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Evaluation of Groundwater Quality Used in Agricultural Purposes

[1]Hana M. Alkassar, [2]Nadia Moneem Al-Abdalay, [3]Husein Ali Zeini

[1,2,3] *Department of Civil,Najaf Technical* Institute, *Al-Furat Al-Awsat Technical University,Iraq. E-mail:* [1]*inj.han@atu.edu.iq* , [2] *inj.nad@atu.edu.iq* , [3] *inj.hus@atu.edu.iq*

Abstract

The current study concentrated on the groundwater chemistry in part of Najaf city area to evaluate the groundwater quality for knowing its relevance for agricultural purposes. The quality of groundwater significantly affected by Urbanization and agriculture activities. The (10) samples of groundwater were randomly raised from various wells Najaf farms region by pumps, then resolved for main anions. Anions dominant were Na, Ca and Mg, thence get a criterion index of water quality the ratio of sodium adsorption (SAR) in addition to test electrical conductivity *(E.C.)*. Then, examine those samples of groundwater where used as an irrigation water supplied to several types from of Oryza sativa l seeds (Yassmin class, Dijla class, Amber 33 class, Al-forat class, Amber Baraka class, Mashkhab class) to test germination of seeds. The results of germination of seeds with those samples of irrigation water was between (40%- 100%).

Keywords: Saline waters, Groundwater Quality, Hydrogeochemical Facies, Irrigation water.

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1 Introduction

The groundwater considers from a precious natural source; usually the ground water is use in study area for two objectives are household and farmed. Groundwater is the major resource of irrigation and agriculture considered as the basic source to population in earn a living. From sources of groundwater pollution are agriculture, industrial and domestic.

As result of population growth and intensive agriculture, actions become enormous increased in demand for fresh water. Because the disposal of urban and industrial solid waste led to rapid increase in a threat population and growth of industrialization [5], the physical and chemical properties of groundwater differ in space and time [2]. Pesticides, fertilizers, and other chemical products for agriculture affect. Groundwater quality and its suitability for domestic and agricultural use in Tondiar river basin, Tamil Nadu, India is given in [7]. Groundwater quality[8] and its suitability for drinking and agricultural use in the Yanqi Basin of Xinjiang Province, Northwest China [9]. The investigation for treatment water drainage for agriculture is given in [10]. Using drainage water for agriculture purposes by[11]. Evaluation of groundwater quality and its suitability for domestic and irrigation are used in parts of the Chandauli-Varanasi region, Uttar Pradesh, India[6] [12]. Groundwater quality assessment for domestic and agriculture purposes in Puducherry region is given in [3]. The objective of present study examines samples of ground water where used as an irrigation water supplied to several types from of Oryza sativa l seeds (Yassmin class, Dijla class, Amber 33 class, Al-forat class, Amber Baraka class, Mashkhab class) to test germination of seeds.

2 Description of Study Area

The study area was farms region Najaf city, about between latitude 44° and longitude 32°. Table (1) explains the location of wells relative to latitude and longitude and Figure (1) shows reach study location.

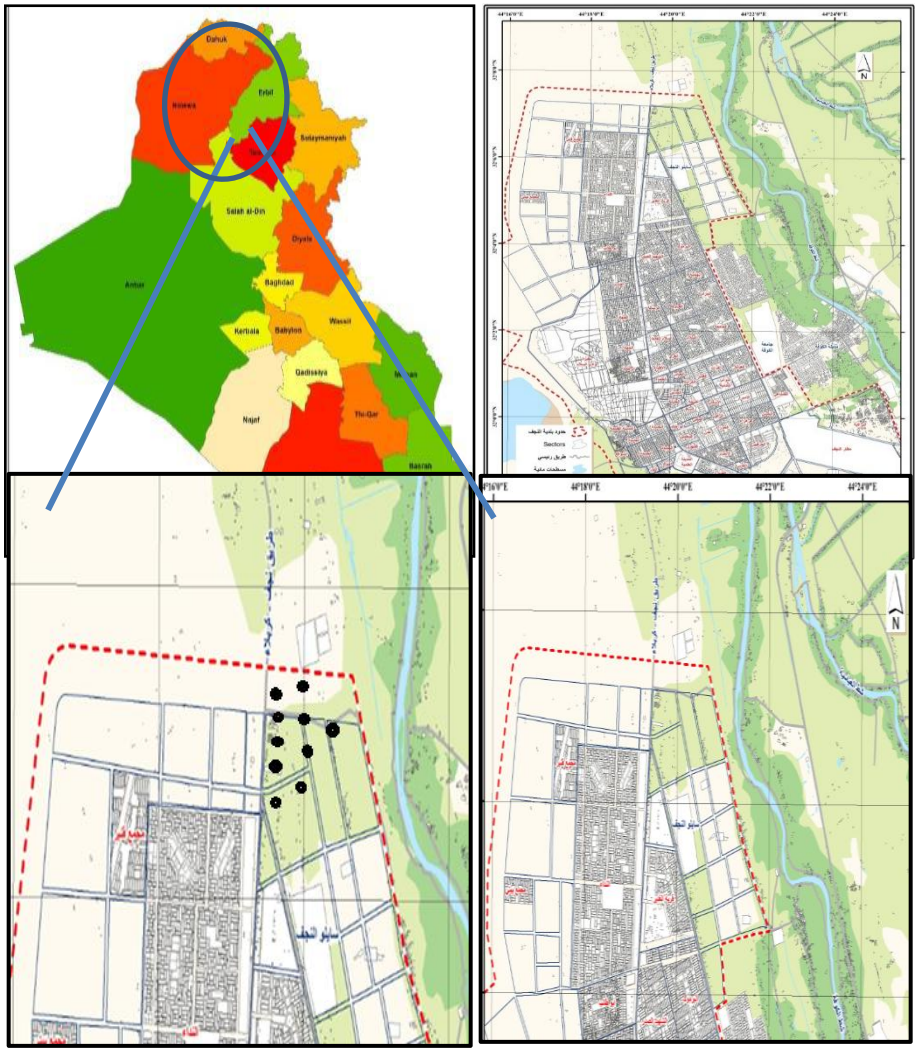

Figure 1 Shows Reach Study Location

Table 1 Explains the location of wells relative to latitude and longitude

No.	N	E
1	32.66201	44.19519
2	32.66201	44.19519
3	32.66642	44.19896
4	32.66964	44.19807
5	32.66959	44.22119
6	32.66901	44.22795
7	32.67026	44.22984
8	32.67304	44.25307
9	32.6952	44.19647
10	32.7193	44.19778

3 Characteristics of Salinity

Generally, to irrigation purposes there are two assessments of saline water quality. The salinity of irrigation water is the concentration of total salt or total soluble solids (TDS). Usually, the units are expressed. in milligrams. of salt per liter (mg/L) of water. (TDS) expresses the all-out number of milligrams of. Salt that would stay after 1 liter of water vanished. to dryness and still used by commercial Analytical laboratories. Also, often the (TDS) is stated as parts per million (ppm) and is equivalent numerically as (mg/L). Electrical conductivity (EC) is the other measurement that is documented in water quality reports from commercial labs,it is a much more helpful measurement than TDS because it can be made immediately and easily by irrigators or farm observers in the farm. Therefore, the content of salt in the water is directly linked with the (EC). (EC) is measured in units in millimhos per centimeter (mmhos/cm) or decisiemens per meter (dS/m)[4].

3.1. Classification of Saline Waters

Table 2 Saline Waters Classification

Class of Water	Electrical. Conductivity dS/m	Salt. Concentration mg/l	Water type	Electrical. Conductivity dS/m
Non-saline.	< 0.7	< 500	Irrigation. water &drinking	< 0.7
Minor saline	0.7 - 2	500-1500	Water of irrigation.	0.7 - 2
Medium salinity	2 - 10	1500-7000	Aquifer & main. drainage. water.	2 - 10
Highly. saline	10-25	7000-15 000	Aquifer & Secondary.	10-25
Very highly. saline	25 - 45	15000-35 000	Very. Saline groundwater	25 - 45
Brine	> 45	> 45 000	Seawater	> 45

To identify the degrees of water salinities for which these rules are intended, it is valuable to give an order plot. Such, a classification is given in table (2) in terms of total salt concentration. (Rhoades, et.al,1992) [3]. The SAR value in groundwater samples range from (2-.4.22) referring that all the aquifer, samples are proper for drinking and irrigation purposes.

4 Sodium Absrption Ratio(SAR)

The imperative chemical factor is for evaluation the extent of relevance of water for irrigation as sodium content. or soluble base danger for yields, which is represents .as sodium adsorption proportion (SAR).(SAR) is calculated from the proportion of sodium to calcium, and magnesium. Calcium and magnesium particles are significant since they are tending. to confrontation the impact of sodium. The high concentration of (SAR) causes the destruction of the soil's structure. Sodium is suck up and end up connected to soil particles. Then the soil becomes strong, compressed and impermeable to water when dry. Absorbing Sodium take the place of. calcium and magnesium is a harm as it reasons destroy to the texture of soil. (SAR) clearly indicate the extent to which irrigation water be apt to arrive into interchange response in soil. The (SAR) recommended salinity laboratory of US Agriculture Department [1] is considered consuming the equation:

$$SAR = Na^{+} /[(Ca + Mg)/2]^{0.5} \quad (1)$$

There is a tough connection between (SAR) values and the degree absorbed of soils for Na. In case, water consumed for irrigation is low Ca and high Na, the particle-exchange complex1 may end up with Na, which damage soil texture, due to dissipate of clay earth particles. The earth will in general become deflocculated and relatively impervious. Such. Soils can be actual tough to germinate. The expresses sodium harm in the classification. of irrigation. water, as low. (S_1: <10), moderate (S_2: 10 to 18), high. (S_3: 18 to 26.) and very high. (S_4: >26). The (SAR) rate in groundwater samples variety from (2- 4.22) representing of groundwater models. are seemly. for irrigation. determinations; table (3) explain number of groundwater wells, Ca, Mg and Na ions content, electrical conductivity and sodium adsorption value.

Table 3 Explain number of ground water wells, Ca, Mg and Na ions content electrical conductivity and sodium adsorption value

No.	Ca (meq/L)	Mg (meq/L)	Na (meq/L)	(E.C.) (mmoh/cm)	(SAR)
1	8.3	251	32	0.93	2.47
2	120	436	33.5	0.5	2.00
3	37.5	180	44	3.11	4.22
4	33	242	43	2.08	3.67
5	54	304	46.2	1.87	3.45
6	82	280	42.6	1.6	3.17
7	103	390	42.61	1.17	2.714
8	60	276	42.61	1.7	3.3
9	73.5	259.5	39.1	1.46	3.03
10	102	316.5	42.1	1.35	2.91

5 Experimental Work

The (10) samples of groundwater were collected randomly from different sources Najaf farms region by hand pump in wells in study area during February, 2019. The samples were collected in an enclosed container

and the tests were done in quality control laboratory of Kufa University. A flame photometer (CL738, British origin) and E.C. meter (USA origin) devices were used as an instrument to make the tests. The analysis of the groundwater samples was done to find out ions. (Na, Ca and Mg). The Ca. and Mg, were assessed. using correction. method while Na. ion was reached by flame photometer. The electrical conductivity (E.C.) was estimate and then the value of sodium adsorption ratio (SAR) was calculated using eq. (1). Table (3) show the results of the tests done on these groundwater wells, Ca, Mg and Na ions content, electrical conductivity and sodium adsorption value.

The groundwater samples dominated from lab were used as an irrigation water supplied to several types of rice (Oryza satival) seeds which was brought from (Abaa Center of Rice Researches) in Mushhab city (Yassmin class, Dijla class, Amber 33 class, Al-forat class, Amber Baraka class, Mashkhab class) to test the viability of seeds**.** The vitality of seeds was tested by taking seeds of all varieties of rice, varieties used in the work had been soaked in water for 24 hours to ensure moisten the seeds. Each (50) seeds were kept in plastic sterile dishes under warn laboratory conditions of temperature of 26º ± 1. The irrigation with groundwater was provided regularly to maintain the necessary moisture for seed germination for seven days. The percentage of germination was between (40%- 100%) of the varieties.

The percentage of germination was calculated from equation (2). Table (4) show the results of the percentages of seeds germination for groundwater samples. The percentage of germination for seeds rice varieties are explained in figures. **(**2, 3,4,5,6) taken.

$$\text{Percentage of Germination} = \frac{Number\ of\ germinated\ seeds}{The\ total\ number\ of\ seeds} \times 100 \qquad (2)$$

Table 4 Percentage of Germination for Seven Days

No.of well	sodium adsorption ratio (SAR)	Electrical Conductivity E.C.	Yassmin class	Dijla class	Al-forat class	Amber 33 class	Amber Baraka class	Mashkhab class
2	2.00	0.5	100%	100 %	100%	90%	90%	90%
1	2.47	0.93	100%	100 %	100%	90%	85%	80%
7	2.714	1.17	100%	100 %	100%	90%	80%	70%
10	2.91	1.35	100%	100 %	100%	85%	80%	65%
9	3.03	1.46	100%	100 %	100%	85%	77%	65%
6	3.17	1.6	100%	100 %	100%	85%	75%	60%
8	3.3	1.7	100%	100 %	100%	80%	73%	60%
5	3.45	1.87	100%	100 %	100%	75%	70%	55%
4	3.67	2.08	100%	100 %	100%	75%	70%	50%
3	4.22	3.11	95%	93%	88%	65%	60%	40%

6 Analyses of Experimental Results

The results of the study applied to varieties of seed rice for those samples of ground water governed show a very good percentage of germination of these seeds of different varieties of rice (Yassmin class, Dijla class, Al-forat class, Amber 33 class, Amber Baraka class, Mashkhab class). Whenever salinity of water decreased the percentage of germination was increased as shown in table (4), where all samples of groundwater gives (100%) percentage of germination for Yassmin class, Dijla class and Al-forat class, except the sample that (SAR=4.22) was (95%, 93% and 88%) percentage of germination respectively. While Amber 33 class, Amber Baraka class and Mashkhab class gives between (90% - 40%), percentage of germination grows. The amazing results can grow a lot of types of crops in addition for the types of rice in the region. So moderately saline water can be used successfully for irrigation purposes, especially when it is used to plants which need more water for irrigation. The current results were registered by the comparison with an international standard when the results are within the ratios given in this standard.

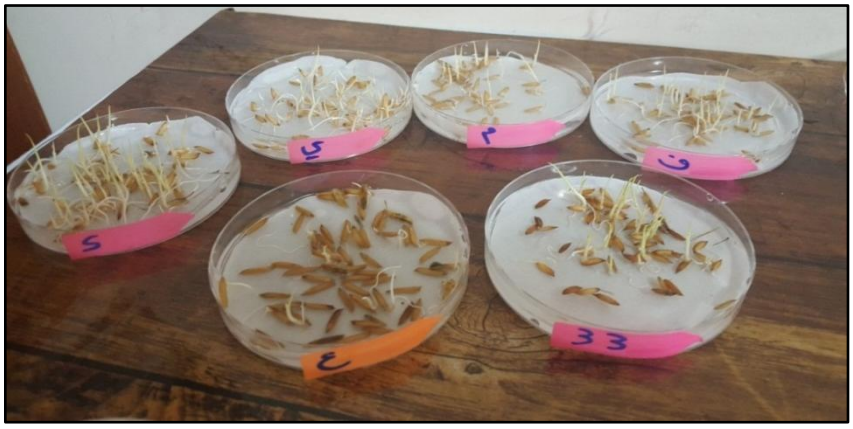

Figure 2 Percentage of Germination for all Class for Seven days

Figure 3 Percentage of Germination for Mashkhab Class for Seven days

Figure 4 Percentage of Germination for Al-forat Class for Seven days

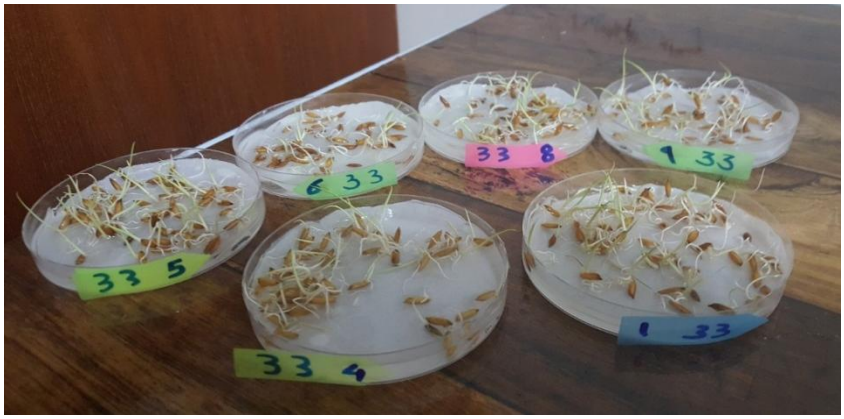

Figure 5 Percentage of Germination for Amber 33 Class for Seven days

Figure 6 Percentage of Germination for Amber Baraka Class for Seven days

7 Conclusions

1. The salinity of groundwater that E.C (3.11) dS/m within the range (2-10) dS/m salinity as moderate condition, it can be used for irrigation for so many other plants if they will be under suitable conditions and good management.
2. It is clear that the area has a very good water reservoir and it is sufficient to provide the population's need for drinking and watering, they can be applied to different types of other plants successfully.
3. It is possible to collect a lot of samples to see more specifications for the water of the region.
4. This water is excellent alternative to river water and is mainly used for agricultural purposes.

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Biographies

Assistant Teacher **Hana Mahmood Amer Al-kassar** is a lecturer in civil Department of Najaf technical institute at al- Furat Al Awsat Technical University and work as Lecturer in Civil Department on going 2012.She is also the Author of five Published Articles. She holds an M.SC. in Hydraulic Structure Engineering and a bachelor's degree from University of Kufa, Civil Engineering Department.

Dr. Nadia Moneem Al - Abdaly is a Lecturer in Civil Department of Najaf Technical Institute at Al – Furat Al Awsat Technical University and work as ahead of Civil Department on going 2018. She is also the Author of eleven published articles. She holds an PhD in Civil Engineering from University of Technology, Building and Construction Engineering Department, M.SC. in Construction material from Babylon University, Civil Engineering Department and a bachelor’s degree from the University of Kufa. She lives in Najaf, Iraq with her family.

Husein Ali Muhammad Zeini is a lecturer in civil department of Najaf technical institute at Al-Furat Al-Awsat Technical University and work as ahead of civil department from 2012-2015 and then as ahead of building and construction branch on going 2015. He is author of eight published articles. He holds MS.C. in civil engineering and bachelor's degree from the university of technology. He lives in Najaf with his family.