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Bacteriological Study and Properties of Drinking Water and Storage Tanks in Some Neighborhoods of Al-Kut City

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Annotation: This study has been applied on different sites in Kut city to evaluate the content of water of coliform fecal bacteria and to evaluate the ecology characteristics so (9) districts have been chosen from the right side of Tigris river in Kut and (7) districts from the left side of the same river. These samples have been taken regularly during six months from January 2018 to June 2019. The total number of E. coli bacteria has exceeded the allowed limit of the drinking water especially in Summer season which recorded a higher average for the number of bacteria (79.5 cell/100ml) for right side of the river and with the average of (67.1cell/100ml) for the left side. The failure of the sample was obvious by recording (10.79%) for those ,which were taken from right side while they ranged as (5.99%) for those in the left side of the river ,so it seems that the sample which are selected for six months from AL-Jihad district is the most failure of the right side the river. whereas, the values of physical and chemical properties can be recorded according to the water PH which showed a

fluctuation in its acid state and it has less values in AL-Karemeya district which is ranged as (5.7) and its high values was in the right side in AL- Khajiya district which ranged as (8.2) and most values were within swift baseband state. The Total of dissolved material (TDS)have clear proximities in both sides and with exceeding in the values during March month which ranged as (1000mg/L) and it recorded (1018 mg/L) in the right side and (1017 mg/L) for the left side .The result of some examined sample showed that the average of chlorine is less than the allowed average while it's higher in other areas which ranged 600mg/L.

Keywords: Tigris River, physical and Chemical, AL-Kut city, AL-Jihad, AL-Karemeya, AL-Khajiya.

Introduction

Pollutants are an important problem, but the most important aspect of water quality is its effect on human health. Polluted water directly endangers human life or has an adverse effect on natural resources, food supplies, and the economy, which in turn affects food chains (World Bank, 2005). Water pollution is when energy or materials are added to the environment in excess and at unsuitable periods, endangering human health, destroying ecosystems and biodiversity, and restricting the uses of the environment that are allowed. Ensuring universal access to good water and sanitation is the most effective way to prevent disease and save lives on a global scale. It is crucial to research fecal coliform bacteria since they are a sign of dangerous germs for humans. The main markers of fecal pollution in rivers are Escherichia coli bacteria (Thurman and Webber 1984; UN 2004). E. coli, which is present in huge quantities in sewage, all types of soil, warm-blooded animal and human excrement, and waterways exposed to fecal contamination, usually makes up the bulk of isolated fecal coliform bacteria in drinking water. Their presence in water samples shows fecal contamination, and their great sensitivity to disinfection implies a major disinfection process failure when found in drinking water (EPA 2006). To be sure, there are still microbiological hazards in drinking water even if E. Coli isn't present because several bacteria and protozoa are more resilient than E. Coli (WHO 2006-b). The World Health Organization and the US Environmental Protection Agency state that coliform bacteria are the most reliable markers of water contamination for a number of reasons. These include their abundance in the feces of warm-blooded animals and humans, their quick diagnosis, and their resemblance in isolation techniques to water-dwelling pathogenic microbes. Sewage or direct waste disposal into water bodies can contaminate water with pathogenic organisms, rendering it unfit for human consumption. Numerous microorganisms that cause waterborne diseases are present in sewage from cities, including residences, factories, hospitals, and slaughterhouses (USEPA 2005; WHO 2006-a).

Materials and methods.

Description of the study area.

The study lasted from (1/1/2019 to 1/6/2019) for six months and included a study of the physiochemical and bacterial properties with (917) samples of drinking water from faucets collected from sixteen districts in Kut city seven districts on the left side of the Tigris River, namely, (Karemeya , Jihad district, AL-Azza, Zain Al-qaws, university district, Al-falahia, Al-anwar) and nine districts on the right side of the Tigris River have been chosen: (Al-kafaat, Al-Hora, Al-Sharqia, Al -Rabie district ,Tamwz and Al salaam, Al-zahra, Damuk, Al-Shuhada and Khaji) all the samples have been taken into account to be random and their numbers are as close as possible Bacteriological and chemical tests were conducted based on internationally recognized scientific sources for diagnosing isolates(Baron and Finegold,1990; ;Holt etal,1994) and relying on central health laboratories in Wasit province to isolate and diagnose some types of bacteria and in the most likely ways (MPN) using MAC Conkey broth for both E.coli colon bacteria and the use of nutrient Ager to calculate the total number of bacteria (APHA,1999; WHO,1996; Mara, 1974) Chloride concentration was measured by the method used by the American Society for Testing and Methods (ASTM,1989) and the PH was measured by (temperature meter) and total dissolved solids were measured by a multipolar device (YSI Incorporated).

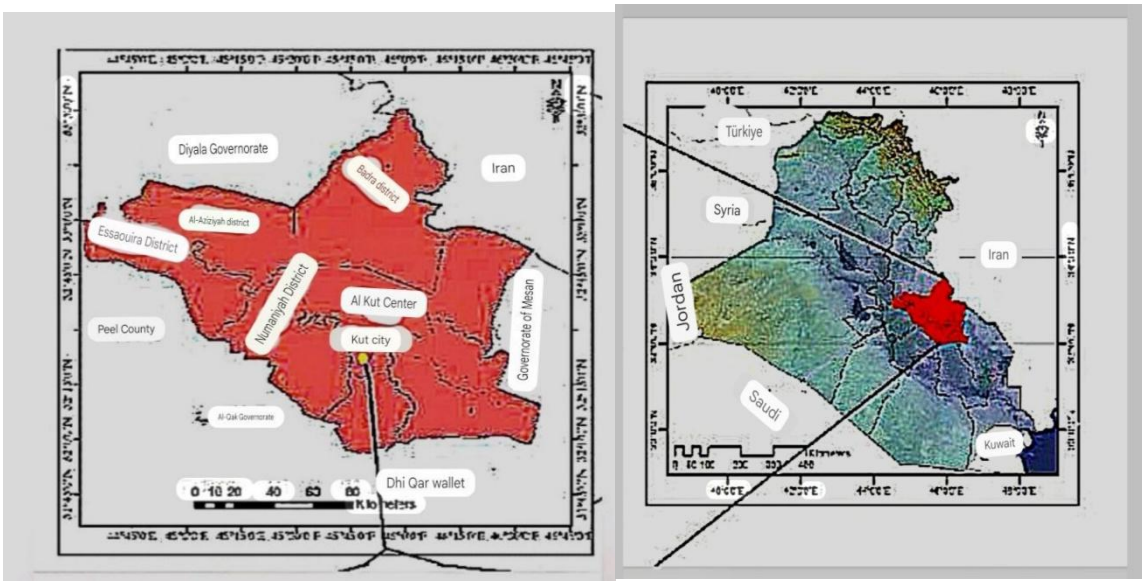
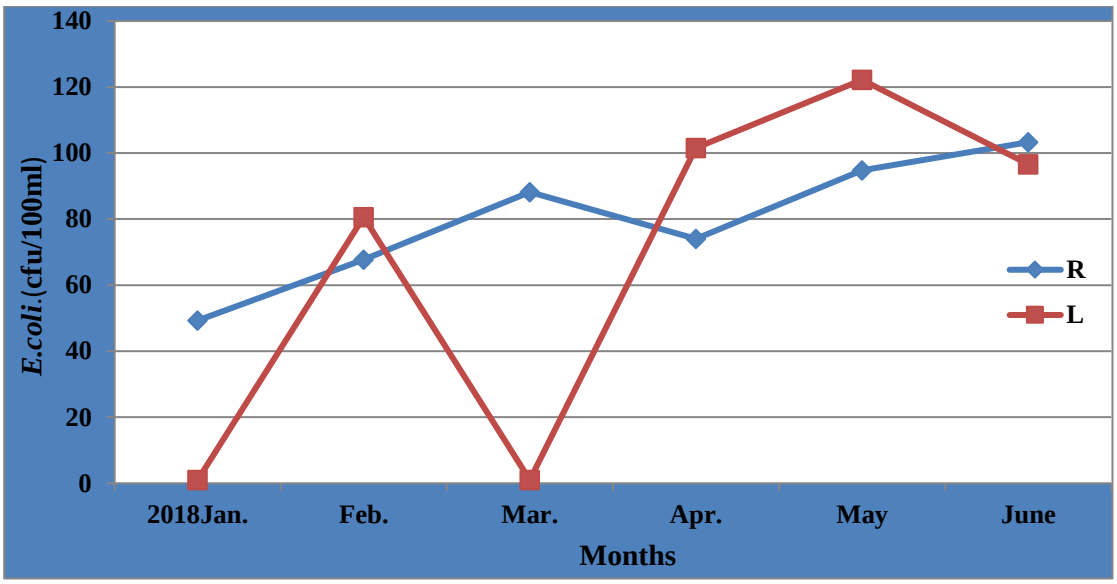


Figure (1): Map showing the study sites on the Tigris River within Al-Kut city.

Results and discussion

The presence of Escherichia coli (E. coli) in drinking water indicates that water is not treated properly or that the working system is of low quality or as a result of poor water quality and chemically and microbial contaminated with increasing salinity and heavy elements (Sabri and his group, 2001).

The rates of E. coli bacteria recorded for the waters of the Tigris River to the right side of Kut city ranged from (79.50-0.00 cells /100ml) in the Al-shuhada district recorded the highest rates in June and May respectively, while the lowest rates of E. coli were recorded during the month of January, but The left side of the Tigris River water at Kut showed rates between (0.00-67.1 cells /100ml) if the lowest rates of E. coli for water samples were recorded during the month of March, while the highest values were recorded during May and June respectively, Figure (2) shows a change in the rates of bacteria between the right and left side of the Tigris River at the City of Kut.

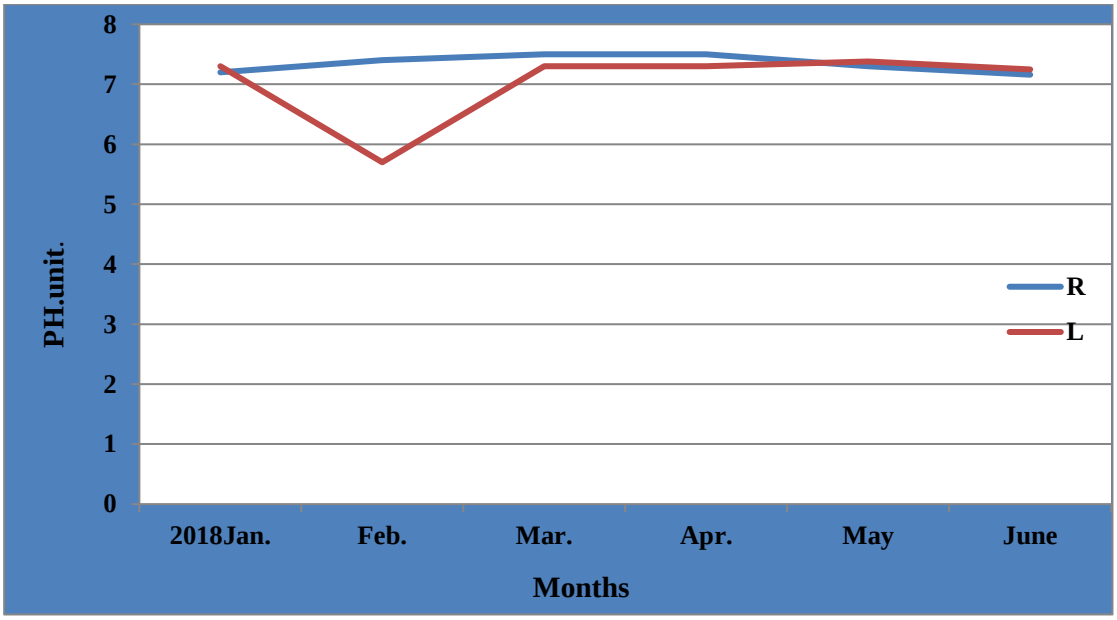


(2): The numbers of E. coli (cfu/100ml) for the left and right sides of the Tigris River formed for the study areas of kut.

The highest failure rates were recorded in the models of the right side of the Tigris River of Kut city and by 10.79% compared to 5.99% in the models of the left side if Al- Jihad district showed the most failed models on the left side, while Al-Khajia district on the right side recorded the most failed water samples taken in the six months this is due to reasons related to the quality of treatment processes in the water supply projects and the amount of pollutants in the water source, which are increasing in the southward direction, with increased sources which throw their pollutants along the riverbed, due to reasons related to the amount of pollutants in raw water equipped for water supply projects, which increase the flow of untreated pollutants entering the river bed resulting from civil and industrial activities., as well as the quality of disinfection processes in the water supply projects in terms of the quantities of alum and chlorine added and provide appropriate seam time to ensure a successful disinfection process Tests have also shown that chlorine rates are lower than allowed, with the sodium hypochlorite in some samples.

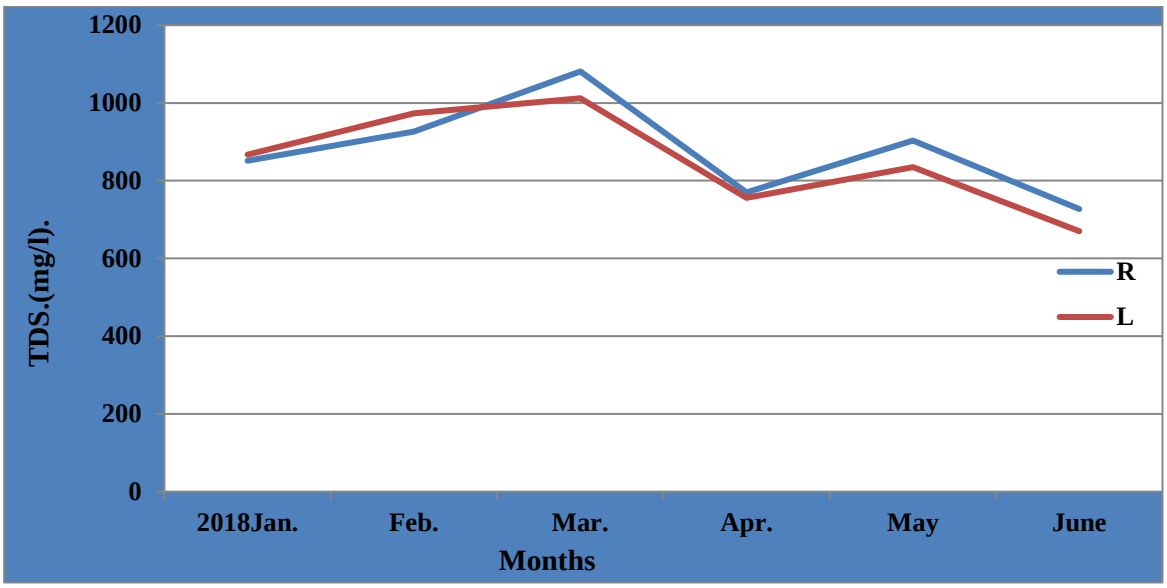
The study indicated that the number of E. coli increased in the summer and this is due to the frequent use of water by people doing recreation work on its banks and throwing their waste in it, this is confirmed by many studies the throwing of civilian waste in water leads to an increase in the number of bacteria .The rise in bacterial numbers may be due to the low level of the Tigris River, which supplies drinking water plants in Wasit province, and its reception of large amounts of sewage during the summer. (Al , Zaidi 1988). The proportion of organic matter in water bodies increases, especially in places close to populations where household or civilian waste water is released, and the human uses of these water bodies, as well as the existence of animals that put their waste in them, as well as has been shown through studies that there is a relationship between organic matter in sediments and the bacterial presence there. The decrease in temperature during winter also reduces the activity of microbiology in organic decomposition processes as a result of the decrease in enzymes and metabolic processes when water temperature decreases, but when the temperature rises, this will increase the activity of microbiology and thus increase the consumption of dissolved oxygen to analyze and oxidize organic matter, resulting in a decrease in oxygen concentration according to the concentration of organic matter (Al-safawi ,2007). Contaminated water has a high salt content and one of the most important inorganic salts affected by water bacteria is nitrogen salts and phosphorus, in poor aquatic environments there is competition between them and plants for these salts, especially plant floats (Phytoplankton) specifically in the spring where their amounts in water decrease and increase in winter, although bacteria are not self-feeding with the availability of organic materials that enrich water in these compounds.

The results of the study showed that the increase in the numbers of colon bacteria may be due to the availability of conditions appropriate for the growth and reproduction of bacteria in the event of nutrient availability, and does not specify a specific season to increase the numbers of coli bacteria, but rather the numbers of increase and decrease are related to where they live and the plenty of nutrients appropriate to their growth, as well as the nature of the environmental relationship between all the factors that usually represent the ecosystem of the organism in the presence or disappearance of certain species, as reached by the (Miley and Ali 2008). Contamination of water with colon bacteria is a dangerous indicator as drinking water should be free of any cell of colon bacteria in 100 ml (Central Agency for Measurement and Quality Control,2001) And the presence of colon bacteria contamination may be due to the inability of used chlorine disinfection to kill this type of bacteria with insufficient chlorine concentrations in the drinking water distribution system to help prevent bacteria from growing in water distribution systems. PH rates in Tigris River in the right side of kut city ranged between (7.2-7.5) respectively recorded the highest values during the month of February valued at (8.2) in the-Khajia district, while the left side showed rates between (5.7-7.3) respectively for water samples taken and recorded the lowest values during the month of February valued at (5.7) in Karimiyh district .



Form (3): Monthly changes in PH values for the left and right sides of the Tigris River for the study areas in Kut city during the period from January 2019 to June 2019.

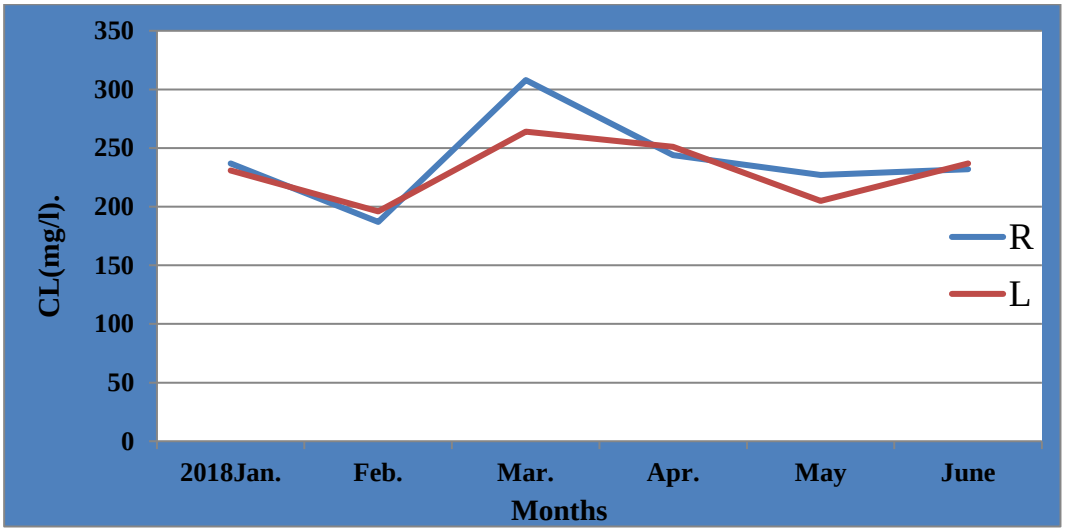
That increasing PH values during low discharge periods with little amount of drainage and less rain produces more breathing and decomposition of organic matter and thus within the swift baseband side (Ezekiel et al., 2011) that fluctuates values PH and their decline in some areas of the left side of the Tigris River may be due to the increased melting of CO2 gas in the water with low temperatures, consisting of carbonic acid, which decomposes an increased component of hydrogen ion. The rates of total dissolved solids have differed for water samples in Tigris River at Kut city with different study sites, the rates recorded on the right side ranged from (727-1081 mg/L) while the left side recorded rates between (670-1017 mg/L) the highest rates during the month of March were shown for the left and right sides at rates exceeding (1000 mg/L) and values decreased during April and June respectively for both sides by (600 mg/L).



Form (4): Monthly changes in TDS values for the left and right sides of the Tigris River at the study areas of Al-Kut City from January 2019 to June 2019.

The high values of total dissolved solids (TDS) and clearly on both sides of the Tigris River during the month of March may be due to the low water level due to the lack of rain, which increases the concentration of salts as well as the nature of the salts containing many types of salts, which is due to the entry of various elements and pollutants and the high urbanization of large areas that throw household waste and sewage directly into the river and the contribution of agricultural land surrounding the river and their contribution in its entire contribution to the lifting of total dissolved solids (Akan et al ,2008).

Chloride levels for the water of the Tigris River were also recorded at the city of Kut to the right side between (187-308 mg/L1) respectively, while the left side had rates between (196-264 mg/L) and values increased significantly during the month of March more for the right side than for the left side for the same month but the lowest values During February and May, respectively, on the left and right sides of the Tigris River, it was recorded the rising in some areas may be due to that area is close to drinking water pumping stations or may be due to the addition of some homeowners tablets of chloride to the water of houses to eliminate diseases and for sterilization purposes, which led to increase in rates of chlorine levels (Hammer,1996).



Form (5): Monthly changes in chlorine values for the left and right sides of the Tigris River at the study areas at Kut city from January 2019 to June 2019.

After looking over the chloride levels, we discover that, as long as it stays above the allowable

limit, there is usually no problem with the little amount of chlorine needed for drinking water. Chloride levels over the permissible limit, which is a maximum of 600 mg/L, may, nevertheless, be a sign of issues. Higher concentrations were discovered to surpass this allowable limit in certain research regions. Inadequate disinfection techniques can lead to excessive chlorine levels (Hassan et al., 2008).

References

A- Arab References

1. Zaidi, Hamed Majid(1988). Theoretical microbiology. Book House for Printing and Publishing. Baghdad.
2. Safawi, Abdul Aziz Younis AL-Talia.(2007). Study the quantity and quality of liquid waste from Mosul and its effect on the water quality of the Tigris River. Proceedings of the first scientific conference of the Center for Environmental Research and Pollution Control, Mosul University June 5-6:1-10.
3. Standard Specification 417, Part 1, Ministry of Planning, Central Agency for Standardization and Quality Control, Iraqi Republic 2001.
4. Al-Mayali, Ethar Kamel and Ali Nouri Abd, assessing the microbiome quality of drinking water distributed from the Al-Fateh Al-Mubin station. Al-Mustansiriyah Science Magazine, Baghdad, Iraq. Issue, 19 Issue 2- p. 43-37.
5. Hassan, Bushra Khaled, Shatha Abdul Razzaq and Amal Rashid Farhan. (2008). Measuring the efficiency of sterilizing drinking water and the factors affecting one of Baghdad's regions. Technical Magazine, 21 (3): 76-84.
6. Sabri, Anmar Wehbe, Mohammed Hassan Younis and Hassan Hindi Sultan.(2001). Bacterial contamination in the Euphrates River. Journal of Environmental Research and Sustainable Development. Atomic Energy Organization. 4 (1): 30-42.

B- English References

1. Akan,J.C.; Abdulrahman, F.I.; Dimari, G.A. ;Ogugbuaja, V.O. (2008). Physicochemical determination of pollutants in Wastewater and vegetable samples along the Jakara waste water channel in Kano Metropolis, Kano. State, Nigeria. European Journal of Scientific Research, 23(1):122-133
2. APHA,(1999).Standard methods for examination of water and waste water. American public Health Association.
3. ASTM.American Society for Testing Materials, Annal Book of ASTM(American Society For Testing Materials)Philadelphia, USA., 1989, Pp.1110
4. Baron,E.J.and Finegold, S.M, Baily and Scott Diagnostic Microbiology. C.V.1990,Mos By Company Toronto.
5. EPA (2006) Distribution systems indicators of drinking water quality. US. Environmental Protection Agency, Washington, DC.
6. Ezekiel, E.N.; Hart, A.I. and Abowei, J.F. (2011). The Physical and Chemical Condition of Sombreiro River, Niger Delta, Nigeria Res. J. Environ. Earth Sci., 3(4): 327-340
7. Hammer, M. J. (1996). Water And Water Waste Technology, (3rd Ed.), Prentice-Hall, Inc. Simon And Schuster Company, Engle Wood Cliffs, New J. Ersey
8. Holt,J.G.Krieg,N.R.Senth, P.H.A. Staley, J.T.and Williams, S.T.C. Berges. Manual of Determinative Bacteriology. thEd.(Willams and W).

9. Mara,D.D.(1974).Bacteriology for Sanitary Engineers Churchill living ston, Edingbarag London P208.
10. Thurman, H.V.and Webber, H.H. (1984). Marine Biology. Charles E.Merril Publ.Comp. Columbus,Ohio
11. UN. (2004). International Decade for Action, “Water for Life”, 2005-2015. UN Resolution 58/217 of 9 February 2004. United Nations General Assembly, New York, NY.
12. USEPA(United State Environmental Protection Agency). (2006). The drinking water standards and health advisories. Washington, Dc.
13. .USEPA, U. S.(Environmental Protection Agency Microbial Source Tracking Guide Document. Office of Research and Development, Washington, DC EPA-600/ 064.›. 2005› Pp. 131
14. WHO (2006-a) Guidelines for drinking-water quality. 3rd ed. first addendum, vol. 1. World Health Organization, Geneva: 515 pp.
15. WHO (2006-b) Guidelines for safe recreational water environments, vol. 2. World Health Organization, Geneva, Switzerland.
16. WHO,(1996).World Health Organization .Guideline for Driking Water Quality. H walth Criteria and other Supporting information. Vol.(2).2nd. Ed. Geneva.
17. World Bank. (2005). Towards a More Effective Operational Response: Arsenic Contamination of Groundwater in South and East Asian Countries. Environment and Social Unit, South Asia Region, and water and Sanitation Program, ,South and East Asia, vol 2,Technical Report .International Bank for Reconstruction and Development Washington, DC.