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Evaluation Of the Quality of Desalinated Water in Commercial Stores and Its Suitability for Drinking from a Chemical and Bacterial Point of View in The Municipality of Janzour

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Abstract

In this research, a problem of great importance was highlighted, as water desalination shops are spread very widely in the region, and it is considered a source that most of its residents resort to obtain drinking water. Where the research included a study of desalinated water for a number of shops specializing in water desalination in the municipality of Janzour, which are distributed over the region (Shuhada Abd al-Jalil - Janzour Al-Sharqiya - Janzour Al-Wasat - Janzour Al-Gharbia - Al-Rashah) in order to find out its suitability for drinking in terms of the concentration of some chemical elements and in terms of bacteria. The concentration of pH, total dissolved salts, electrical conductivity, calcium, sodium, sulfate, and chloride were measured. Bacteriologically, the presence of fecal coliform bacteria was measured in the samples of the study area. The study showed that the concentration of all samples in terms of hydrogen ions, sulfate and chloride conformed to the Libyan standard specifications for drinking water. As for the degree of total salinity and electrical conductivity, most of the samples were within the permissible limits of the Libyan standard specifications. As for the calcium concentration, they were all less than the permissible limits of the Libyan standard specifications. And the concentration of the sodium element, most of the data was within the permissible limits of the Libyan standard specifications. As for the presence of fecal coliform bacteria in the study samples, all samples were completely free and conformed to the Libyan standard specifications for drinking water.

Keywords: Janzour, Drinking, water, chemical, bacterial

1. Introduction

Water is an essential element in human life and its importance appears in the words of God Almighty, “Have not those who disbelieve known that the heavens and the earth were of one piece, then we parted them, and we made every living thing and of water? Will they not then belive” [Verse 30 of Surat Al-Anbiya]. And the Almighty said in an airtight download “He it is who sendeth down water from the sky, and therewith we bring forth buds of every kind; we bring forth the green blade from which we bring forth the thick-clustered grain; and from the date-palm, from the pollen thereof, spring pendant bunches; and (we bring forth) gardens of grapes, and the olive and the pomegranate, alike. Upon the fruit thereof, when they bear fruit, and upon its ripening. Lo! Herein verily are portents for a people who belive” [Verse 99 of Surat Al-Anaam]. Water is also one of the most basic elements of life and is included as an

essential component in the human body, as the percentage of water ranges between 65-70% of the human body, in addition to being an essential factor in various vital processes.

Drinking water is considered one of the necessary, continuous and indispensable human needs, and it must meet quality standards in terms of taste, color and smell, in addition to physical and chemical specifications. The percentage of existing water is about 14 billion cubic kilometers, 99% of which is unfit for human use because it represents seas and oceans, and the rest is groundwater and ice in the polar regions [1]. In recent decades, the problem of lack of potable water has increased, as the proportion of saline groundwater is many times more than potable water, and due to the existence of water deficit and poverty, this has led to drought in many countries, which led UNICEF to sound the alarm, by announcing that more than 4 million people will face water problems, With this deficit in potable water resources, water desalination technology was directed to benefit from sea water or by desalinating groundwater and using it for drinking. Water desalination is known as the process that takes place to remove excess salts from the water in order to make it suitable for drinking and agriculture. The water desalination process is carried out in several ways, including desalination by distillation, desalination by freezing, desalination by reverse osmosis and several other methods [2].

And given that water may be exposed to pollution, which is defined as a change in the natural, chemical or biological characteristics of water, which makes it a real or potential source of harm to humans [3], many countries tended to prepare standards and specifications for drinking water, and the United Nations Organization also carried out programs Environment (UNEP) and many international scientific bodies prepare standard standards and specifications that can be relied upon to determine the suitability of drinking water.

Therefore, must be continuously monitor and analyze the water used for human purposes to monitor any changes and indicators that can be observed in the water specifications in order to take the necessary measures to preserve it [4]. As the World Health Organization estimated that more than 80% of the diseases spread in the world are directly or indirectly related to water, and the prevailing belief that desalinated water is free of pollutants and bacteria harmful to humans is a misconception, as studies have confirmed the presence of some pollutants in commercial desalination water in Various countries of the world [5], and due to the scarcity of studies that talk about the validity of this water and its conformity with the Libyan and international standards, this study was conducted in one of the areas of Greater Tripoli (Janzour).

2. Research importance

The importance of this research lies in knowing the extent of microbial contamination in the study samples and knowing the health risks of pollution in the water resulting from these stations, if any. As well as the extent to which this water conforms to the Libyan standard specifications and the specifications of the World Health Organization. And also knowing the extent to which water conforms to the standard specifications for drinking in terms of the concentration of some elements, especially since the municipality of Janzour has a high population density.

3. Search questions

1. What is the concentration of microbial contamination in the study samples?
2. Is the percentage of physiochemical elements in the study samples conforming to the Libyan standard specifications and within the permissible limits for drinking water?
3. Is this water suitable for drinking and what is the extent to which this water conforms to the Libyan standard specifications?

4. Research aims

1. Knowing the extent of microbial contamination in the samples of the study area and their conformity with the Libyan standard specifications.
2. Knowing the physiochemical concentration of the study area samples and their conformity with the Libyan standard specifications.

5. Previous studies

Water contains a number of useful elements and compounds, but when it exceeds the permissible limits, whether by increase or decrease, it makes the water unfit for drinking and sometimes even for other uses. And since the quantities of fresh water are few and the largest percentage of the water is salty water, the amount of which is estimated at about 97% of the surface water on earth, which made man think well of exploiting this enormous wealth to fill the growing shortage of water suitable for human and agricultural uses by removing salts from it [6].

A study conducted by Al-Balazi (1997). That most of the population centers are concentrated on the coastal strip and that there is a lot of depletion of groundwater, which led public and private institutions to intervene by establishing desalination plants to provide water [7].

A study was conducted in the Libyan city of Sabratha by Ahmed Al-Kilani et al. (2020). Where the study showed that a number of desalinated water samples in the city of Sabratha contain some substances that make them unfit for drinking and have negative effects on public health in the event of reliance on them as a primary source of water [8].

By Kamila Al Ghoul at 2014. About 18% of the desalination plants fed from the public network were not in conformity with the Libyan standard specifications No. (82) For the year 2008. And that about 9% of the desalination plants that were fed from the wells were not in conformity with the Libyan standard specifications [5].

A study was conducted in Egypt by Ahmed Abdel-Gawad in 1995. It was stated that the number of deaths in Egypt at the end of the nineteenth century as a result of diseases related to water amounted to more than 48 thousand cases. Of these, there are approximately 20,000 cases of typhoid and 1,414 cases of other bacterial diseases [9].

In 1996, a study was conducted by Ahmed Hassan. The results were that about 80% of human diseases result from water pollution with disease-causing germs. And that about 50% of the world's patients, their diseases are directly related to drinking water contaminated with pathogenic organisms [10].

Hana Al-Hanash et al in 2002 confirmed the presence of contamination in many samples of bottled water, local and imported, in terms of the presence of bacteria was not in conformity with the Libyan standard specifications [11].

6. The practical side of the study

- **Materials and method of work:**

The city of Janzour is located to the west of the capital, Tripoli, about 12 km westward from the center of Tripoli, as its coastline extends for about 20 km, and its population is about 100 thousand people. In this study, random samples were taken from the desalination plants distributed in the study area, whether they are located on public roads or in shops for bottling and selling water. The water was collected in glass bottles that were well washed with distilled water. After that, the concentration of each of the following was measured:

• **Electrical conductivity (EC):** which is defined as the extent of water's ability to carry electric current, as the higher the water's salinity, the greater its ability to electrical conductivity. The electrical conductivity was measured with a Conductivity Meter.

• **Total Dissolved Salts (TDS):** The total dissolved salts were measured by the Conductivity Meter.

• **PH**: The degree of reaction was measured using a PH meter.

Calcium (CA): Calcium ion was measured according to method number B 3113 as stated in APHA, 1995.

Sodium (NA): Sodium was measured by Flame Photometer using method No. D 3500 as water stated in APHA, 1995.

Chloride (CL): The concentration was measured by the Iodometric Method method No. B 4500, as stated in APHA, 1995.

Sulfur SO_4: Sulfates were measured by Ultraviolet Visible Spectrophotometer as stated in APHA, 1995.

Fecal coli bacteria (E.coli): The detection of fecal coliform bacteria by the American Public Health method in 2005 is summarized in withdrawing an amount of water that is collected through a membrane filter and placed in a Petri dish that contains a selective food environment for the growth of fecal colons of the type E.coli, and the dishes are incubated at a temperature of 44.5 degrees Celsius, and the growth of fecal colonies is monitored for a period of 18 to 24 hours.Fecal bacteria, heat-resistant bacteria that have the ability to ferment the sugar lactose and produce acid and gas when grown at a temperature of 44.5 degrees Celsius, where their presence indicates the inefficiency of the treatment units.

As for the samples, the samples were collected from the study area by 10 samples divided into 5 regions (distributed geographically in the Janzour region), and the samples were examined directly after collection.

Table 1: Regions from which samples were taken

location	Shuhada Abd al-Jalil	Janzour Al-Sharqiya	Janzour Al-Wasat	Janzour Al-Gharbia	Al-Rashah
Sample Number	1-2	3-4	5-6	7-8	9-10

Table 2: Libyan standard specifications for bottled drinking water

Component	H-	Total dissolved salts total	electrical conductivity	Ca	Na	SO_4^{2-}	Cl
Libyan Standards (gm/liter)	6.5-8.5	500 -1000	500 -1500	200	100	250	250

While the Libyan standard specifications for drinking water indicated the need for drinking water to be free from the fecal coliform bacteria E.Coli.

7. Results and discussion

pH: It is the activity of the hydrogen ion in the water, where the value of the hydrogen ion ranges from 0 to 14, as the numbers less than 7 are acidic and more than 7 are basic, and when the number 7 is neutral, it is indicated that the concentration of the hydrogen ion has a role in the life of Most of the microorganisms multiplied, and through the results of the analysis of the samples in terms of the hydrogen ion concentration in the water, it turned out that it was 6.1 in sample No. 7 to 7.9 in sample No. 11, which means that all samples conform to the Libyan standard specifications.

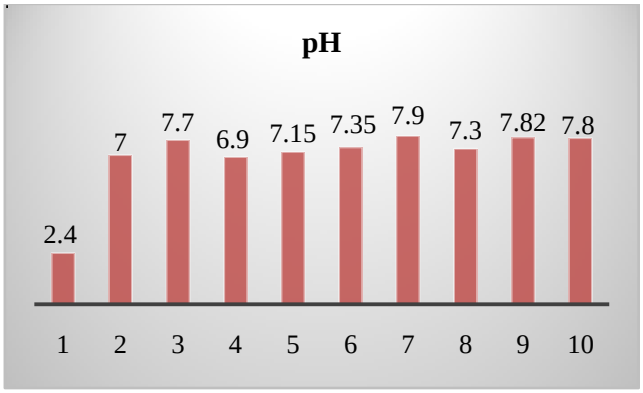

Fig 1: Concentration of the samples according to the numbering of the samples in Table 1

Total Dissolved Salts (TDS): It is the sum of the total solid salts dissolved in water such as bicarbonate, sulfate, calcium, magnesium and potassium, and through the results of the samples it became clear that its value ranges from 11 in sample No. 8 and 600 in sample No. 2 and by comparing the results with the

Libyan standard specifications It is clear that all samples conform to the Libyan standard specifications, except for sample No. 2, in which the percentage of salts was higher than the permissible limits.

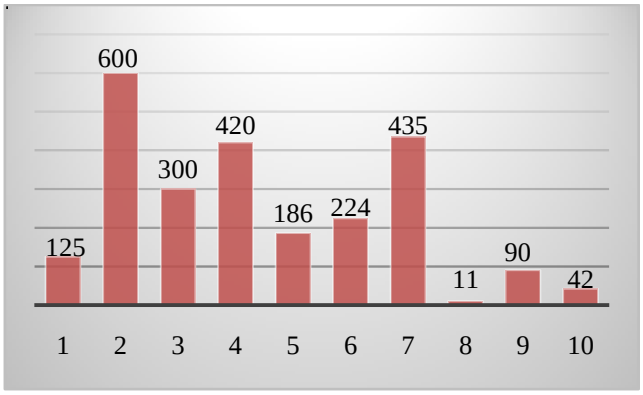

Fig 2: Concentration of samples in terms of TDS

Electrical Conductivity (EC): It is the extent to which water can carry electric current. Through the analyzes, it became clear that the results of the analysis of the samples were from 15 in sample No. 9 to 1025 in sample No. 2, and by comparing the results, it is clear that all samples conform to the Libyan standard specifications except for sample No. 2. The electrical conductivity ratio exceeded the permissible limits.

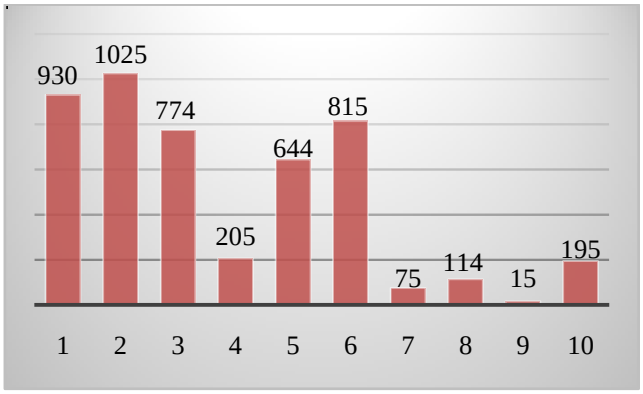

Fig 3: The extent of electrical conductivity of the samples

Calcium (CA): Calcium ion is a major cause of water hardness and has a strong influence on water quality. According to the results of the analysis of the samples, it is clear that the concentration of calcium in them ranges from 3 in sample No. 6 to 57 in sample No. 1, and by comparing them with the Libyan standard specifications, it is clear that all of them are less than the permissible limits.

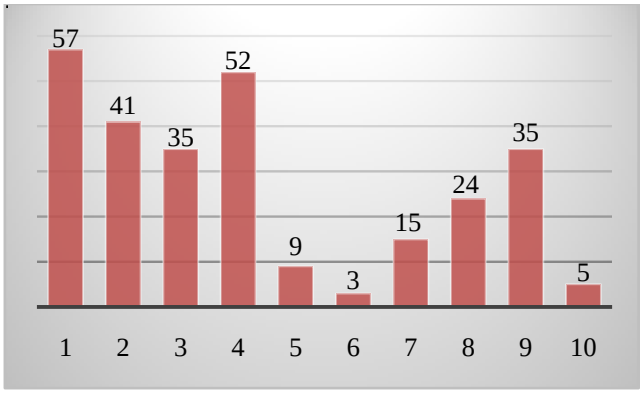

Fig 4: Calcium ion concentration in study samples

Sodium (Na): Sodium is present in water due to its rapid solubility in it, as it combines with the chloride ion, a component of sodium chloride salt which gives a salty taste to the water. The increase in salts causes a problem in children because the child is unable to get rid of sodium at an early age. And through the results of the samples, it became clear that the values range from 6 in sample No. 5 to 120 in sample No. 3, and by comparing them with the Libyan standard specifications, it became clear that all samples conform to the specifications except for sample No. 3, the percentage of sodium in which is higher than permissible.

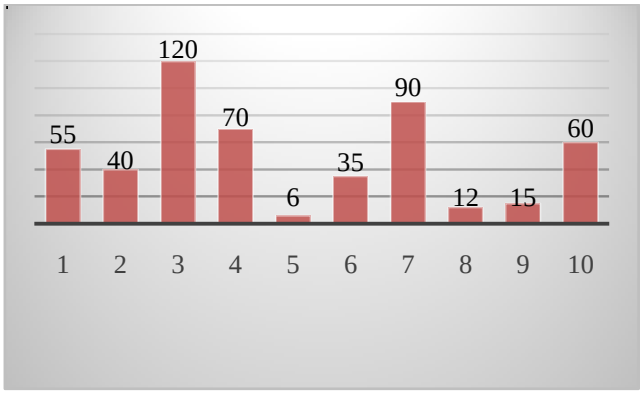

Fig 5: Sodium ion concentration in study samples

Sulfates (SO_4): The water containing sulfates gives it bitterness in taste, and its presence in large quantities causes problems for the intestines. And through the results of the analyzes, it became clear that the values range from 33 in sample No. 8 to 181 in sample No. 1. And by comparing them with the Libyan standard specifications, it became clear that all of them conform to the specifications and within the permissible limits.

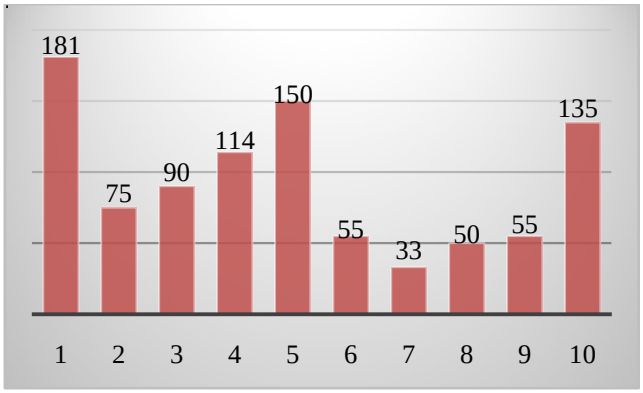

Fig 6: Sulfate concentration in study samples

Chloride (CL): The presence of chloride in water increases its salinity and makes its taste unacceptable. Chloride may combine with sodium, magnesium, and potassium. Through the results, it became clear that the values range from 18 in sample No. 10 to 248.2 in sample No. 6, and by comparing them with the Libyan standard specifications, it is clear that all samples are within the permissible limits.

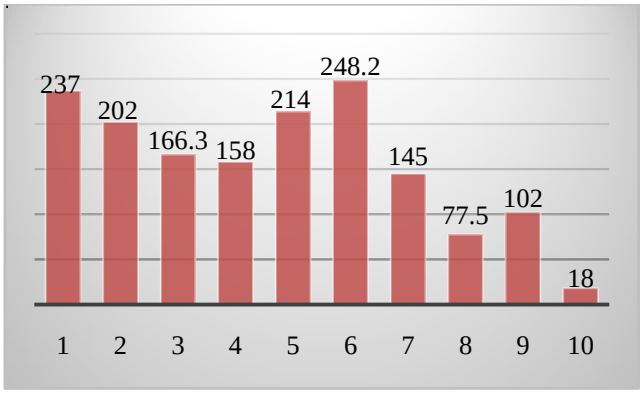

Fig 7: Chloride concentration in study samples

Fecal coliform bacteria (E.coli): The fecal coliform bacteria are a strong indicator and evidence of contamination of water with human waste. Through the results of the samples, it is clear that all samples are free from the presence of bacteria, which makes them conform to the Libyan standard specifications for drinking water.

8. Recommendations

1- Continuous monitoring of drinking water sources, whether governmental or private, and conducting continuous analyzes for early detection of any contamination that may occur.
2- The need for water desalination shops to obtain a license to ensure that all conditions are met and that a database is available through which to follow up.
3- Providing spare parts for desalination plants to conduct periodic maintenance.
4- Training technical personnel to carry out maintenance operations for desalination plants so that they are always of high efficiency.
5- Encouraging researchers to conduct periodic research on water, whether desalinated or groundwater, because of its importance.
6- Spreading environmental awareness among the owners of water shops and among the citizens, in order to form popular resistance against any clear violations.
7- Periodic and continuous cleaning of desalination water tanks to keep water from pollution.

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