دراسة خصائص المياه الجوفية ومعرفة أثار التلوث ومدى صلاحيتها للاستعمال البشري جنوب الطريق الساحلي شرقي مدينة الزاوية

فرج عبدالجليل المودي- كلية التربية ـ جامعة الزاوية

الملخص:

تضمن البحث دراسة مجموعة أبار من المياه الجوفية بأعماق وأبعاد مختلفة جنوب الطريق الساحلي شرقي مدينة الزاوية منطقة الطويبية, جودائم, ومنطقة الماية ومعرفة تقييم جودتها ومدى صلاحية الاستخدام البشري من حيث الخصائص الكيميائية والطبيعية المتضمنة في (الملوحة - العسر الكلي - عسر الكالسيوم، وعسر المغنيسيوم، وتركيز الصوديوم - البوتاسيوم - الكلور – الكبريتات – البيكربونات – ودرجة الموصلية) مقارنة بالمواصفات الليبية والمواصفات العالمية.

Study the Characteristics of groundwater and knowing the effects pollution and its suitability for Human use, south the coastal road of east Al-zawia city

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Abstract:

Ten samples of groundwater at different depths and farthest south the coastal road of east Al-zawia city Tawebya area, Joddaim and Al-mayah area were analyzed and through this study it was found that human populations need large quantities of water for domestic, agricultural and industrial use and the rest of the other activities. Due to the dumping of industrial waste and waste near the sea (landfills), which leads to their decomposition and leaching, as well as water swamps during rain and the pollutants they carry, and in agricultural areas, the causes of pollution are due to excessive irrigation by the need of plants, fertilizers and improvers that are added to the irrigated agricultural soil, insecticides that are used in the prevention of insects and various diseases, animal waste all seep through the pores of the soil and be a major cause of pollution, making it unfit for drinking compared to Libyan the specifications and the world Health organization

Keywords: groundwater, analyzed, pollution, agriculture, hardness

Introduction:

The study including research ten wells of the ground water at different depths and farthest south of the coastal road of east al- Zawia city Tawebya area, Joddaim and Al-mayah area, and knowing the assessment of their quality and the validity of their human consumption in terms of the chemical and natural properties included in (salinity- total hardness- calcium hardness, Magnesium hardness, concentration of sodium - potassium - chlorine - Sulfate-bicarbonate-and the degree of conductivity) water is considered the basis of life and the element of its continuity for many vital processes that inside the body living organisms, it has formed in the various ways(rivers, lakes, seas, and oceans) a source of benefit to humanity ancient times and most countries of the world depend on groundwater to meet their needs in industry and agriculture, in addition to human use. it must be preserved and maintained to achieve the general strategic goals, foremost of which is the protection of the environment.

Human health food and industrial development are at risk unless the human being takes care of water resources and land more effectively than it was.

Research problem :

There are some problems that led to the selection of this topic in the study area including the change in the natural and chemical characteristics the increase in salinity corrosion and blockage of pipes.

Many of them are filtering pollutants through sewage thank irrigation water and the pollutants they carry in irrigated agricultural areas including fertilizers and pesticides regardless of their concentration as they are very dangerous and most of them are soluble in water .

It is important to note that the fates of pollution or difficult to determine and control it can also continue to be contaminated for a long period of time due to the turbidity of its exploitation and the determination of public health (1.2.3).

Research importance:

Health prevention is the main objective of the process analysis and purification of ground water by removing suspended or dissolved substance and getting rid of harmful.

Parasites and Parasites stuck in them The absence of some phenomena no there are no more dangerous pollutants than what he witnessed and the cystic natural physiological and radiological properties must be studied and to know the extent of their usefulness.

Chemicals analyses:

1- Measurement of PH meter (Acidity) using PH meter Apparatus.
2- Measurement of conductivity by conductivity detector.
3- Determination of total dissolve salts (T.D.S)their validity and must does not exceed the Libyan and international specification(1500 mg/L).
4- Determination of total Hardness as ($CaCO_3$) mg/l.
5- Determination the Hardness of Calcium and Magnesium by mg/l.
6- Determination of Sodium and Potassium by mg/l.
7- Determination of Bicarbonate by mg/l.
8- Determination of Chloride by mg/l.
9- Determination of Sulfate by mg/l

Libyan and world Health organization standards for drinking water.

Table No. (1)Shows Libyan and World Health Organization standards (6,7)

Element	Libyan Standard specifications mg/L		World Health Organization standards mg/l	
	Normal Rate	Maximum Rate	Normal Rate	Maximum Rate
Total dissolve Salt	500	1000	500	1500
Sulfate	200	400	200	400
Total Hardness	100	400	100	400
Magnesium	30	150	50	150
Sodium	-	-	-	200
Calcium	75	200	75	200
Chloride	200	250	200	600
Bicarbonate	125	350	150	350
Conductivity	1400	-	-	-

Practical Side:

Steps methods of the research and laws used in the calculation:

Samples of groundwater were collected from (10) wells with at different depths and farthest south of the coastal road of east Al-Zawia city in the period from March to May 2022 the sample were collected in a period of 30 minutes after the operation of each well and each sample was filled in the

half liter plastic bottle made from the polyethylene, study the Chemical and Physical properties.

- Total dissolved salt in water (T.D.S):
  Weigh 50ml of the Sample in beaker and Evaporate it at temperature of $180C^0$ and let it cool, the difference weight is equal total dissolved salt (T.D.S).
  $T.D.S = \frac{\text{wt.of ppt x 1000x1000}}{\text{sample volume}} = \text{mg/l}$
- Determination of PH meter: using the 4330 Combined PH/ Conductivity device and it is measured when taking the sample directly.
- Determination of total Hardness:

1- The first stage:

Determination of Calcium and Magnesium using the Erio Chrome black (T) indicator, and the buffer solution PH = 10, we start titration the solution, and the product is produced with a standard solution of EDTA (a known concentration of 0.01M)to determine the Calcium and Magnesium together.

2- The second stage:

To determine the amount of Calcium, a highly concentrated solution of Sodium hydroxide (Caustic buffer) is added until its PH becomes (PH=13) thus precipitating all the ions Magnesium present in the unknown solution in the form of $Mg(OH)_2$ and used the Muroxide indicator titrated and the difference between the first stage and the second stage in the volume of (EDTA) is the volume needed to determine the amount of Magnesium$_{(8,9)}$ from the following relationship, the Molar concentration of Calcium and Magnesium in the sample is calculated, then the resulting total hardness is calculated in the form of Calcium Carbonate mg/l$(CaCO_3)_2$ product.

from the following relationship, calculate the Molar concentration of Calcium and Magnesium in the sample

$M_1 \times V_1 = M_2 \times V_2$

And calculate the total Hardness product as Calcium Carbonate ($CaCO_{3\ mg/L}$)

∴ (Total Hardness)

$$= N^{o} \text{ of Ca (mg/l)} \times \frac{\text{M.Wt Of CaCO3}}{\text{M.Wt } Of \text{ Ca}} + \frac{\text{M.W}t \text{ Of MgCO3}}{\text{M.Wt Of Mg}} \times N^{0} \text{ of Mg (mg/l)}$$

- How determine Chloride ion concentration in the sample:

By titrating the precipitation using a standard solution of silver nitrate (0.01) and an indicator of Potassium Chromate concentration (5%)at the end point of titration, Reddish brown precipitate is formed from silver Chromate Ag_2CrO_4 is evidence of completion of the reaction and by precipitation of halide Silver(10,11).

$$\therefore \text{Molarity of chloride} = \frac{\text{Molar of AgNO3 X volume of AgO3 ml}}{\text{volume of sample ml}}$$

Wt. of Chloride mg/l = M of Chloride X M.Wt of Cl X 1000 = mg/l

- Determine of sulfates (SO_4^{--}):

  10 ml of the sample is heated to boiling point, the 10ml of barium chloride is added to it until all barium sulfate precipitates, the let it cool, filter the product ad wash with hot distilled water, dry at a temperature of 800^0C, ad let it cool isolation from air to prevent moisture absorption, then calculate the weight of sulfate in the sample according to the following relationship.

  $$\text{Wt. of sulfate} = \frac{\text{wt of sample X M.wt of SO4 X 1000 X 1000}}{\text{sample volum X M.Wt BaSO4}}$$

Results and Calculations:

Table(2)Shows the calculation and the samples analysis results

Sample N	1	2	3	4	5	6	7
Weight Of Calcium mg/l	172	116	136	120	88	60	64
Hardness product from Ca^{++} mg/l	430	290	340	300	220	150	160
Weight of Magnesium Mg mg/l	66.8	30	50.4	48	36	50.4	50.4
Hardness product from Mg^{++} mg/l	195	125	210	20	150	210	210
Total Hardness product from $CaCO_3$	625	415	550	600	370	360	370
Weight of Chloride mg/l	284	198.8	238	216	177.5	103	100
Weight of Sodium Na^+ mg/l	122.8	159.9	170	135	130	80	80
Weight of Potassium K^+ mg/l	9	5	9	7	7	5	5
Weight of Sulfate SO_3^{--} mg/l	312	242	250	254.9	238	190	190
Weight of bicarbonate HCO_3^- Mg/l	248	224	243	151	220	183	180
Total dissolved salt calculated	0+1214.611	975.7	1069.4	931.9	896.5	671.4	669.4
Measurement PH meter at $25C^0$	7.4	7.6	7.3	7.4	6.2	7.03	7.05
Conductivity by 1/ Om	1649	1602	1850	1180	1349	895	930
Well depth in the Area	80	80	80	100	125	110	110
Farthest of the sea by (Km)	3	4	4	4.5	4	5.	6

8	308	770	20	500	1270	400	290	14	192	215	1539	6.21	3240	70	2.5
9	108	270	30	125	395	200	130	5.2	209	240	922.2	7.4	1420	100	3.5
10	124	310	45	187.5	497.5	244	250	11	180	210	1064	6.9	1730	80	4

Discussion:

Table (2)Shows the result of analysis of Ten Samples of the groundwater if the water ranges between the range is 500-1500 milligram per liter locally and internationally it is considered suitable for drinking and for many household purposes and Agricultural and industrial, but if it exceeds this range, then this water will have an unacceptable taste and not valid it causes many problems, including Corrosion of iron pipes and Kidney disease, as it become clear through the results the degree of salinity concentration in the samples ranged between 669.4 - 1539 mg/l and the highest salinity was in the sample N^0 8,which is 3000 meter away from the Sea, and decreases as we move away from it, and compare these results with the Specification the Libyan Standard, the permissible rate from 500-1000 and scientific Health Organization, the permissible rate from 500- 1500 mg/l samples that exceed this limit are considered unfit for drinking in terms of salinity and Figure (1) shows the degree of salinity concentration in the samples and the calculates the total hardness resulting from Calcium Carbonate the results ranged between 360-1270 mg/l and these results were Compared with the Libyan standard specifications and the world Health Organization, found the maximum total Hardness to be 400mg/l and thus all samples are considered it is not suitable for drinking, and according to the hardness of Calcium and Magnesium hardness, respectively, it was found from 60-308, 20-66.8mg/l and comparing these results with the Libyan standards and world Health Organization, it was found that a maximum hardness of Calcium 200 and Magnesium 150mg/l all samples that are more than drinkable Figure (2)Shows the degree of Concentration of total hardness, Calcium squeezing and the samples, as well as according to the Molar concentration of Sodium

and Potassium, respectively. It was found that it ranges between 80-290, 5-14mg/l and the universally permissible is 200mg/l as limit, it is not suitable for drinking, and the Concentration of Chloride in the samples ranges between 100-400mg/l and the permissible maximum is according to the Libyan specification from 200-500 and world Health Organization from 200-600 mg/l samples that exceed this limit are not for drinking. Figure (3) shows the degree of concentration of Sodium, Potassium and Chloride in the samples, and the degree of concentration of Sulfates and bicarbonate respectively ranges from 180-312,151-248 and the permissible limit for Sulfates according to Libyan and scientific specification from 200-400 and for bicarbonate 125-350mg/l and samples that exceed this limit are not suitable for drinking. Figure (4)shows the degree of concentration of sulfur and bicarbonate.

Then the degree of conductivity was calculated on a scale of 1/Ohm ranging between 142-3240 and the permissible limit is 1400 and Figure (5) it shows the degree of conductivity. We note that the samples near the sea, especially the depth that do not exceed (80meters), have very high percentages, which makes this water unsuitable for human consumption, noting that the further away from the sea the natural rate of salts in the water of atmospheric wells approaches From the Libyan specifications and the World Health Organization.

Figure (1) shows the salts concentration of the samples by mg/l

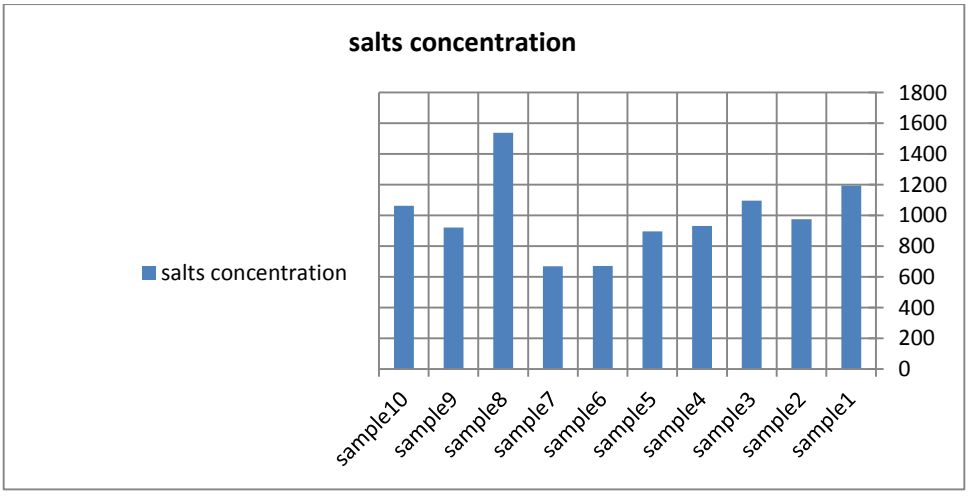
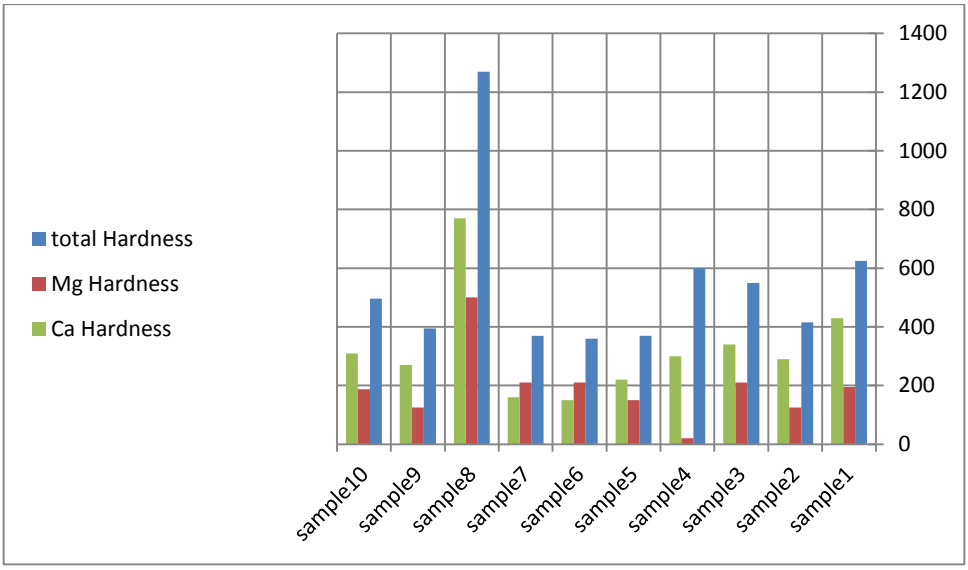


Figure (2) shows the total Hardness, Mg, Ca Hardness of the samples by mg/l



Figure(3) shows the chloride, sodium, potassium concentration of the samples by mg/l

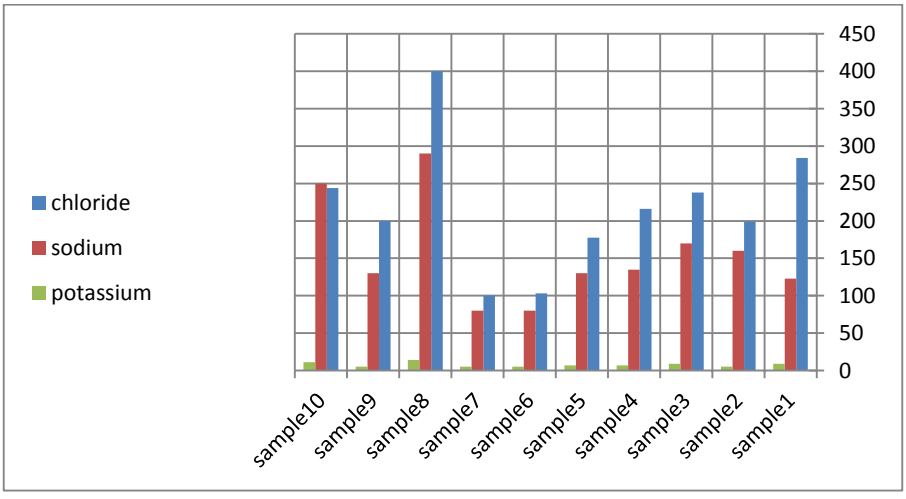
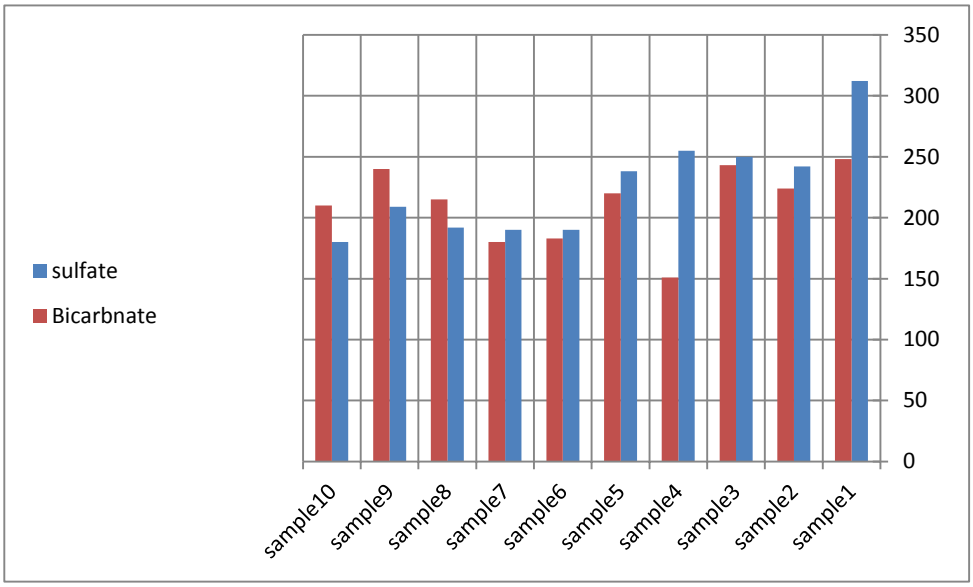
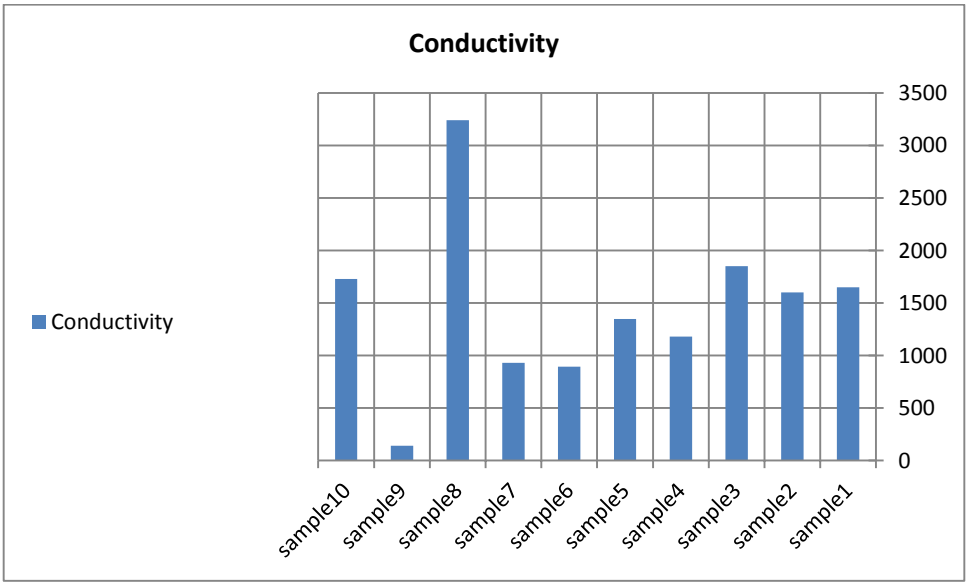


Figure (4) shows the sulfate, Bicarbonate concentration of the samples by mg/l



Figure(5) shows the degree of the samples Conductivity



Conclusion:

Ten samples of groundwater at different depths and farthest south the coastal road of east Al-zawia city Tawebya area, Joddaim and Al-mayah area, were analyzed and through this study it was found that human populations need large quantities of water for domestic, agricultural and industrial use and

the rest of the other activities. Due to the dumping of industrial waste and waste near the sea (landfills), which leads to their decomposition and leaching, as well as water swamps during rain and the pollutants they carry, and in agricultural areas, the causes of pollution are due to excessive irrigation by the need of plants, fertilizers and improvers that are added to the irrigated agricultural soil, insecticides that are used in the prevention of insects and various diseases, animal waste all seep through the pores of the soil and be a major cause of pollution, making it unfit for drinking compared to Libyan the specifications

and the world Health organization.

Recommendations:

1- The person must protect himself from pollutants, such as throwing garbage of all kinds in the places designated for it to avoid its danger.
2- Establish factories to recycle garbage, especially plastic and paper, and treat it to benefit from it instead of being a source of pollution to the environment.
3- Providing areas near the sea with desalination plants, because the large number of groundwater withdrawals compensates for the sea water, which causes an increase in the salinity (the percentage of dissolved salte)
4- Attention to sewage channels and their maintenance.
5- Develop appropriate solutions and suggestions to reduce redundant irrigation, fertilizers and insecticides, regardless of their concentration.

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