## Evaluation of water quality on some wells in Basrah Governorate for irrigation purposes.

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**Abstract**

The study was conducted at selected sites in some of the desert areas in Basra for three sites in El-Bargesia, Khor El-Zubair and Safwan for the classification of well water and its suitability for irrigation and when matching the values of chemical analysis of water wells related to the qualitative classification criteria for water, which include electrical conductivity and sodium adsorption, The American salinity laboratory, the water of the Barges wells is classified into C4S4, which is very salty and very high water from the sodium adsorbent and the Khor al-Zubayr is classified into C4S3, which is very saline and very harmful to the adsorbent sodium The water of Aabar Safwan took the same classification as the Khawr al-Zubayr water, ie, the C4S3, and according to the classification of Ashcroft 1972 (Taylor), the water is classified according to the values of the electrical conductivity to class D, which describes the water very badly in the three sites either according to Fipps (2003) Water is classified according to the values of the electrical conductivity to class (4), which describes the water without irrigating in the three sites According to the percentage of adsorption of sodium, the water is classified into the second type, the average damage at the sites of Burjisia, Khor al-Zubayr and the harmless species in Safwan.

## Introduction

The limited water available for irrigation is of great strategic importance at present for most regions of the world, including the region of Mesopotamia and the problem of the first dimension quantitatively and qualitatively. There is a significant decrease in the discharge of the Tigris and Euphrates rivers, in addition to the high salinity of the two rivers, . Many of the current problems of irrigated agriculture are a direct result of the salts accumulated in the soil which is the source of water added. The importance of the study of the quality of irrigation water is determining whether this type of water is usable and does

not cause the formation of conditions of saline or alkaline soils, Evidence of whether this type of water causes toxicity to plants and crops during irrigation, The problem of Stalinization  in the agricultural sector in Iraq has caused the deterioration of approximately 65% of agricultural land in the center and south, as well as the use of saline water by farmers under semi-desert conditions and lack of vegetation cover, these are all factors specific to the production of agricultural crop(Zubaidi 2000). The irrigation water used in the irrigation of agricultural crops affects the salinity of the soil according to its concentration and ionic composition. The effect of irrigation water on salinization depends not only on its quality but also on the chemical and physical properties of the soil and the extent of their participation and assistance in the salinization process. Soil permeability, drainage conditions and salt balance of the soil have an important role to play as well as rain, distribution and evaporation(Shukri, 2002). Groundwater is one of the water resources that can be adopted for agricultural purposes after being evaluated based on criteria suitable for these purposes. The importance of studying the quality of irrigation water lies in the containment of irrigation water, regardless of its sources of different concentrations of dissolved salts. The chemical analysis of water is relatively easy and inexpensive. It is used to help solve the current problems and the problems that may arise in the future due to the use of irrigation water. This is useful in determining the necessary management methods to avoid and minimize the damage caused by using this type of water(Al-Najem and Hammadi, 1980). Therefore, this study is the classification of selected water wells in some desert areas in Basrah and its validity for irrigation. Irrigation water rating systems have multiple criteria and use more than one indicator which reflects the validity and suitability of these types of water for irrigation. The assessment of the validity of irrigation water depends on certain characteristics related to many factors related to water type, including soil factors in terms of humidity, wind, season and the quality of the plants themselves in terms of Tolerance to salinity and the stage of its growth as well as the amount of water used for irrigation and the date added. Each of these characteristics has specific indicators based on the basis of measurement indicating that the assessment of the possibility of using water for irrigation is linked to different characteristics and each of these characteristics are specific indicators based on qualitative water analyzes that reflect their validity and seriousness of irrigation. These characteristics are salinity and water

quality,There are many classifications of irrigation water based on the concentration of total soluble salts. The classification of the American salinity laboratory is one of the most widespread classifications in the world and the classification of Ashcroft 1972 (Taylor) in Khazraji and Ali (2002) and Fipps (2003).

| Classification of the American Salinity Laboratory, 1954 | | |
|---|---|---|
| **Total dissolved salts TDS mg / l** | **Electrical conductivity E.C mmhose / cm** | **Category** |
| **0-160** | **0-0.25** | **Low salinity C1** |
| **160-480** | **0.25-0.75** | **moderate salinity C2** |
| **480-1440** | **0.75-2.25** | **High  salty C3** |
| **>1440** | **>2.25** | **Very  High  saltyC4** |
| **Classification Taylor and Ashcroft, 1972** | | |
| Total dissolved salts TDS mg / l | Electrical conductivity E.C mmhose / cm | Category |
| **<480** | **<0.75** | **A little damage** |
| **480-960** | **0.75-1.5** | **Bmoderatdamage** |
| **960-1920** | **1.5-3** | **Csevere damage** |
| **>1920** | **>3** | **DVery severe damage** |
| **Classification of Fipps, 2003** | | |
| **Total dissolved salts TDS mg / l** | **Electrical conductivity E.C mmhose / cm** | **Category** |
| **>175** | **>0.25** | **Excellent    1** |

| 175-225 | 0.25-.75 | Good      2 |
|---------|----------|-------------|
| 225-1400 | 0.75-2 | Allowed with washing 3 |
| 1400-2100 | 2-3 | Doubt needs to be 4  removed |
| >2100 | >3 | invalid 5 |

Table (1): Classification of water quality based on the values of electrical conductivity.

Table (2): Classification of water quality based on sodium adsorption values

| Classification of the American Salinity Laboratory, 1954 | | | | |
|---|---|---|---|---|
| **Electrical conductivity E.C mmhose / cm** | | | | **Category** |
| >2.25 | 0.75-2.25 | 0.25-0.75 | 0-.0.25 | |
| **Sodium adsorption rate SAR** | | | | |
| 4-0 | 6-0 | 8-0 | 10-0 | S1Low damage |
| 9-4 | 16-12 | 15-8 | 18-10 | S2moderate |
| 14-9 | 18-12 | 22-15 | 26-18 | S3severe damage |
| >14 | >18 | >22 | >26 | S4very serious |
| **Classification of Todd,1980** | | | | |
| **Sodium adsorption rate SAR** | | | | **Category** |
| <20 | | | | Excellent    1 |
| 20-40 | | | | Good      2 |
| 40-60 | | | | 3 allowed |
| 60-80 | | | | 4 Doubtful |
| >80 | | | | 5 Invalid |
| **Classification of Fipps, 2003** | | | | |
| **Sodium adsorption rate SAR** | | | | **Category** |
| 1-10 | | | | little harm     1 |
| 18-10 | | | | 2moderate harm |

| 18-26 | very harmful | 3 |
|---|---|---|
| >26 | Very severe | 4 |

## Study area:

The area of study is three sites: 1 - KhorZubair, 2 - Zubayr and 3 - Safwan, which is part of the western region of southern Iraq, which is located in the northwest of the Arabian Gulf as shown in Figure (1) Of the sand, gravel and volcanic rocks by 74.6% and the thickness is more than 348 meters and is heading to the east to reach 150 meters thickness and the other proportions of this component are 15.9% clay and silt by 8.9% The composition of the dibdbah membranes mature allow the penetration of rainwater and its detention to form groundwater Haddad , 1978). )
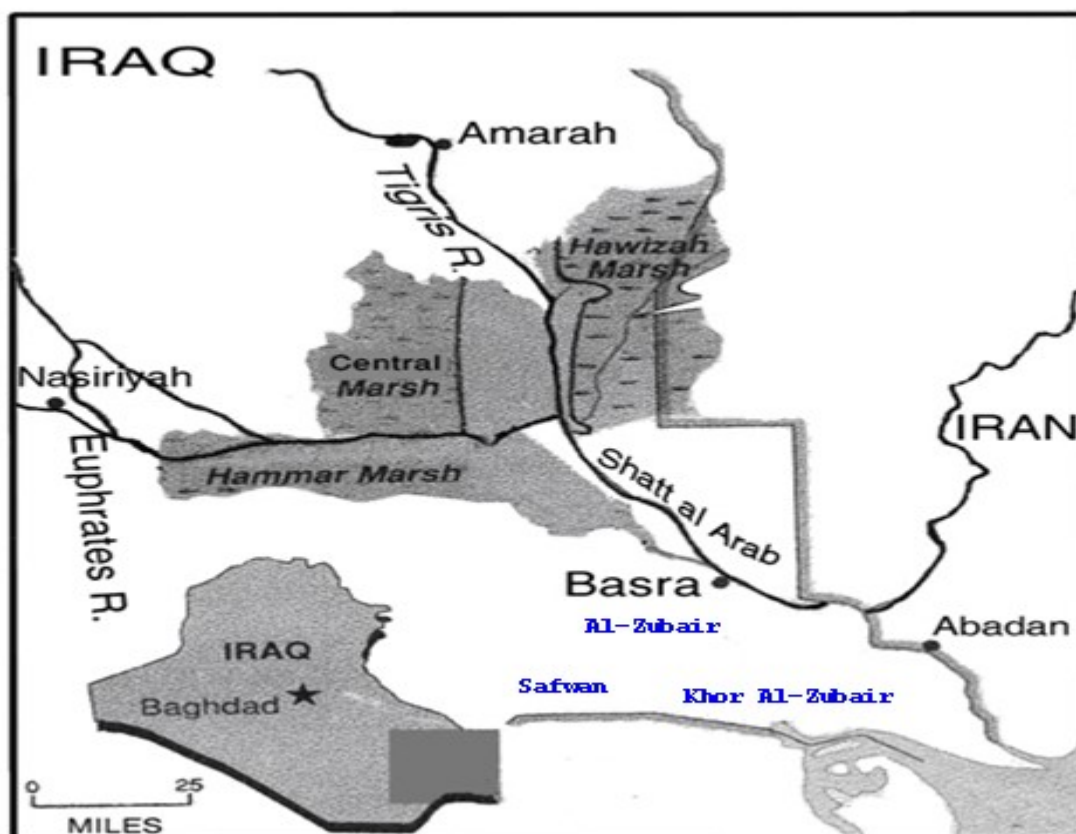


Figure (1) A map showing the sampling sites of the wells of the study areas

## Materials and Methods:

Three wells were selected in Burjisiyah, Khor al-Zubair and Safwan and collected 15 samples of water wells and five samples from each well. Water samples were stored in 3 liter plastic bottles, The following characteristics were estimated as follows;  Use the Microprocessor, PH-meter to determine Number of acidity,the electrical conductivity of the water was measured by using electrical conductivity meter L17, manufactured by the Japanese company Bishof, after being calibrated using KCL solution. Salinity was calculated in the computational method of the electrical conductivity values of microsemens / cm multiplied by $640 \times 10-6$, The concentration of calcium was estimated based on the method described by Lind (1979). 50 mL of the sample was added after adding 2 ml of N2 with Na2EDTA (0.01M) using MurexidTo violet. The output was expressed as meq / L.,., Sodium ionate is estimated in the atomic emission device. The ratio of sodium adsorption is calculated from the following relationship:

$$SAR = Na / \sqrt{[ (Ca + Mg ) / 2}$$

## Results and Discussion:

Table (3) shows the chemical analysis of water wells in the specified sites, which included Burjisia and Khor al-Zubayr and Safwan. It is clear that the values of the analyzes were different between the studied sites and overall the location of Bargisia significantly in all the values of the analysis followed by Khor al-Zubayr and Safwan .

Table (3): Chemical analysis of wells water

| SAR | $Ca^{+2}$ | $Mg^{+2}$ | $Na^+$ | EC ds/ m | Sites of wells |
|------|------|------|------|------|------|
| 15.95 | 19.50 | 13.20 | 64.44 | 9.80 | Burjisiyah |
| 13.18 | 14.17 | 10.18 | 46.41 | 7.22 | Khor Al-Zubair |

| 9.43 | 12.55 | 4.36 | 27.35 | 4.70 | Safwan |
|------|-------|------|-------|------|--------|
| 2.01 | 1.33 | 2.50 | 13.07 | 1.99 | RLSD |

wells in fields planted with tomatoThe increase in electrical conductivity (figure 1 ) in all locations can be expected to increase the intensive pumping of water from these wells during the season of growing the tomato crop, which leads to the rise of water in the most saline water formation under the less saline water formation (Mansouri, 2000). Aquifers of aquifers without the presence of separated layers with a large withdrawal of water causing salinity (Abdalla, 2008 and the General Authority for Groundwater, 2016).
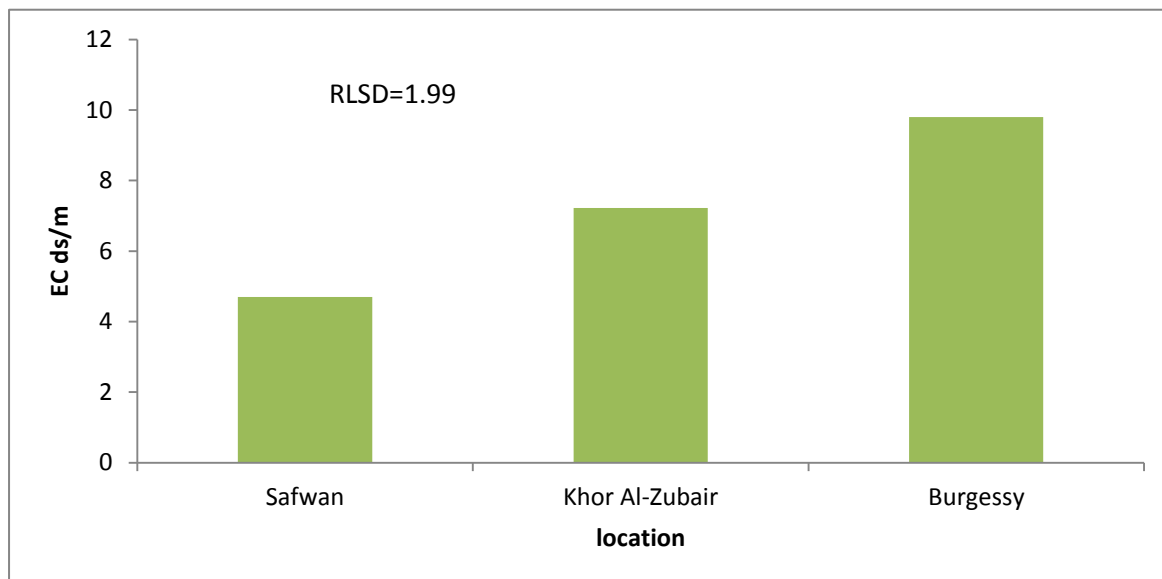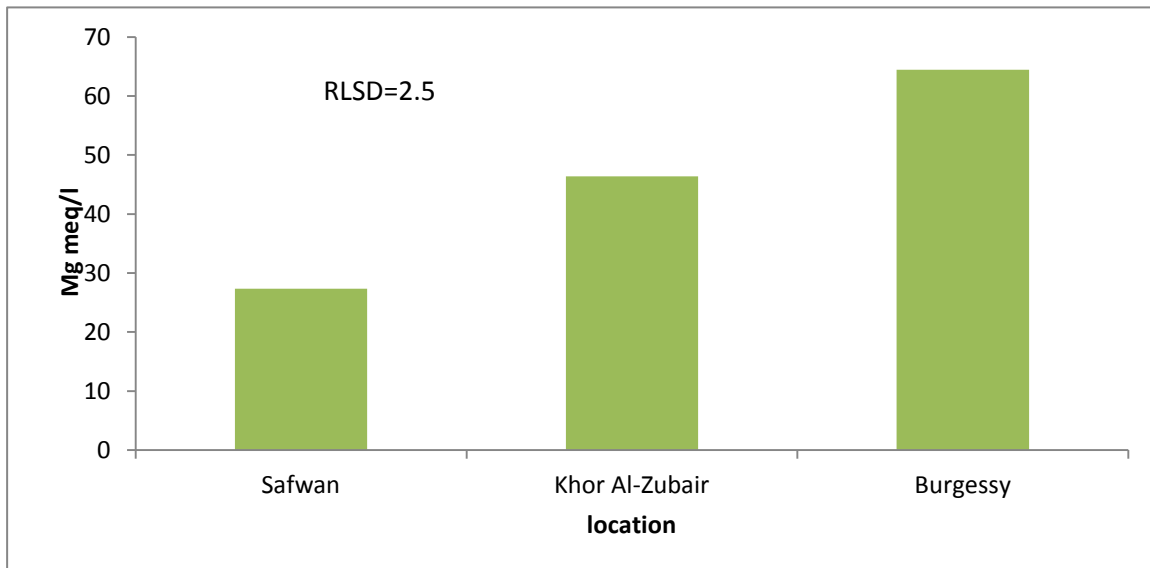


figure(1) Electrical conductivity of water wells

The differences in ionic water composition were generally associated with the difference in the values of the electrical conductivity at the specified sites. The results of the study showed that, according to the chemical analysis of positive cation values in the water samples. As shown in Figs. 2 and 3, the concentration of calcium on the concentration of magnesium in the desert region, which is spread by the wells under study, may be due to differences in the structure of the geological structure of the continuation of the region (Abbadi, 2000).

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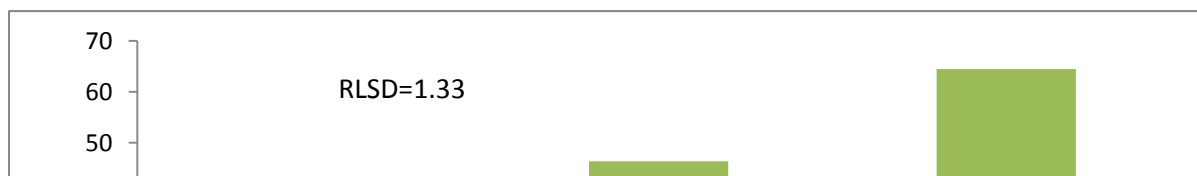
figure(2) calcium concentration of water wells



figure(3) magnesium concentration of water wells

The concentration of sodium varied widely with the variation in the electrical conductivity values at the specified locations, where the highest values were found, as shown in the table in Burjisiyah followed by Khor al-Zubayr and Safwan. In this study and in a study on the hydrology of the desert region, 2000) The increase in sodium concentration of groundwater is due to the fact that the water is very old and is kept in a closed system, which helps to combine the high concentration of sodium, So the process of perfusion with

high-sodium water will lead to accumulation in the soil with positive ions that exist with it has a strong impact in the soil as the soil containing sodium tends to dispersed and the formation of a cohesive crust during drought reduces the growth of plants and seedling penetrating the surface of the earth Abdul Abbas, 2012).

figure(4)sodium concentration of water wells

When comparing the values of chemical analyzes of the wells water in Table 3 related to the criteria for the qualitative classification of water (Table 1 and 2), which include the electrical conductivity and the rate of adsorption of sodium, it is noted according to the classification of the American salinity laboratory, the water wells of the tower are classified into C4S4, Of the adsorbed sodium and the water of Khor al-Zubayr are classified into C4S3 The water is very saline and very harmful to the adsorbent sodium. The water of the Safwan wells, however, took the same classification as the C4S3 water. According to the classification of Ashcroft 1972, water is classified according to the values of the electrical conductivity to Class D, which describes the water very badly in the three locations According to the classification (Fipps, 2003), water is classified according to the values of electrical conductivity to class (4), which describes the water is not suitable for irrigation in the three sites and according to the percentage of adsorption of sodium, the water is classified into the second type of damage medium at the site of Burjisia and Khor al-Zubair, Safwan,

**Conclusions** :

1-Because of the water scarcity in the desert areas, farmers are digging wells to use their water for irrigation. According to the international classification that was adopted in the assessment of the water quality, the water of these wells is characterized by its lack of irrigation capacity due to the increase in water conductivity in all the sites specified for the study as well as increasing concentrations of ions

2- The chemical analysis showed that the water of the wells, which was taken as a sample of the study, showed that it contains high concentration of salts and that water with high concentrations of sodium, chlorides and others

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**تقييم نوعية مياه بعض الابار في محافظة البصرة  لأغراض الري**

**امين حسين جبر /جامعة البصرة /كلية الزراعة / قسم علوم التربة والموارد المائية**

**المستخلص:**

اجريت  الدراسة  في مواقع لابار مختارة في بعض المناطق الصحراوية في البصرة لثلاثة مواقع في البرجسية وخور الزبير وسفوان لتصنيف مياه الآبار ومدى صلاحيتها للإرواء وعند مطابقة قيم التحاليل الكيميائية لمياه الابار ذات العلاقة بمعايير التصنيف النوعي للمياه والتي تتضمن التوصيلية الكهربائية ونسبة امتزاز الصوديوم ، يلاحظ وفقا الى تصنيف مختبر الملوحة الأمريكي فأن مياه ابار البرجسية تصنف الى  C4S4 أي مياه شديدة الملوحة جدا وشديد الضررجدا من الصوديوم الممتز وابار خور الزبير تصنف الى C4S3 أي مياه شديدة الملوحة جدا وشديد الضررمن لصوديوم الممتز  اما مياه ابار سفوان فاتخذت نفس تصنيف مياه خور الزبير أي تتبع

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الصنف  C4S3 ، واعتمادا على تصنيف (Taylor & Ashcroft  1972)  فتصنف المياه حسب قيم التوصيلية الكهربائية الى الصنف D  والتي تصف المياه بشديدة الضررجدا في المواقع الثلاثة اما حسب تصنيف (Fipps,2003 ) ) فتصنف المياه حسب قيم التوصيلية الكهربائية الى الصنف (4) و التي تصف المياه بغير الصالحة للري  في المواقع الثلاثة وحسب نسبة امتزاز الصوديوم فتصنف المياه الى الصنف الثاني المتوسط الضرر في موقعي البرجسية وخور الزبير والصنف قليل الضرر في سفوان ، وحسب تصنيف Tood,1980 فتصنف المياه حسب قيم نسبة امتزاز الصوديوم الى الصنف ممتاز في جميع المواقع .