Types of bacteria present in rainwater, collected in ground tanks and eliminated

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Abstract

This study to solution for some problems product from consumption the human to this type of water.

The present study was carried the water quality of the rain water collected in the tanks of the study area (elrayayna) has evaluated.

This evaluation includes the physical properties such as temperature, degree of reaction, electrical conductivity, turbidity, measurement the total dissolved salts and the quantity of the dissolved oxygen, as well as the biological properties such as detection of total coliform bacteria and the fecal coliform bacteria.

A total of 20 random samples of the rainwater collected in the tanks of the study area have been collected, 15 tanks with earthen collecting surfaces and 5 samples collected from the tanks of concrete roofs. By carrying out the previously mentioned analyses, the rainwater collected in the open roofs has (pH 7.53 , the electrical conductivity was 392µs/cm , the total dissolved salts was 253.8mg/l , turbidity was 17.37 unit, the dissolved oxygen 10 mg/l).

Whereas the rainwater collected in the concrete roofs has (pH 7.59, the electrical conductivity 358.6 µs/cm, the total dissolved salts 249 mg/l , turbidity 1.58 unit, the dissolved oxygen 10mg/l) when matching the obtained results with the Libyan standards and the standards of the world Health Organization , on the lights of these results ,a unit for treatment of the water contaminated with the fecal coliform bacteria was proposed and designed at the degree of react on of pH10, pH 4, and pH 7.3 and at different temperatures begin with 25,55,65,70 and 75c°,respectively.

When carrying out the treatment process at pH 10 and pH 7.3 , the concentration of both the total coliform bacteria and the fecal coliform bacteria are reduced at temperature of 55c° as compared with that at 25c°until it reaches 65c°, where both the total coliform bacteria and the fecal coliform bacteria are completely annihilated.

***Key words**:*

Magen / Underground hole in the shape of a cylinder

The fountain / pit below the surface of the earth horizontally and its shape is square or rectangular

Rakakat / small basin beside the tank for sedimentation of foreign materials.

Introduction

Water is a basic and necessary requirement for all forms of growth and development and a basic need for the continuation of human and economic activities, which increased the continuous demand for it resulting in water scarcity in many regions of the world, which led to the search for other sources of water to fill this deficit, and as rain water is like other types of water It is subject to contamination with all kinds of pollutants, including biological pollutants that are present in the air, soil, human and animal wastes, and others (1) and therefore may be contaminated with a group of Coliform bacteria) , which is abundant in faces, and accordingly, the presence of Escherichia coli bacteria is a vital indicator of this contamination. The water with this type of bacteria (3) was chosen as evidence of contamination, due to the ease of detection, and it gives reliable results for the contamination of these waters with coliforms (3).

Purpose of the study:

The study aims to detect pathogenic bacteria that may reach the collected rainwater and to try to find solutions to get rid of this pollution.

Materials and Research Methods:

Description of collection areas around cisterns:

The collection areas around the tanks of the study area are divided into two types of surfaces:

1 .Dirt roofs, which are open areas of cohesive and impermeable soil with an appropriate inclination that collect rainwater in tanks through gullies known as mesaqas.

2 .Concrete roofs, which are house roofs of limited space with a slight inclination that helps water flow and collect and transfer it through a pipe to the tank.

20 tanks were selected, including 5 tanks with concrete assembly surfaces, 15 tanks with earthen collection surfaces, and the size of these tanks ranged from 10-43 m3.

Treatment of polluted rainwater:

Experience design:

A water purification treatment unit has been designed and planned, which is a stereoscopic placement consisting of a tank under continuous feeding of polluted rainwater and its passage through a copper tube in the form of a coil of 10 m length and 11 mm diameter inside a tank or a circular water heating basin made of metal with a height of 70 cm and a base of 45cm The heating process is controlled by a thermostat. The treated water is discharged from the end of the copper tube.

Used water in the experiment and its characteristics:

In this experiment, rainwater contaminated with coliform bacteria and fecal coliform bacteria were collected and collected in the tanks and tanks of the study area.

Then samples were taken at the aforementioned temperatures to check for total coliform bacteria and fecal coliform bacteria To conduct a comparison process between the characteristics of water contaminated with total coliform bacteria and fecal coliform bacteria in different water media, starting with the aforementioned neutral water and comparing it with water in the acid and alkaline medium, so that the water medium is changed from the neutral medium at the reaction point of PH 7.3 to the medium Acidic acid is added by adding drops of concentrated nitric acid in the feeding tank to change the degree of reaction to PH 4, then start the treatment and purification unit. In the same way, the medium is changed to alkaline by adding a little sodium hydroxide.

Results and discussion

Through the results presented in Table (1,2,3,4,5) and Figures (1,2,3,4,5,6,7,8) for rainwater samples collected in tanks and tanks of the study area, we note that all water samples The tanks were contaminated with total coliform bacteria, where the highest value was in the rainwater samples collected in the tanks of the dirt surfaces, and it was more than 433 cells / 100 ml while the lowest value was 37 cells / 100 ml. As for the rainwater collected in the tanks for concrete surfaces, the highest value was 221 cells /100 ml and less the value of 10 cells per 100 ml is due to the increase in contamination of the tanks Dirt surfaces indicate the presence of animal and bird wastes and the failure to clean the tanks before the rainy season. As for the concrete surfaces, all tanks are contaminated with total coliform bacteria, but to a lesser degree than the dirt tanks and the failure to clean the tanks and everything around them is considered the main cause of pollution.

When comparing these results with the Libyan specifications of 1992 (4), World Health Organization(7) we note that all samples exceeded the permissible limits, as these results are consistent with the study conducted by (2) in which it reached that 87% of the stored rainwater in The tanks are not suitable for drinking, and these results also agree with the study that he conducted (5) When collecting samples of rainwater from tanks near paved roads, they contain indicators of total coliform bacteria as well as It also agrees with the studies he conducted (8) and the study that he conducted (9).

Table (1) Number of total and fecal bacteria cells in open surface samples

Sample number	Coliform bacteria		Fecal coliform bacteria	
	Cfu/100ml	Sample case	Cfu/100ml	Sample case
1	201	Contaminated	82	Contamenated.
2	58	Contaminated	153	Contamenated.
3	Very high	Contaminated	129	Contamenated.
4	343	Contaminated	77	Contamenated.
5	Very high	Contaminated	Very high	Ontamenated.
6	70	Contaminated	0	Unpolluted
7	313	Contaminated	180	Contamenated.
8	37	Contaminated	9	Contamenated.
9	264	Contaminated	62	Contamenated.
10	Very high	Contaminated	37	Contamenated.
11	Very high	Contaminated	237	Contamenated.
12	100	Conaminated	214	Contamenated.
13	56	Contaminated	9	Contamenated.
14	433	Contaminated	0	Unpolluted
15	91	Contaminated	151	Contamenated.

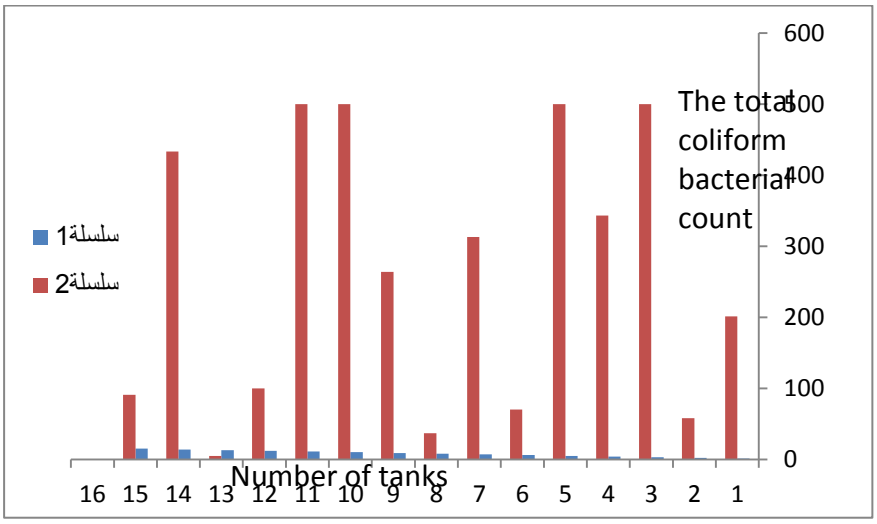

Figure (1) Number of total coliform bacteria cells in open soil surfaces

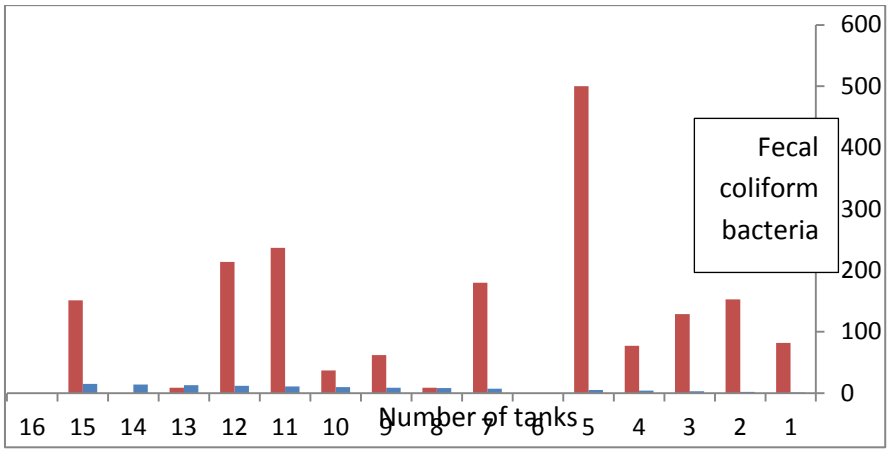

Figure (2) Number of fecal bacteria cells in open dirt surfaces

Table (2) Number of total and fecal coliform bacteria cells in concrete surface samples

Number of tanks	Coliform bacteria		Fecal coliform bacteria	
	Cfu/100ml	Sample case	Cfu/100ml	Sample case
1	79	Contam.	19	Contam.
2	84	Contam.	60	Contam.
3	10	Contam.	6	Contam.
4	70	Contam.	20	Contam.
5	221	Contam.	116	Contam.

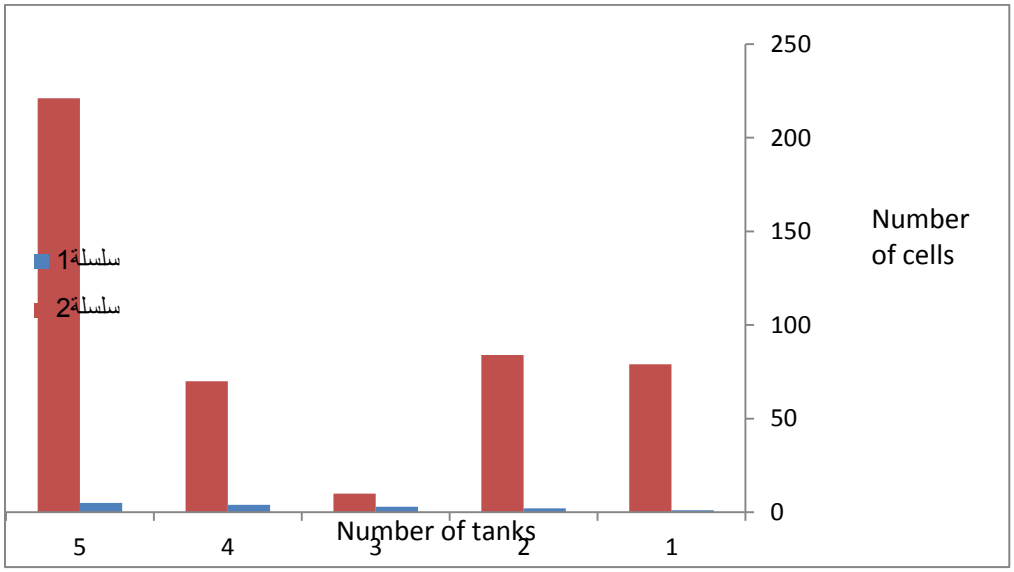

Figure (3) number of total coliform bacteria cells in the concrete surface samples

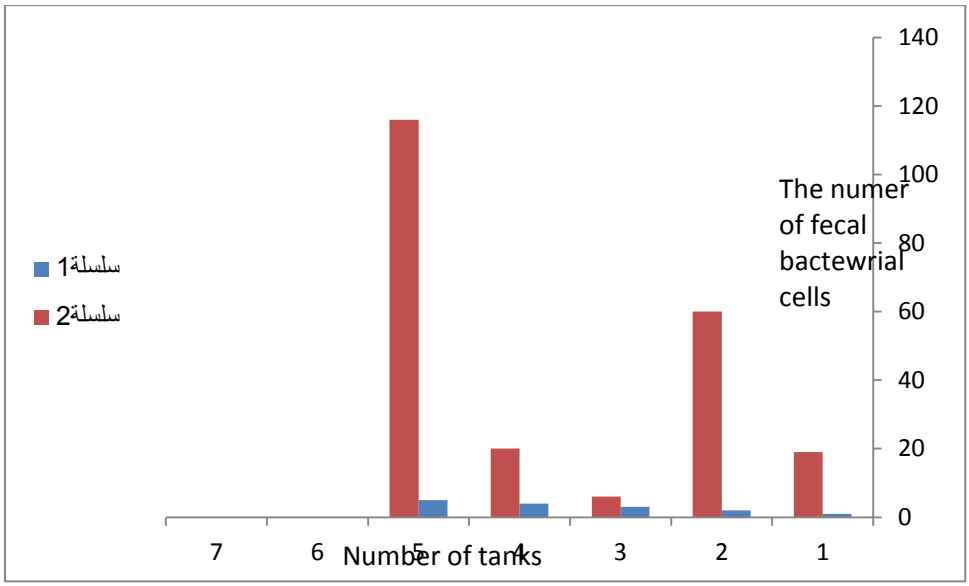

Fig. (4) Number of fecal coliform bacteria cells in concrete surface samples

Results obtained from the experiment (treatment and disinfection unit):

Through the previous analyzes to survey the tanks and reservoirs of the study area, the results were revealed. All samples are contaminated and need to be treated, and therefore an experiment was proposed and designed to treat the contaminated water.

Treatment and disinfection of rainwater from total coliform bacteria:

Treating rainwater contaminated with coliform bacteria in neutral medium:

The results obtained in samples of rainwater contaminated with total coliform bacteria in a neutral medium of PH 7.3 and a temperature of 25 degrees Celsius before operating the treatment and disinfection unit showed the presence of contamination. It was 133 cells / 100 ml and when operating the treatment and disinfection unit and raising the temperature to 55 degrees Celsius and at the same time. The degree of reaction. PH7.3, and by detecting contamination with total coliform bacteria after treatment, we notice a decrease in the degree of contamination of 79 cells / 100 ml. With the continued increase in the temperature in the treatment and disinfection unit, to 65.70.75. ° C, respectively, and at the same degree of reaction mentioned above, and by detecting contamination with total colonic bacteria, we noticed that there is no contamination, as the temperature of 65 ° C is considered suitable for elimination and final disposal of total coliform bacteria in the water.

Likewise, in the acidic environment when it was (PH4) and when the water temperature was raised to (75, 70, 55.65 degrees Celsius) it was noticed that there was no contamination with total coliform bacteria in the water and returned (4) the reason to the absence of a wall or a solid shell that protects the bacteria cells From the effect of acids and disinfectants, in the same way and when changing the degree of reaction to alkaline (PH10), we noticed a decrease in the number of Total coliform bacteria decrease inversely with temperature, and the temperature of 65 ° C is considered the ideal temperature for elimination of this type of bacteria in the water.

As for the treatment of rainwater from fecal coliform bacteria, it did not differ much from the previous treatments and results, except for the acidic medium in which this type of bacteria was absent by adding drops of nitric acid, which turned the medium into acidic, and the optimum temperature for treating this type of bacteria was 65 degrees. Celsius is sufficient to eliminate it permanently.

Table (3) Number of total and fecal coliform bacteria cells in the samples without changing in the media

Sample No.	Temperature C°	PH	Coliform bacteria		Fecal coliform bac.	
			Cfu/100ml	Sample case	Cfu/ 100ml	Sample case
1	25	7.3	133	Contaminated	91	Contaminated
2	55	7.3	79	Contaminated	37	Contaminated
3	65	7.3	0	Unpolluted	0	Unpolluted
4	70	7.3	0	Unpolluted	0	Unpolluted
5	75	7.3	0	Unpolluted	0	Unpolluted

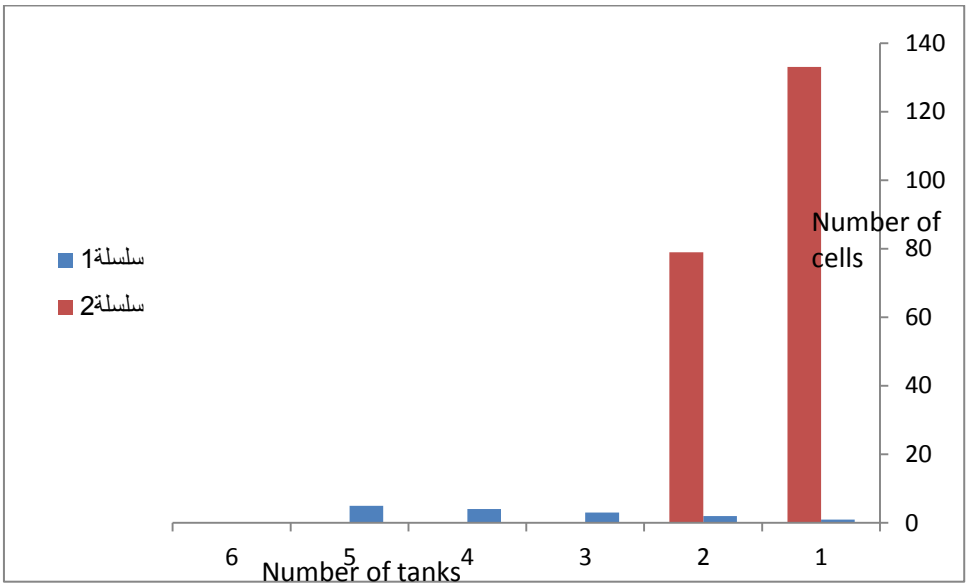

Fig. (5) The number of total coliform bacteria cells in the samples without change in the media

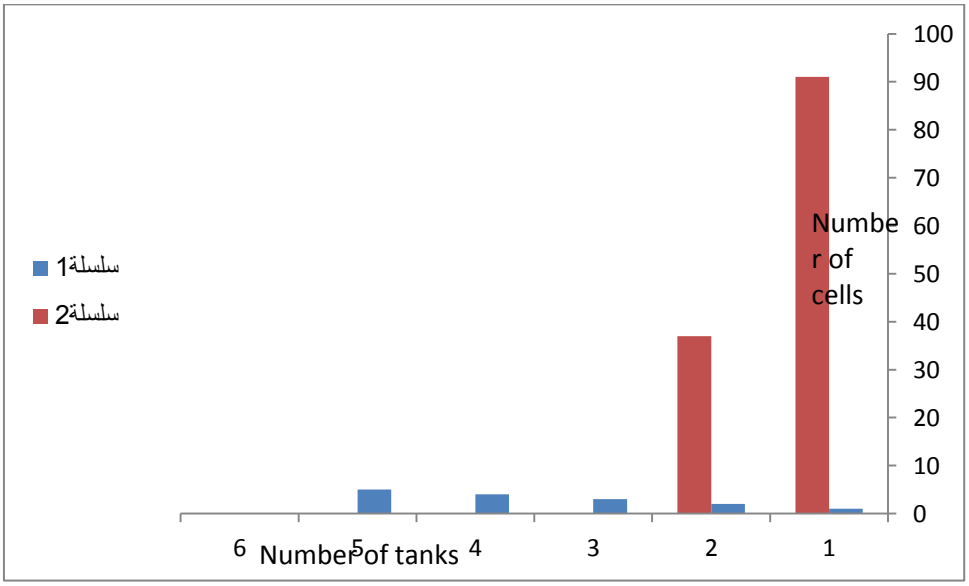

Figure (6) Number of fecal coliform bacteria cells without medium change.

Table (4) Number of total and fecal coliform bacteria cells in rainwater samples heat treated in an acidic medium

Sample No.	Temperature C°	PH	Coliform bact.		Fecal coliform bact.	
			Cfu/100ml	Sample case	Cfu/100ml	Sample case
1	25	4	0	Unpolluted	0	Unpolluted
2	55	4	0	Unpolluted	0	Unpolluted
3	65	4	0	Unpolluted	0	Unpolluted
4	70	4	0	Unpolluted	0	Unpolluted
5	75	4	0	Unpolluted	0	Unpolluted

Table (5) Number of total and fecal coliform bacteria cells in rainwater samples collected in alkaline medium after heat treatment

Sample No.	Temperature C°	PH	Coliform bact.		Fecal coliform bact.	
			Cfu/100ml	Sample case	Cfu/100ml	Sample case
1	25	10	23	polluted	10	Polluted
2	55	10	15	polluted	6	Polluted
3	65	10	0	unpolluted	0	Unpolluted
4	70	10	0	Unpolluted	0	Unpolluted
5	75	10	09	Unpolluted	0	Unpolluted

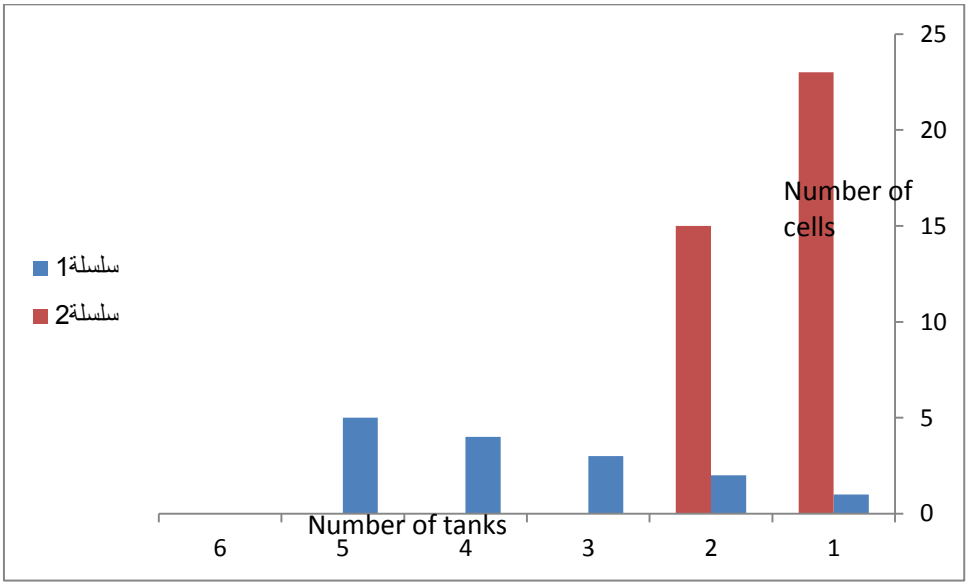

Fig. (7) Number of total coliform bacteria cells in rainwater samples in alkaline medium.

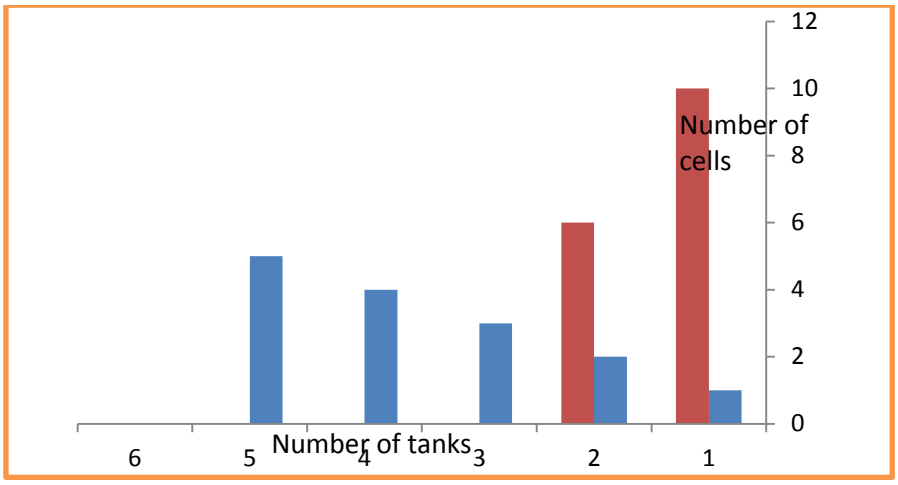

Fig. (8) The number of fecal coliform bacteria cells in an alkaline medium

Summary

We conclude from this study that the bacteria present in their various types, especially fecal and kidney bacteria can be resisted and eliminated using heat under any circumstance and in any existing medium with a warning to harvest rainwater from concrete surfaces because it is less contaminated than others

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الملخص

هذه الدراسة تشتغل على نوعية مياه الامطار المجمعة في الخزانات الارضية في منطقة الرياينة بالجبل الغربي ، حيث تم فيها تحديد بعض الخواص الفيزيائية والكيميائية لهذه المياه مثل درجة الحرارة ودرجة التفاعل والتوصيل الكهربي والعكارة والاملاح الذائبة الكلية وغيرها، بالاضافة الى الخواص البيولوجية مثل بكتريا القولون الكلية والغائطية .

تم في هذه الدراسة تحديد عدد 20 صهريج منها 5 صهاريج ذات اسطح تجميع خرسانية ،15 صهريج ذات اسطح تجميع ترابية.

وعند بداية العمل تم قياس بعض هذه الخواص فكانت في الخزانات ذات الاسطح الترابية كالاتي :

PH=7.59 , Ec=392µs/cm, TDS=253.8mg/l, Turbidity=17.37 unit , Oxygen dissolved=10mg/l بينما كانت في الخزانات ذات الاسطح الخرسانية كالاتي:

PH=7.59, Ec=358.6µs/cm, TDs=249mg/l ,Turbidity=1.58 unit,Oxygen dissolved=10mg/l.

بالنسبة لمعالجة مياه الامطار الملوثة ببكتريا القولون الكلية فقد تبين ان درجة الحرارة 65 درجة مئوية اعطت نتائج جيدة عند مختلف الاوساط (المتعادل ،الحامضي ، القلوي) ، اما بالنسبة لبكتريا القولون الغائطية فهي لا تختلف كثيرا عن بكتريا القولون الكلية الا عند اضافة قطرات من حمض النيتريك فقد انعدم وجود هذا النوع من البكتريا وان درجة الحرارة المثلى للقضاء عليها هي 60 درجة مئوية .