted to (11.8) mg/L,while the lowest concentration of ph in the Tigris River in Sample No. (4) in the village of Al-Mahzam before Tikrit amounted to (32.7) mg /left in Figure No. (3), it was found that the reason for the difference in the study area is the presence of pollutants that are released to the Adhaim river and Tigris .

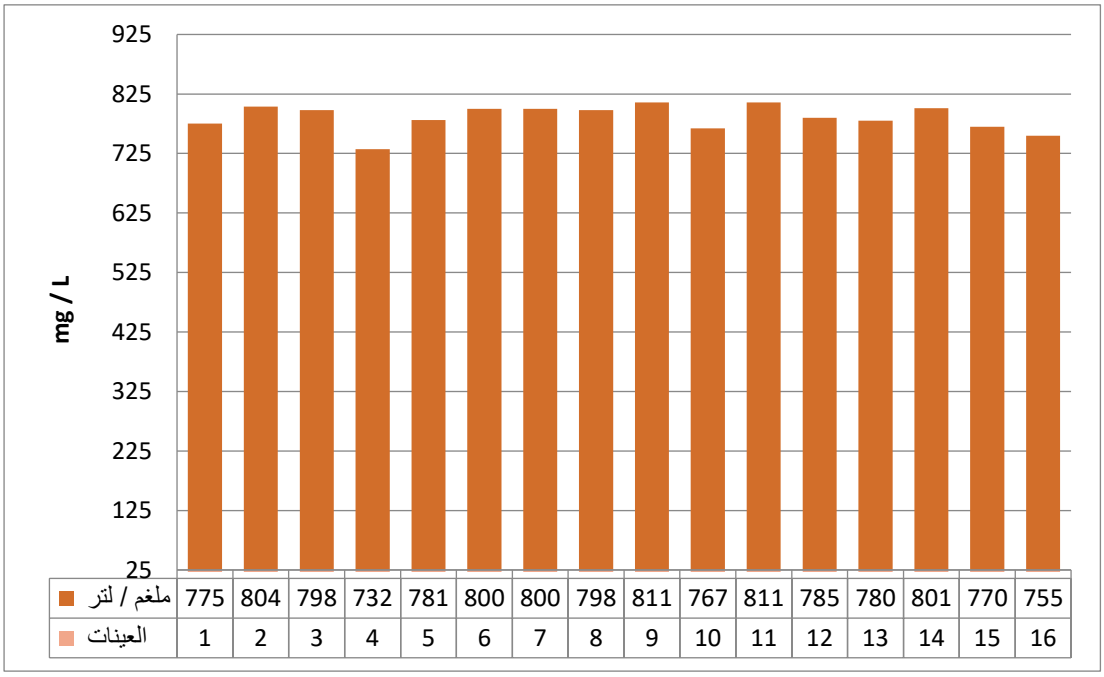


Figure 3.PH)) values The pH function in the Tigris River

4- Calcium (Ca+): -

The most common calcium ion among the positive dissolved ions in the fresh water because of its wide spread in the sources of soil and rocks, and industrial and domestic waste leads to an increase in its concentration in the water, and is one of the main components causing the total hardness of the water, and its increase in the irrigation water leads to the strengthening of the soil and the preservation of its construction and permeability, and from Table No. (14), it was found that the highest concentration in the Tigris River in Sample No. (14) in the sewage pipe in Al Kadhimiya reached (96) mg /L, while its lowest concentration in the Tigris River reached in several samples No. (1, 3, 7, 8, 9, 10) and its value reached (60) mg /L.(6) As in Figure No. (4), it was found that the reason for the difference in ratios for the presence of sewage pipe in a sample(14).

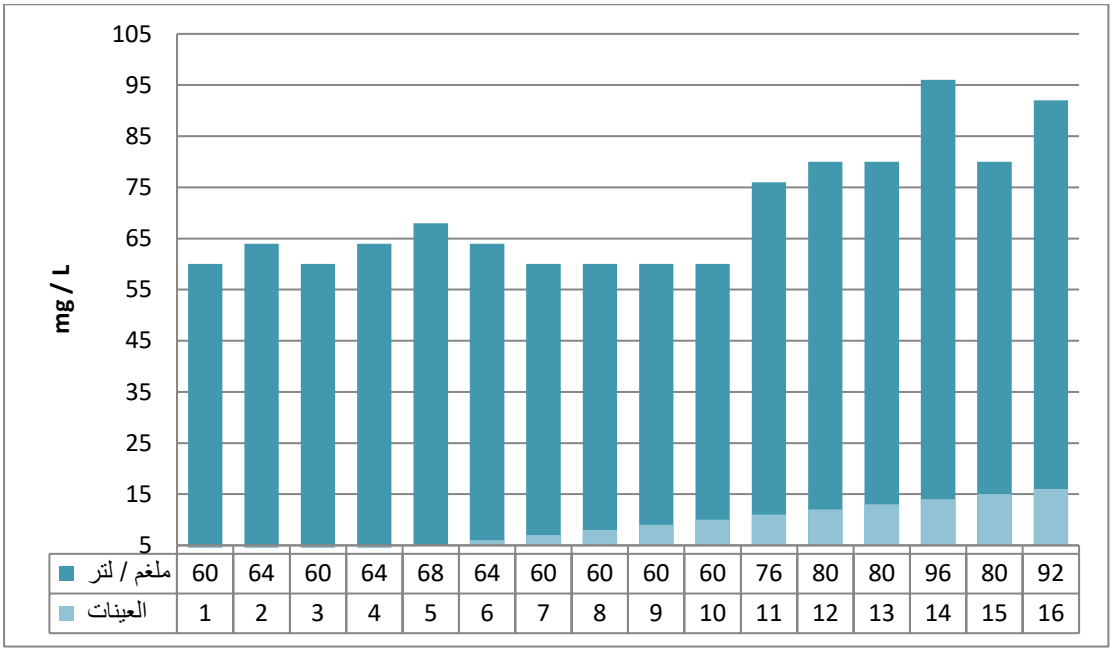


Figure (4)Ca + Values)) Calcium in the Tigris River

5- Magnesium (mg+ +): -

Magnesium is found in dolomite metal, and clay minerals are also a source of magnesium ion in water(7),as the presence of magnesium metal in water at high concentrations can result in an unpalatable taste, as well as a change in the color and turbidity of water, and magnesium concentrations of more than (125) mg /L may cause human diarrhea (8) from Table (14). It was found that the highest concentration in the Tigris River in Sample No. (13) in Jadiriyah Bridge was (36) mg / L, while the lowest concentration in the Tigris River was in Sample No. (4, 6) and reached (6.21) mg / L. From Table No. (12), it was found that the highest concentration in the Tigris River in Sample No. (13) in Jadiriyah Bridge was (36) mg /L,while the lowest concentration in two samples was No. (4, 6) and reached 6.21 mg / L, as shown in Figure No. (5). It was found that the reason for the difference in ratios is due to the industrial and human activities that are released to the Tigris River.(9)

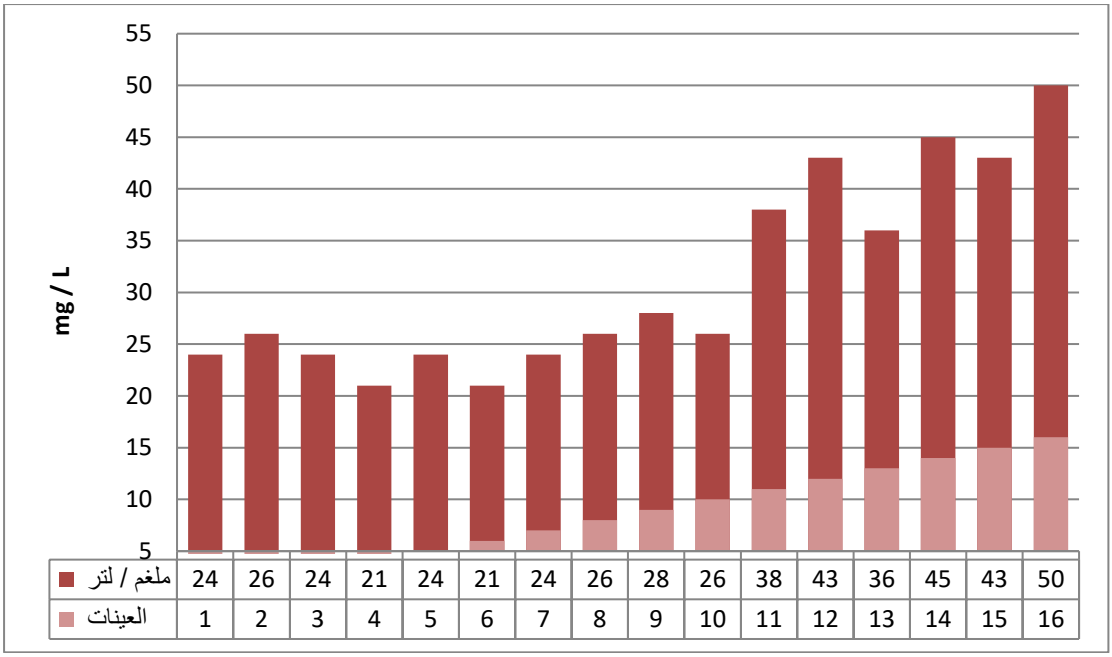


Figure (5)Values (mg+ +) of magnesium in the Tigris River

6-Sodium Na+) :): -

Sodium is one of the fast-melting alkali minerals in water and among the most abundant elements as the earth's crust contains sodium at a rate of (2.36%) of its composition [10], and the dissolved materials during the weathering processes and mud are the main source of sodium in the waters of rivers in addition to its high concentrations often related to pollution resulting from human activities as well as rain, which is one of the sources of sodium, and from Table (14) it was found that its highest concentration in the Tigris River in Sample No. (16) reached 100 mg /L,while its lowest concentration in the Tigris River in Sample No. (1) reached 21 mg /L. As shown in Figure (6), the reason for the difference in percentages resulting from multiple human activities and comparing them with other samples.

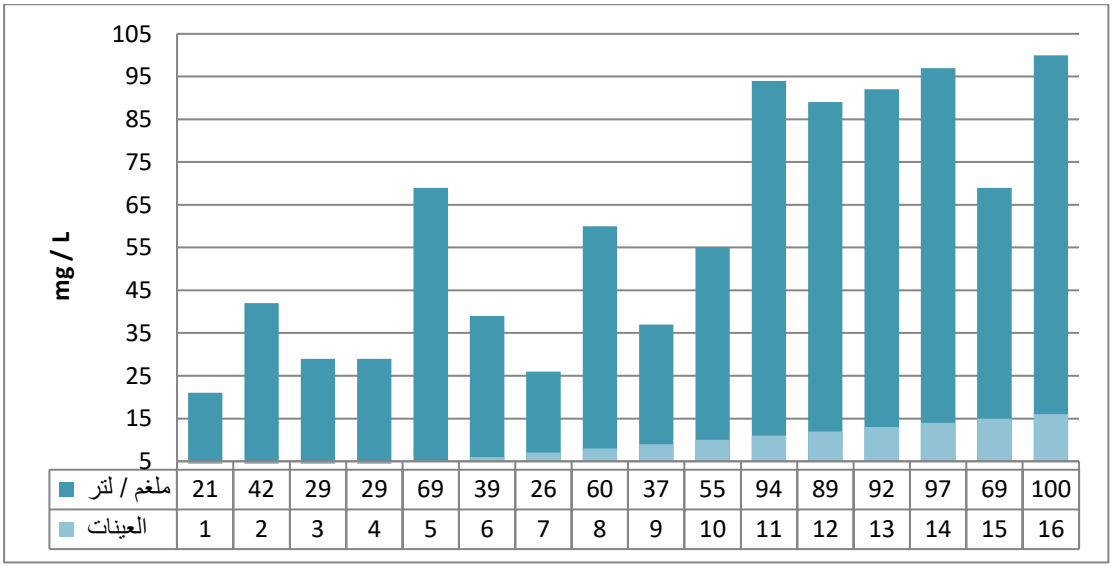


Figure (6) Values of Na+)) in the Tigris River

7- Potassium (+k): -

The element of potassium is one of the basic elements that cannot be dispensed by humans, but its increase damages human health and causes diseases, and from Table No. (14) it was found that its highest concentration in the Tigris River in sample No. (1) reached 82.2 mg /L, while its lowest concentration in the Tigris River in several samples, including sample No. (12, 13, 14, 15,) and its percentage was (3.1) mg /L. As shown in Figure No. (7), the reason for the difference in the presence of pollutants and many human activities.

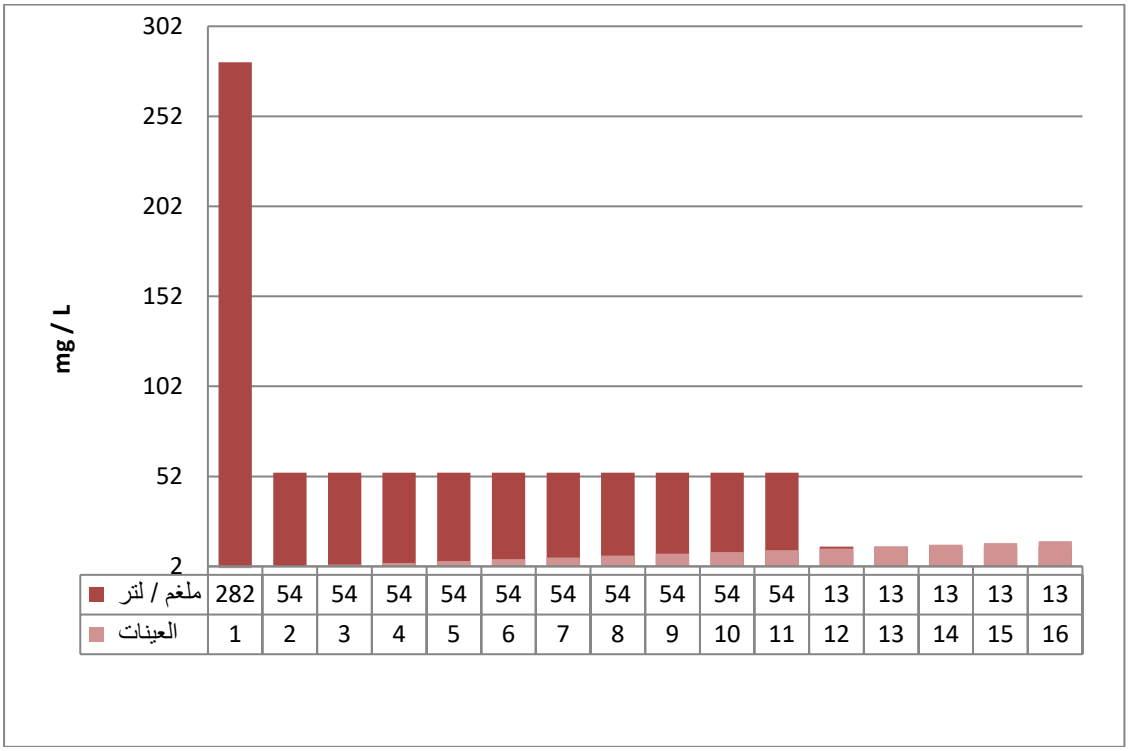


Figure (7) K + Values of Potassium in the Tigris River

8.Total hardship (T.H): -

It is an expression used to describe the state of water when the percentage of mineral salts is high, and hard water is usually harmless to health, but it is possible to cause serious problems in industrial environments [(11)], and the reason for the presence of hardship in water is the concentration of calcium and magnesium ion and the sources of concentration of these ions are carbonates and sulfates as a result of the analysis of organic materials of plants and microorganisms and the dissolution of rocks, and the values of total hardship in the Tigris River vary temporally and spatially from Table No. (14) shows that its highest concentration in the Tigris River in Sample No. (16) and reached (440) mg /L, while its lowest concentration in the Tigris River in several samples, including Sample No. (3, 4, 6, 7) and reached (250) mg /L. As shown in Figure No. (8), the reason for the difference in the presence of carbonates and sulfates in Sample No. (16) compared to other samples.

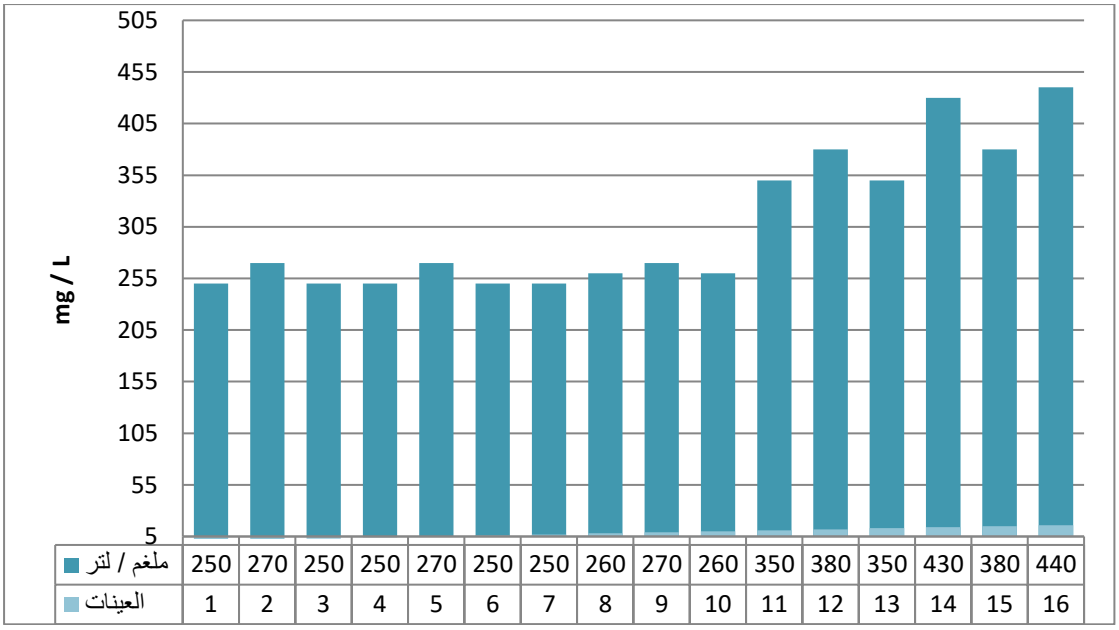


Figure (8) T.H. Values)) Total Hardness in the Tigris River

9.Chlorides (cl-): -

It is one of the largest inorganic components found in drinking water, wastewater or sewage, and the rain is the most important source [12], and the reasons for its presence in nature are due to the analysis of salt deposits, chemical industry waste and oil, as the salinity of the taste that appears in the water depends primarily on the concentration of chloride ions in the water in addition to the other components [13], and from Table No. (14), it was found that the highest concentration in the Tigris River in Sample No. (13, 14, 16) reached (71) mg /L, while its lowest concentration in the Tigris River reached several samples, including Sample No. (3, 4, 6, 7, 9) and reached (28) mg /L. As shown in Figure No. (9), the reason for the difference in the presence of pollutants of the chemical industries and oil mainly, which are released to the Tigris River, was their presence in a greater proportion in the samples mentioned above .

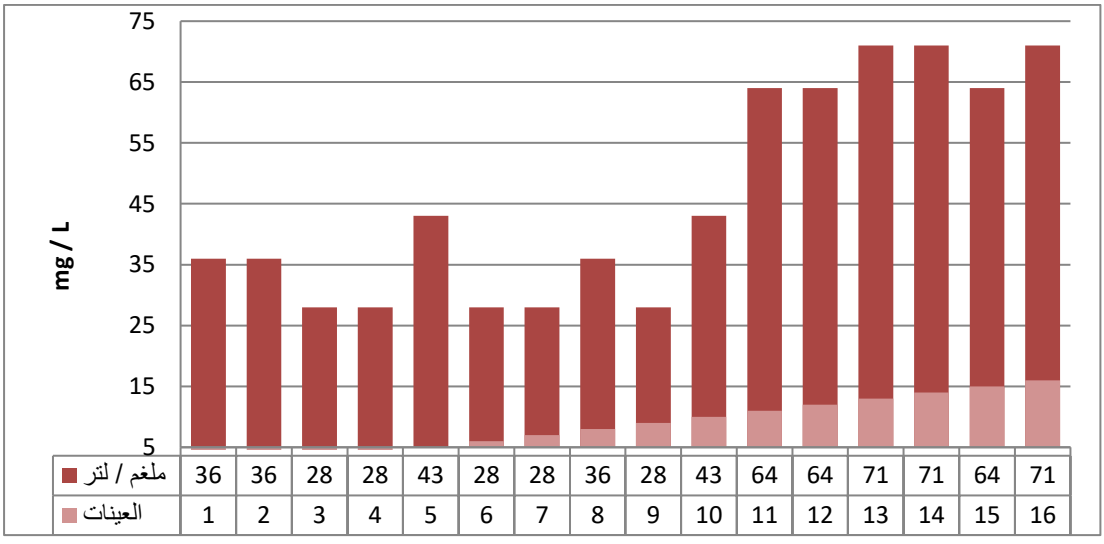
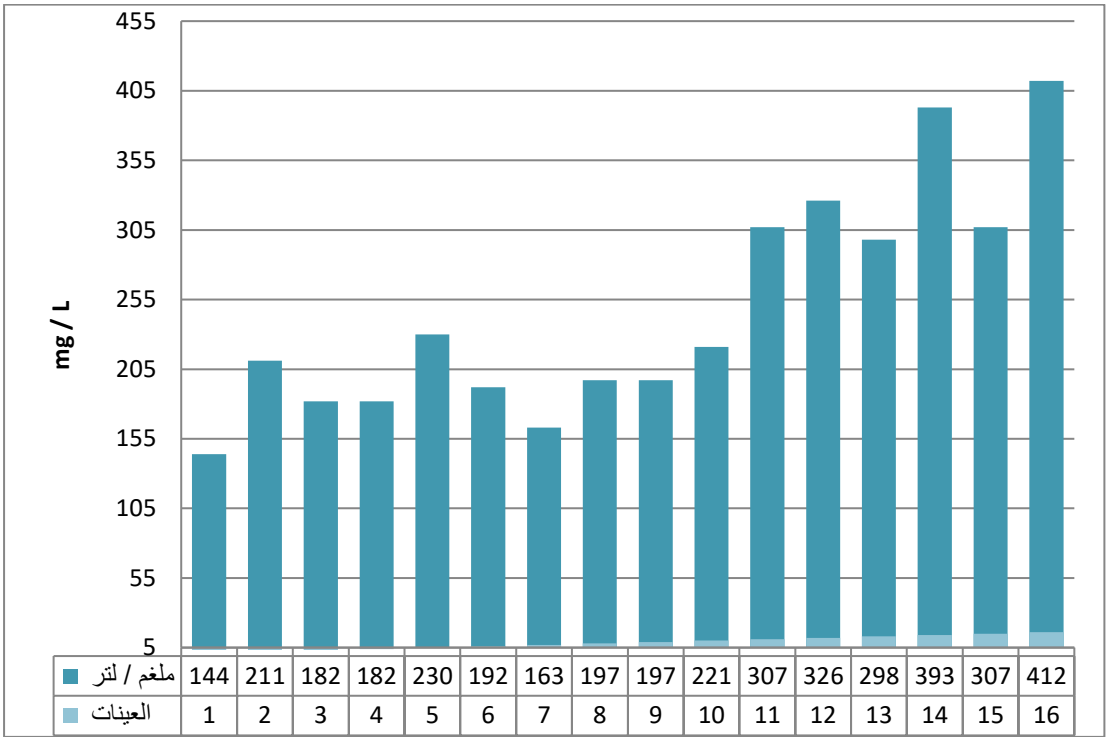


Figure (9) Chlorides (+Cl) values in Tigris River

10-Sulphates (SO4): -

This element is made up of natural factors from the reaction of water with sulfate-containing rocks. They are mainly sedimentary rocks [14], in addition to the human factors resulting from the discharge of industrial water as a result of the melting of some chemical fertilizers added for agricultural purposes [15], that the values of sulfates vary temporally and spatially and from Table No. (14) it was found that the highest concentration in the Tigris River in sample No. (16) in the cities was(412.8) mg/L, while the lowest concentration in the Tigris River in sample No. (1) in the village of Sheikh Hamad before Al-Sharqat amounted to (144) mg/L.As shown in Figure (10), the reason for the difference in ratios is the presence of industrial water that is released to the Tigris River.



ملغم / لتر	144	211	182	182	230	192	163	197	197	221	307	326	298	393	307	412
العينات	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Figure (10) SO4 Values of Sulphates in the Tigris River

11- Turb -:

The turbidity of the water is one of the standards of water quality and the turbidity of the water is defined as its ability to scatter the light falling on it[16], through which the suspended substances in the water are identified from silt and silt, as its height affects the obstruction of the light in the water column, which has a role in the process of photosynthesis of the plant,and from Table No. (14), it was found that the highest concentration in the Tigris River in Sample No. (1) and reached (229) mg /L, while the lowest concentration in the Tigris River in Sample No. (4) and reached 76.3 mg /Left in Figure No. (11), it was found that the reason for the difference in the percentages of the presence of suspended substances in the water in Sample No. (1) that affect the Tigris River.

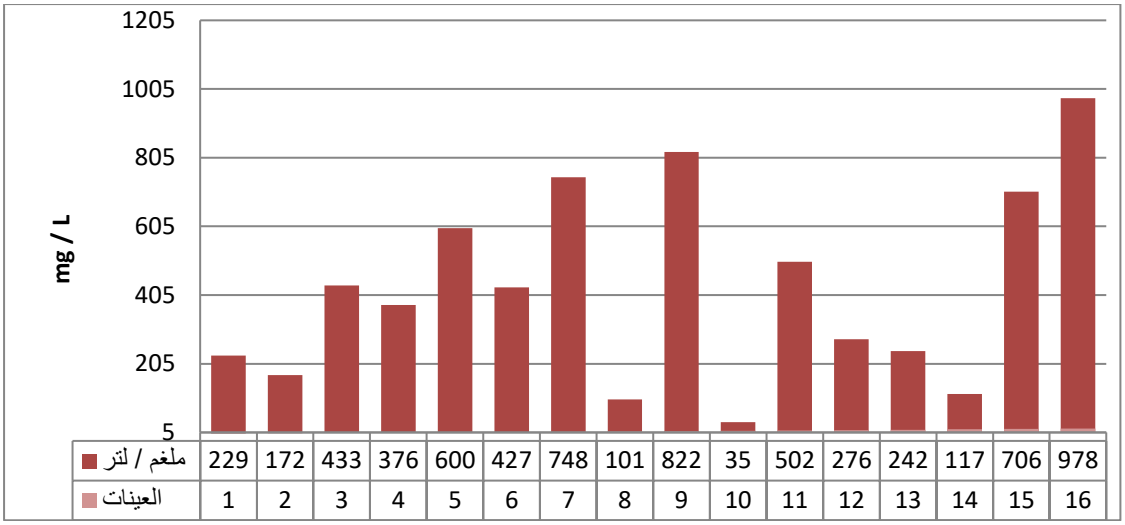


Figure (11)Turb values in the Tigris River

Third : Biological Characteristics

1- Plants

Many varieties of plants spread and vary in their distribution, which works to preserve the soil from erosion and contributes to preserving the banks from erosion, even if there are opposite cases, and depends on the following: -

أ- The density of the natural plant along the banks of the Tigris River and its diversity such as the trees of the west, reeds, papyrus and tails and its lack as we headed towards the floodplain, as well as the spread of certain types of it such as thorns and minds and some annuals and perennials, but their impact was very clear. Each small plant of thorns or minds gathers a mass of soil that remains stuck and cohesive due to the impact of the roots, as well as the rush of small teeth from the banks into the riverbed and these tongues are often covered with a vegetable density of reeds in general, and we note that the barren banks after this tongue suffer from its decline and erosion due to its lack of protection, and some newly fallen blocks from the bank can be distinguished into the stream as picture No. (10).

Picture No. (10)Cane and papyrus plants in the district of Balad
Field study dated 31/7/2022

A)

Plants planted (orchards) along the Tigris River on both sides had the opposite effect, as roots were penetrating the soil, fragmenting it and crushing it because of the large trees and the strength of its roots.

Animals: -

Animals play a role in smashing and weakening the banks of the river and making them easy to erode, as the impact of animal activity is indirectly in the formation of the flood plain of the river and the development of its soil through the processes of demolition and construction by increasing the amount of sediments reaching the river's course as a result of smashing the natural shoulders of the river in different ways and making them vulnerable to the process of water and wind erosion.

The impact of animals can be limited to the following:-

1- **Rodents**:- Rats and mice eat the banks and weaken them by digging the network from the long tunnels that extend from the surface of the banks to the agricultural fields within the floodplain where they feed on the roots and stems of the plants and damage them and contribute river water as they pass through these tunnels to fill them and add their soil to the flood plain, especially at the time of floods, it was noted that there is a wide spread of rodent openings along the stream and the flood plain and some rodents take the hills in the flood plain as their dwellings, which made them proliferate and work as a mechanical element affecting the formation of flood plain soil.

2- **Birds**:- Birds are exploited in building their nests on the upper banks and at levels that the water does not reach except during the very high flood seasons, where the effect of birds is shown in the demolition of banks whose tunnels are drilled in the very steep concave banks and that their burrows are in the form of spaced gatherings and that the role of birds is almost weak in affecting the flood plain .

3- **Insects and worms:**- Their impact is by digging small tunnels not exceeding (1) cm in diameter and a number of centimetres deep, on the floodplain and the banks of the river and the bottom of many types of insects and worms, and that their role in contributing to the demolition of the banks is not of prominent importance, but the presence of specific types of insects has a clear contribution to the erosion of the banks of the concave sides, especially the parts in which the ratio of sand to mud and silt is low, as their spending extends for several centimetres in the floodplain on both sides of the Tigris River [(17)], and the impact of insects is very few, but it is effective when their density increases in a small area if the water enters into it. The various types of earthworms work in mechanical weathering activity by digging the tunnels, which range in depths of (4 - 50) cm, and the worms living in one hectare swallow more than ten tons of soil per year. These processes contribute to the disintegration and decomposition of the floodplantation of rivers and their flow towards the river, but they are manure from the agricultural side through the increase in the soil.

As for the impact of the river's slope and the speed of its flow on the nature of the natural plant located on the banks of the river, where the speed of the water current is an important factor of the erosion of the banks and the dredging of the sediments of the bottom, and the speed of the water in the river stream varies from one river to another and in the same river from one place to another, as it is at its highest near the surface and above the deepest point and decreases as we head towards the bottom and the banks due to the friction factor as it varies in the areas of river sprains, as the speed is at its highest in the concave side of the bend, and less in the convex side, and this gets erosion in the concave side while deposition occurs on the convex side [18-21].

There is a variation and fluctuation in the annual expenditure rates in the region and a large difference between them,as we find that the expenditure rates in the past years have been higher than they were recently, which contributed to changes in the nature of the riverbed and its riverine manifestations and the composition of the floodplain over time, and this variation in water drainage is due to several reasons, including lack of rain and high temperatures and increased evaporation, which have an impact on the lack of drainage .

The most important qualities and characteristics that apply to the longitudinal section of the Tigris River, which extends from the city of Mosul to the Balad and to the south of the city of Kut. This section is characterized by the following:-

1. The stream slope is reduced by half from this section of the Mosul and becomes (53 km to 50 cm per 1 km). In the second section of the section of the section, the slope becomes (9.6cm per 1 km) and extends from the city of Balad to the south of Kout .
2. The river resorts to sedimentation at the city of Mosul, but its manifestations do not appear on the surface of the water except in the period of low levels.
3. The river resorts to the expansion of the stream as a reaction to the water increase and as a reaction to the state of deposition that occurred, that is, the directions of the sculpture became more lateral than anchored, yet the stream in the section from Mosul to the north of Samarra By (20) km deep and was not able to form the flood plain except in the form of intermittent pockets east of the river.
4. The clip shows the turns, carrots and riverine year, but it is limited from Mosul to Samarra.
5. From Balad city to south of Al Kout, geomorphological work trends are evident in the extension of the stream to accommodate the large amount of water and the large load, which is not commensurate with the slope of the slow stream, which is (9.6 cm per kilometer) .

Footnotes

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