ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

The Study of Some Physical and Chemical Properties of Al-Kufa-River, Tap Water and Reverse Osmosis Water in Al-Najaf City/Iraq.

Feryal Ameen Merza*.

Department of Biology / Faculty of Science/ University of Kufa, Iraq

ABSTRACT

Water Quality of Al-Kufa River, Tap water and Reverse Osmosis (R.O.) water in some neighborhoods passing through Al-Najaf City, Iraq, was evaluated for drinking using the standards of World health organization. Water samples were collected from fourteen sites during six months from September 2015 to February 2016. Conductivity (EC), pH, hardness, alkalinity and total dissolved solids (TDS) were determined. It was noticed that some studied parameters of river and tap water were more than drinking water standards, while studied parameters of R.O. water were within acceptable standards.

Keywords: Al-Kufa river, water, osmosis.

***Corresponding author**

ISSN: 0975-8585

INTRODUCTION

Water is the most important element for the continuation of a life every living thing on the surface of the ground, after the air. Water is an essential abiotic factor because it is the main component of the cell, approximately 60 % of the human body is fluid, predominantly a water solution of ions and some components [1]. The purpose of water is not to provide creatures with drinking water but also enters in all agricultural, biological and industrial processes, and others. It is known that the water covers more than three-quarters of the globe, but in spite of that, the suitable water for use remains few. The massive expansion of industry makes the water exposures to many contaminants, making it unsuitable for using. So, purification of water by chemical treatment with chlorine, ozone or Ultra Violet rays is necessary [2]. Although the traditional methods of water purification do not eliminate some industrial, inorganic pollutants and pesticides in addition to the chlorine used in water purification may interact with some components making carcinogens [3]. The loss of adequate treatment and government censorship lead to polluted water. In developing countries, 90% of wastewater pour directly into rivers without any treatment [4]. The main effects to human health related to the using of contaminated water, especially drinking water may affect the digestive system and damage the environment. The World Health Organization estimated that about 1.4 million children die every year as a result of contaminated water [5]. In some areas of Iraq, people use water of river directly without treatment, as well as the water of the river is the source of the supply. The aim of this study is to compare some of the physical and chemical characteristics of Kufa River water, tap water and R.O. water with Guideline values for Drinking-water Quality of World Health Organization [6] illustrated in table1.

MATERIALS AND METHODS

Triplicate samples of water were collected from four different sites of Al-Kufa river (a branch of Euphrates river) as shown in (figure 1) and the other samples were collected from tap water and Reverse Osmosis factories in five neighborhoods of Al- Najaf- city. The samples were collected monthly, starting from September 2015 until February 2016. The average of these samples during six months compared with standards of World Health Organization for drinking water. The electrical conductivity of water was determined by digital multiple meter; WTW Germany. pH was measured by digital pH meter; (origin Germany), alkalinity was measured according to the procedure[7]. Total dissolved solids were determined according to APHA [8]. EDTA titrimetric method was used to determine total hardness as suggested by WHO [9].

Figure 1: The sites of Kufa-river in this study

ISSN: 0975-8585

RESULTS AND DISCUSSION

The average of values of studied physicochemical factors in the duration in six months taken from the studied sites are illustrated in table 2. The range of electrical conductivity and water pH were (25-1427) µs/cm and (6.5-8.2), respectively. The highest values of electrical conductivity were in the river and tap water, due to exist a high concentration of soluble salts [8, 10]. Many dissolved solids change the taste of the drinking water [10, 11]. The kinds of salts (ions) producing the electrical conductivity are carbonates, calcium, chlorides, sulfates, sodium, magnesium, and potassium [12]. Electrical conductivity in the sites of the river and tap water were above the expectable limits by WHO, while the lowest values were in R.O. water, that was caused by treatment by reverse osmosis. The pH is an essential parameter that limits the water suitability for different uses. The pH of waters depends upon the equilibrium of carbon dioxide. The pH value rises as the alkalinity rises in water, while it declines as the carbon dioxide increases [13]. So, the measurement of pH indicates a variation in the feature of the source [8]. Extremely alkaline or too acidic water give alkaline or acid tastes [14]. The values of pH in all sites were within the objective limits, this agrees with studies of [15, 16] ; because of the ability of water to be as buffer solution to normalize pH values. Hardness in the samples are recorded to be in a range of 150 to 497 ppm. There is an reverse association between the hardness of drinking-water and death resulted from cardiovascular infection [17]. All the records of hardness satisfy the objective data for drinking water. Alkalinity ranged from (90 - 263.6) ppm in site 12 and 1 respectively. Iraqi water tends to be alkalinity and is capable to regulate the change in pH. The presence Alkalinity caused by converting insoluble calcium bicarbonate to soluble calcium bicarbonate [18]. Total dissolved solids are constituents that would pass through filter paper. The taste of water may be affected by the existence of these constituents [19]. During this study TDS values of the samples ranged between (17– 606) ppm. WHO guidelines of TDS in drinking water are less than (500) ppm. Therefore in the sites of river were more than guidelines value because the river receives many contaminants such as municipal wastes and industrial wastes making the water unsuitable for drinking. Total dissolved solids values of tap water were less than permissible limit except in tap water of faculty science. This research showed that water of river and tap unhealthy for drinking. The pollution of water may be occur at the source, but water may be polluted during the distribution and transportation. The releasing of corrosion by-products of household plumbing systems can be an important supply of contamination obtained in the water of tap [20]. Ancient distribution networks and piping systems used for transport of water can affect the quality supplied to users. The variation of studied parameters among sites was because of the variation of the source.

Tabe1: Standards of drinking water for World Health Organization.

Factors	Guidelines
Electrical conductivity (EC)	(800) µS/cm
Hydrogen ion concentrations (pH)	(6.5-8.5)
Total dissolved solids (TDS)	less than (500) ppm
Hardness	(150-500) ppm
Alkalinity	There is no standard value but alkalinity levels greater than 250 ppm are high alkalinity, and levels less than 30 ppm are low alkalinity.

ISSN: 0975-8585

Table 2: The average values of investigated characters for the duration in 6 months

Position / Factors	**River water (site1)**	**River water (site 2)**	**River water (site 3)**	**River water (site 4)**	**Tap water of Science Faculty (site 5)**	**Tap.water of AL-Hasan neighborhood (site 6)**	**Tap.water of AL-Ghadeer neighborhood (site 7)**	**Tap.water of AL-Salam neighborhood (site 8)**	**Tap.water of AL-Ansar neighborhood (site 9)**	**R.O.water of Science Faculty (site 10)**	**R.O.water of AL-Hasan neighborhood (site 11)**	**R.O.water of AL-Ghadeer neighborhood (site 12)**	**R.O.water of AL-Salam neighborhood (site 13)**	**R.O.water of AL-Ansar neighborhood (site 14)**
EC	1333 µS/cm	1423 µS/cm	1401 µS/cm	1371 µS/cm	**1427** µS/cm	**1190** µS/cm	**1185** µS/cm	**1183** µS/cm	**1190** µS/cm	**25** µS/cm	**80** µS/cm	**131.7** µS/cm	**100** µS/cm	**100** µS/cm
pH	8.1	8.2	8.1	8.1	**8.2**	**7.8**	**7.2**	**7.5**	**8**	**7**	**6.5**	**6.5**	6.7	6.7
Alkalinity	263.6 ppm	206.7 ppm	213.7 ppm	219.9 ppm	**200** ppm	**200** ppm	**200** ppm	**200** ppm	**200** ppm	**100** ppm	**100** ppm	**90** ppm	**100** ppm	**105** ppm
Hardness	493 ppm	497 ppm	458 ppm	450 ppm	**245** ppm	**250** ppm	**256** ppm	**260** ppm	**270** ppm	150 ppm	155 ppm	150 ppm	180 ppm	220 ppm
TDS	580 ppm	606 ppm	579 ppm	575 ppm	**585** ppm	**488** ppm	**486** ppm	**484** ppm	**489** ppm	**17** ppm	**50** ppm	**70** ppm	**60** ppm	**65** ppm

ISSN: 0975-8585

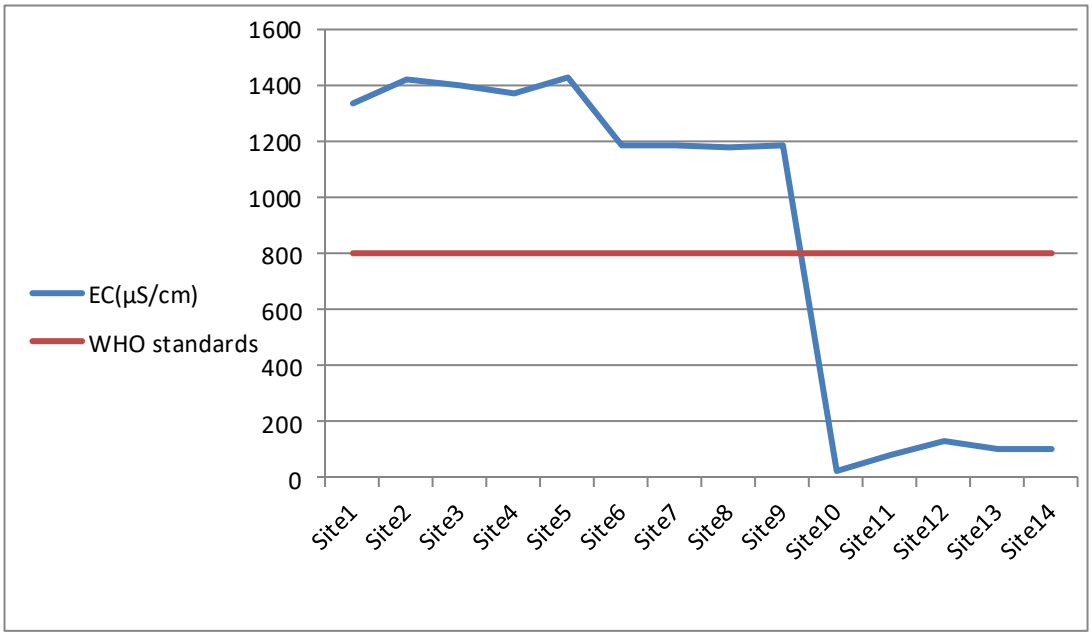

Figure 2: The values of EC in studied sites.

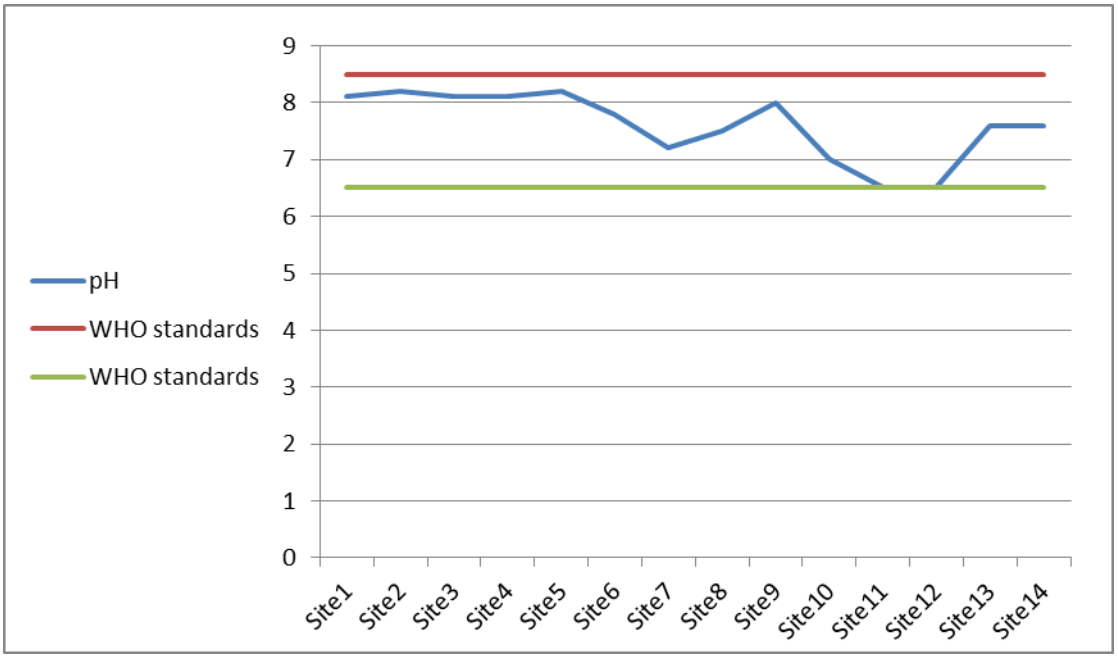

Figure 3: The values of pH in studied sites.

ISSN: 0975-8585

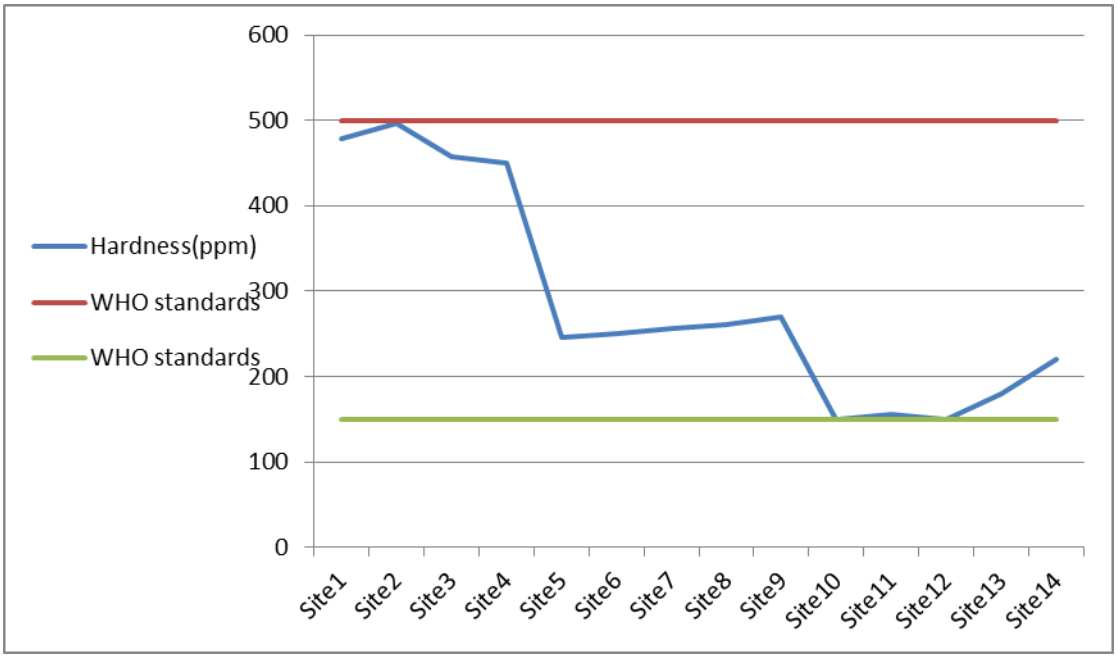

Figure 4: The values of hardness in studied sites.

Figure 5: The values of alkalinity in studied sites.

ISSN: 0975-8585

Figure 6: The values of TDS in studied sites.

Table3: The average of samples of Kufa-river, tap water and reverse osmosis water.

Position / Factors	The average of samples of Kufa-river	The average samples of the tap water	The average samples of R.O. water	Guidelines
EC (µS/cm)	1382	**1235**	87.34	(800) µS/cm
pH	8.125	**7.74**	**7.04**	(6.5-8.5)
Alkalinity(ppm)	226.	**200**	**99**	_____
Hardness(ppm)	474.5	**256.2**	171	(150-500) ppm
TDS (ppm)	585	506.4	52.4	less than (500) ppm

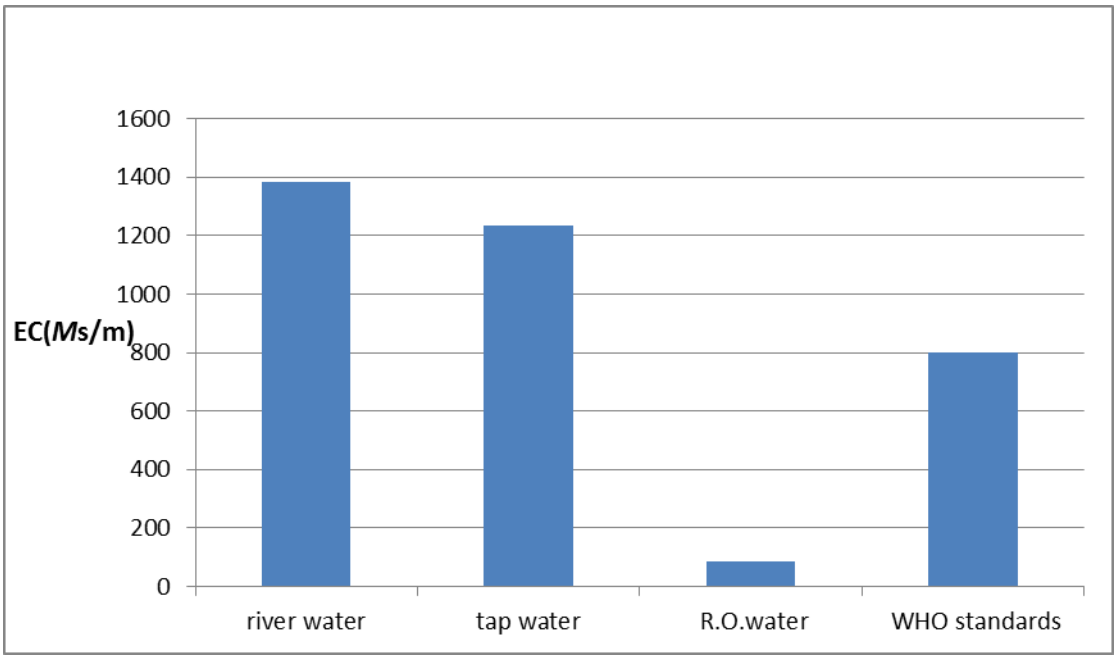

Figure 7: The average of EC of Kufa-river, tap water and reverse osmosis water.

ISSN: 0975-8585

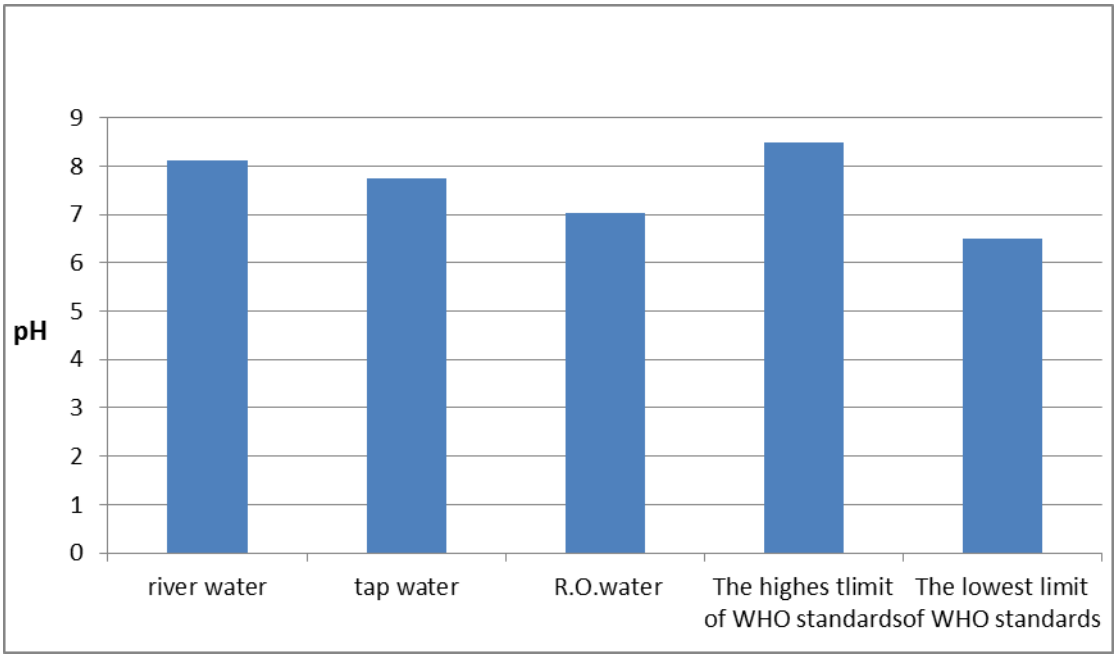

Figure 8: The average of pH of Kufa-river, tap water and reverse osmosis water.

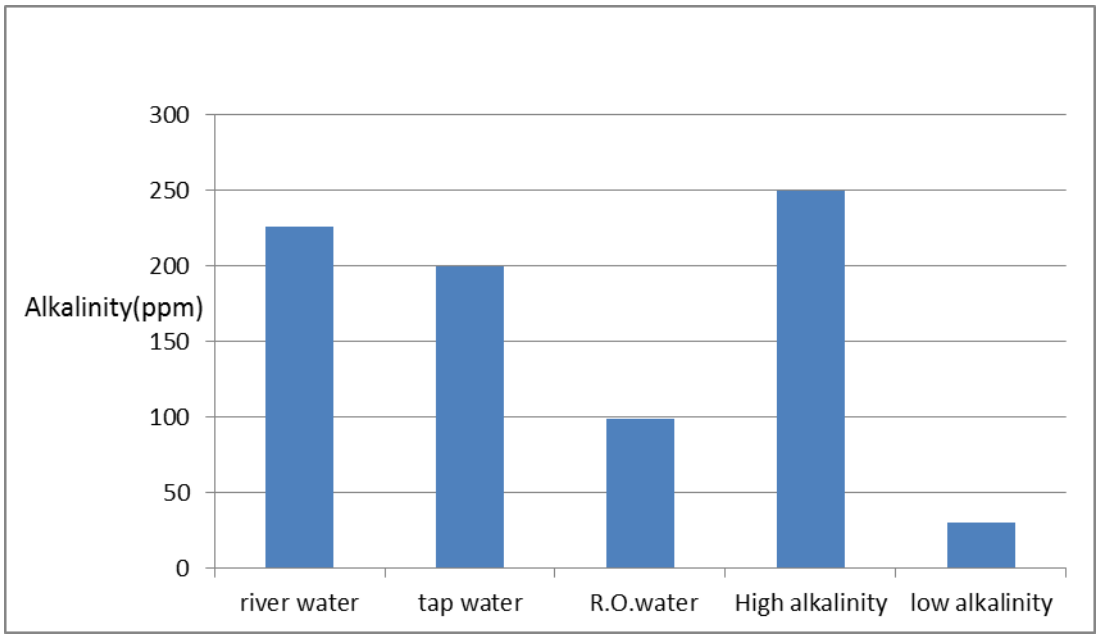

Figure 9: The average of alkalinity of Kufa-river, tap water and reverse osmosis water.

ISSN: 0975-8585

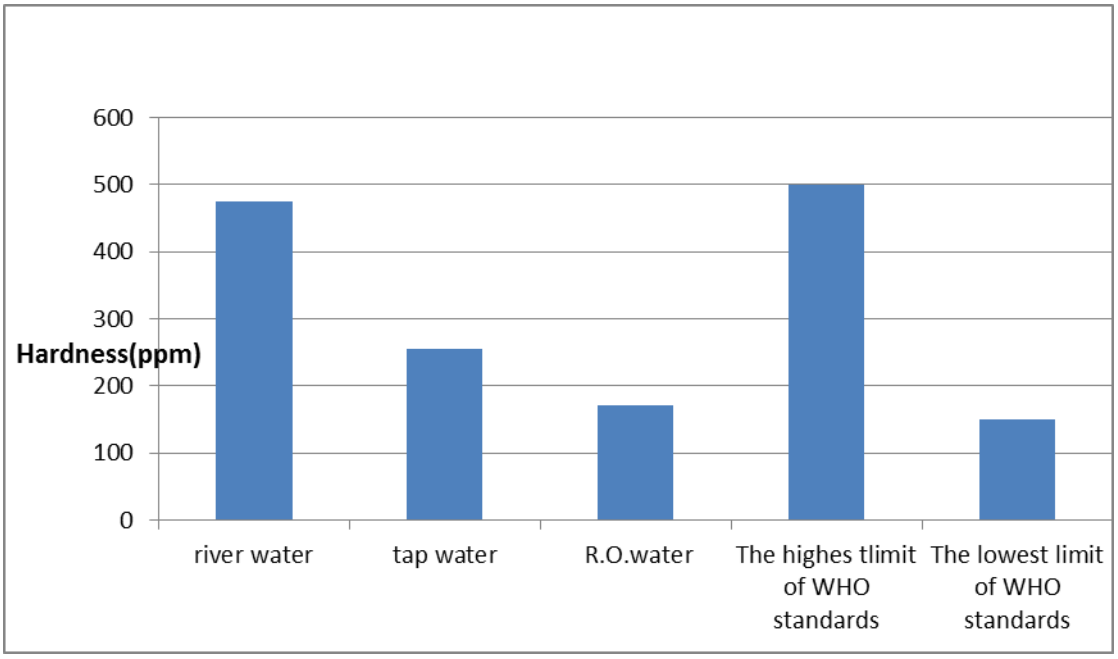

Figure 10: The average of hardness of Kufa-river, tap water and reverse osmosis water.

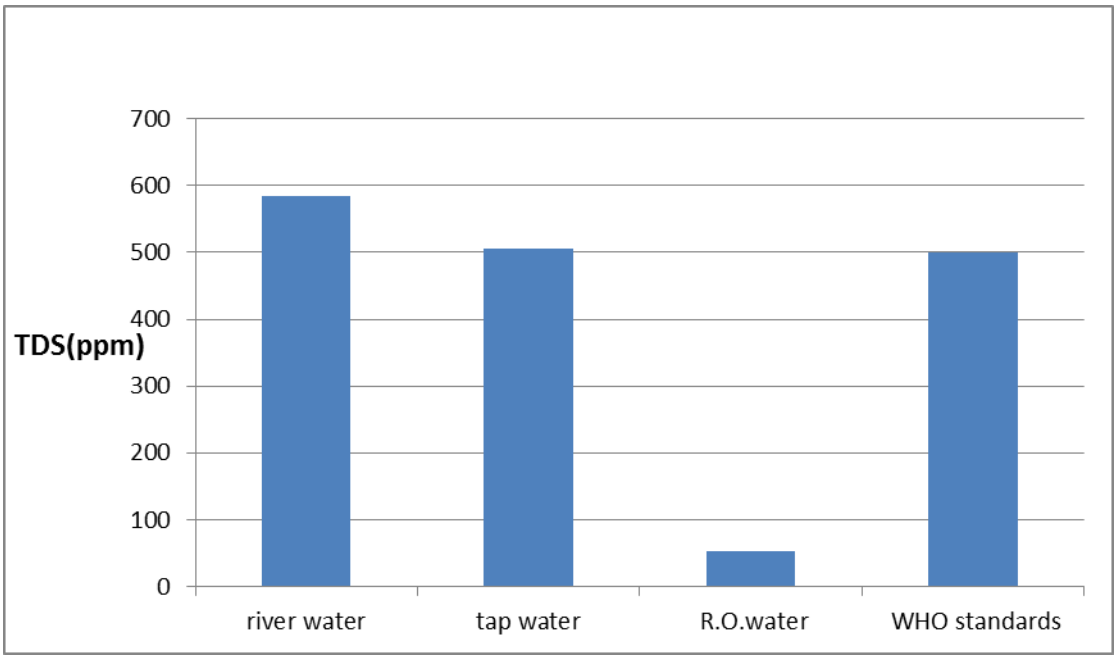

Figure 11: The average of TDS of Kufa-river, tap water and reverse osmosis water.

REFERENCES

[1] Guyton, A. C. and Hall, J. E. (2011). Textbook of Medical Physiology. 11th.ed. Elsever. USA. Publishing Services Manager: Linda Van Pelt.
[2] Abdel Gawad, A. A. (1995). Regulators of Environment.book.Cairo.
[3] Al Rawi, M. A.(1989). Environmental Pollution. Book.
[4] UNEP International Environment (2002). Environmentally Sound Technology for Wastewater and Stormwater Management: An International Source Book. IWA Publishing.
[5] "World Health Organization. Safe Water and Global Health". Who.int. 25 June 2008.
[6] WHO. (2008). Guidelines for Drinking-water Quality, 3rd. ed. incorporating the first and second addenda ,Vol. 1, Recommendations,Geneva.

[7] Lind, G , T (1979). Handbook of Common Methods in Limnology, 2 nd Ed., London.
[8] APHA . (1999). Standard methods for examination of water and waste water.20th ed. Washington DC, USA.
[9] WHO "Global Water Supply and Sanitation Assessment" report, 2000.
[10] Robles, E., Ramirez, E., Martinez, B., Sainz, G., Gonzalez, M. E.. (2011) Comparison of the Water Quality of Two Aquifers Established in Different Development Zones of Mexico. Universal J. of Environmental Research and Technology, 1, (2), 203.
[11] Aydin, A. (2007). The Microbiological and Physico-Chemical Quality of Groundwater in West Thrace, Turkey. Pol. J. Environ. Stud. 16, (3), 377.
[12] WASC (the Water watch Australia Steering Committee) (2002) Water watch Australia National Technical Manual. Environment Australia, Commonwealth of Australia.ISBN 0 6425 4856 0.
[13] Chabuk, A.J., Wadi, A.H. and Himod, J. (2009). Evaluation of Selected Trace Elements in ShattAl- Hilla River, Thesis, Department of Environmental College of Engineering, Babylon University.
[14] Kumari, B. L. Sudhakar, P., Hanuma, S. M. and Satya, N.V. (2011) Analysis of physico-chemical parameters of water quality in and around Saltpans of Prakasam (Dt.) A.P, Journal of Ecobiotechnology 3, (10), 01.
[15] Arab, K. A. (2012) Evaluation of Some Chemical, Physical Properties and Some Metallic Contents of Drinking Water in Kufa City Center, Thesis, Department of Chemistry - College of Science, Kufa University.
[16] Ali khan, H. A. (2012). Evaluation of Surface Water Quality in AL Kufa River Station. J. Al-Qadisiya For Engineering Sciences, Vol. 5, No. 4, 451-465.
[17] Saris, N.E.L.; Mervaala, E.; Karppanen, H. Khawaja, J. A. and Lewenstaun, A. (2000). Magnesium. An update on physiological clinical and analytical aspects.clin-chem Acta z94:1– 26.
[18] Weiner, E,R. (2000). Application of Environmental chemistry .Lewis Publisher, London, Newyork.
[19] Bruvold, W. H. and Ongerth ,H.J. (1969) Taste quality of ineralized water. J. of the American Water Works Association, 61:170.
[20] Agatenos, C. O . and kato, P.O., (2008), Studies of corrosin tendency of drinking water in the distribution system at the University of Benin, J. Environmentalist, 28, 379-384.