Study of some microbial and chemical properties of drinking water in shaqlawa district.

A Research Project

Submitted to the Council of the College of Education-Shaqlawa, Salahaddin University – Erbil in Partial Fulfillment of the Requirements for the Degree of Bachelor in Biology

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بِسْمِ اللَّهِ الرحمن الرَّحِيمِ

﴿ أَفَرَأَيْتُمُ الْمَاءَ الَّذِي تَشْرَبُونَ (68) أَأَنْتُمْ أَنْزَلْتُمُوهُ مِنَ الْمُزْنِ أَمْ نَحْنُ الْمُنْزِلُونَ (69) لَوْ نَشَاءُ جَعَلْنَاهُ أُجَاجًا فَلَوْلَا تَشْكُرُونَ (70) ﴾

صدق الله العظيم

سورة الواقعة(٦٨–٧٠)

CERTIFICATE

This research project has been written under my supervision and has been submitted for the award of the BSc. degree in Biology with my approval as a supervisor.

Signature
Lecturer: Hassan Mahdi Al-fayadh
Date: 8 /4/2023

DEDICATION

This piece of research is dedicated to Department of biology , Shaqlawa College of Education , Salahaddin university – Erbil ,in partial fulfillment of the requirement for the award of bachelor of biology.

Rabar Muhammad **Saya jalal omer**

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ABSTRACT

Random samples were collected from drinking water for 8 locations in Shaqlawa district. Some chemical and microbial properties were examined as the samples contained 136–232 ppm, 203–362.5 S/cm, and 7.8–8.3 for each TDS, Ec, and pH respectively. As for the microbial content, the samples contained 28 cfu/mL. Fortunately, all samples were free of coliform bacteria, and all samples were in conformity with the international WHO and Iraqi standards.

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LIST OF ABBREVIATIONS

- pH=potential of hydrogen.
- TDSW=Trump Derangement Syndrome water.
- EC=Electrical conductivity.
- T=Temperature.
- NA=nutrient agar.
- MA=Macconkey agar.
- WHO = World Health Organization.
- CFU = colony forming unit.
- microsiemens/centimeter = µS/cm.
- PPM = parts per million.

1. INTRODUCTION

All existing life forms on Earth depend on water, each human being needs to consume several liters of fresh water daily to sustain life. Over 97% of the world's water is seawater, which is unsuitable for drinking and for most agricultural purposes. Three quarters of the fresh water is trapped in glaciers and icecaps. Lakes and rivers are one of the main sources of drinking water, even though collectively they constitute less than 0.1% of the total water supply. Recently it was estimated that humanity currently consumes, mostly for agriculture, about one-fifth of the accessible runoff water destined for the sea; this fraction is predicted to rise to about three-quarters by 2025

Water is an essential requirement of human and industrial developments and it is the most delicate part of the environment. Water quality deals with the physical, chemical and biological characteristics in relation to all other hydrological properties. A continuous monitoring of water quality is very essential to determine the state of pollution in rivers (Rabee et al., 2011). Water is the most precious gift of nature, the most crucial for sustaining life and is required in almost for all human need or purposes use. However, water quality in many large rivers has deteriorated significantly worldwide due to anthropogenic activities in the past three decades (Chapman, 2021). Water Quality Monitoring data consists of routine measurements of physical, chemical and biological variables that are intended to give insight into aquatic environment. However, it does not give the overall picture on the water quality status. Further need to translate it into a form that is easily understood and effectively interpreted. In general, water quality indices incorporate data from multiple water quality parameters into a mathematical equation that rates the health of a stream with a single number. That number is placed on a relative scale that rates the water quality in categories. ranging from very bad to excellent (Reza and Singh, 2010). Most natural ecosystems are exposed to anthropogenic impacts, often resulting in severe habitat degradation. As both

the variety and magnitude of impacts have increased at an unprecedented pace, monitoring of biological communities and measuring of their biodiversity have become crucial aspects of conservation planning. Given that wholesale biodiversity assessment is impractical, the use of surrogate measures has attracted increased attention among conservation biologists (Kelly and Whitton, 1998). Rivers are the most important freshwater resource for human. Social, economic and political development has, in the past, been largely related to the availability and distribution of fresh waters contained in riverine systems.

Major river water uses can be summarized as follows: sources of drinking water supply, irrigation of agricultural lands, industrial and municipal water supplies, industrial and municipal waste disposal, navigation, fishing, boating and body-contact recreation, aesthetic value. Rivers can be characterised by particular communities of organisms which are dependent on certain conditions of discharge and the physical, chemical and structural effects that it has on the river bed and water quality. Changes in the structure or quality of the river resulting from anthropogenic activities often produce specific changes in the biological communities which, once identified, can be used to monitor changes in the river environment. Upstream use of water must only be undertaken in such a way that it does not affect water quantity, or water quality, for downstream users (Chapman, 2021). Algae are an important component of aquatic ecosystems like springs, streams, rivers, ponds, and lakes, because they reflect the health of their environment through their distribution, abundance, and productivity (Stevenson et al., 1996). Increasing anthropogenic influence in watersheds has led researchers to develop bio-monitoring schemes that can rapidly assess the status of aquatic systems (Kelly and Whitton, 1998).). Indices to assess environmental conditions have incorporated fish, macrophytes, invertebrates and algae (Wehr et al., 2015). The different types of benthic algae (epilithic, epiphytic and epipelic) play an important role as primary producers in running water, lake and shallow fresh water ecosystems. From

the algae, diatoms have been the primary focus of monitoring studies due to their rapid assemblage response to stress, existing knowledge of the narrow tolerance ranges for a large number of species (Round, 1991). On the other hand, Diatoms are suggested to be indicators of environmental conditions and can be used successfully in bio monitoring(Rimet et al., 2004).

Table 1. Standard quality of the TDS/pH/EC/Total bacterial count

Standard quality	Normal	Abnormal	Excellent
TDS ppm	100-300	Above1000	Less than 200
pH	6.5-8.5	<4 AND>9	7.5
EC µS/cm	269-638	>1875	469>
Total bacterial count cfu/ml	0-10	>10	0

The aims of the study are to.

1- Evaluating the water quality in shaqlawah

2- Investigate major pollutants in water shaqlawah

3- Study the quantitative Bacteriological community in water shaqlawah

2. METHODOLOGY AND RESEARCH DESIGN

Design of the study;

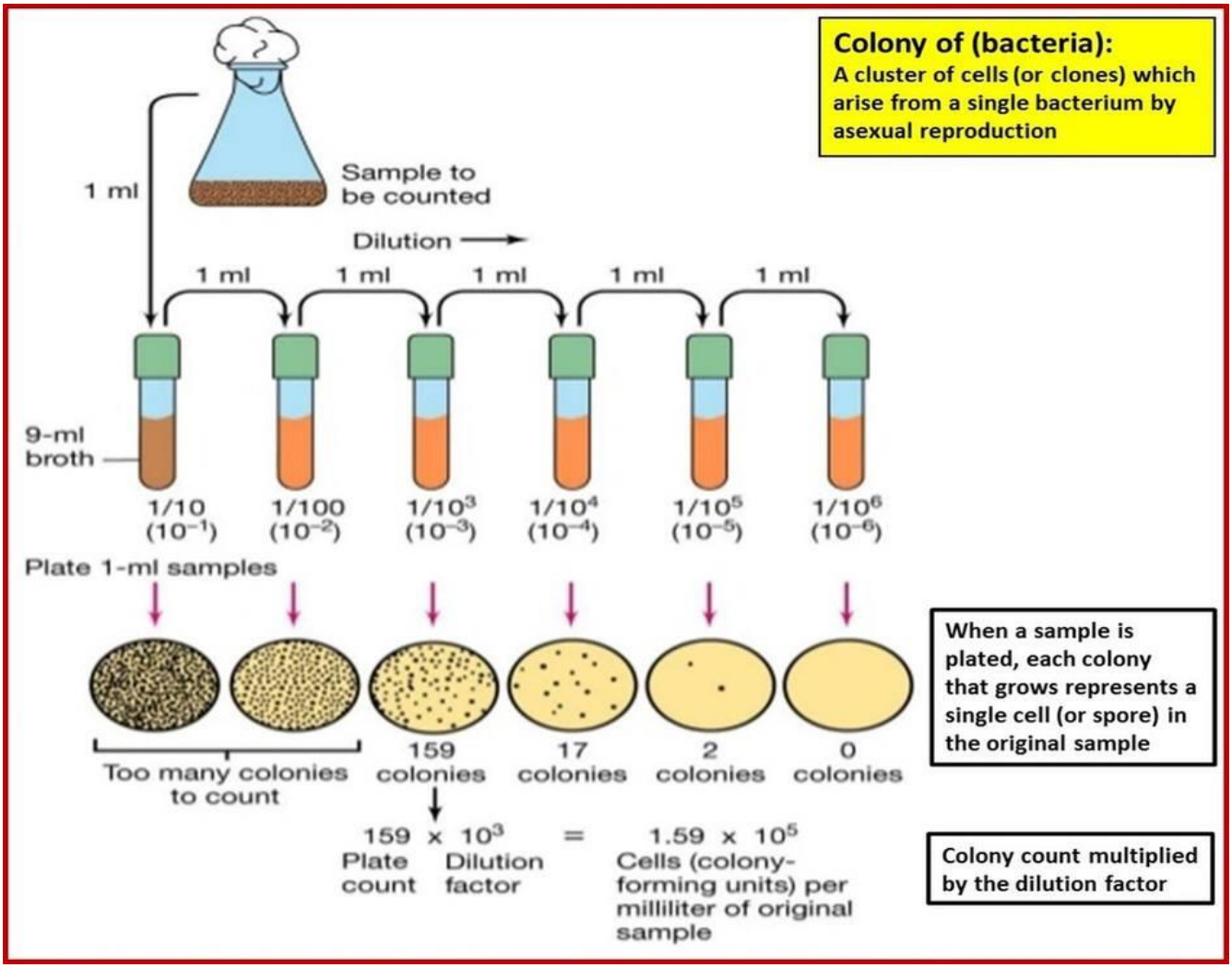

Figure 1. Showing the experimental design.

Drinking water samples were collected randomly from 8 sites and the total dissolved solids (TDS) were estimated by a TDS meter, the electrical conductivity (Ec) was calculated using the following law:

TDS = 0.64 * Ec

The pH was measured by a pH meter, and the microbial tests were carried out using the following method plates poured with Nutrient Agar and MacConkey Agar medium, all assays based on (APHA, 2017).

3. RESULTS

The results show in Table 2. that all samples were within the international (WHO) and Iraqi standard specifications (TDS = 100-1000 ppm, Ec = 1000 micro seminse, pH 6.5_8.5) The TDS value of the samples ranged between (136-232 ppm) and the electrical conductivity Ec (203-362.5µS/cm) and the pH ranged between (7.5-8.3).As for microbial contamination, all samples were within the international (WHO) and Iraqi standard specifications (the maximum total content of bacteria should not exceed 10 cells per 1 ml, and the drinking water should be free of coliform bacteria), as the content of all samples ranged from bacteria (2_8 cfu/ml), Likewise, all drinking water samples were free of coliform bacteria.

Table 2. Test of TDS/T°/pH/EC.

Sample	TDS (ppm)	Temperature C°	Ph	Ec (µS/cm)
داخیلی لێناس	172	16	8	268.75
داخیلی کۆسار	217	18.9	7.8	339
داخیلی هێمن	173	18	8	270
سەرمەیدان	173	18.4	8	270
گەرکی ئاشتی	232	21	7.5	362.5
گەڕەکی شەهیدان	224	18	7.6	350
گەڕەکی تەم تەم	162	18	7.7	253.125
ئاوی زانکۆ	136	5.8	8.3	203.125

Table3. Microbial tests

Sample	NA Cfu/1 ml	MA Cfu/1 ml
داخیلی لێناس	5	0
داخیلی کۆسار	8	0
داخیلی هێمن	4	0
سەرمەیدان	2	0
گەرکی ئاشتی	2	0
گەڕەکی شەهیدان	3	0
گەڕەکی تەم تەم	4	0
ئاوی زانکۆ	2	0

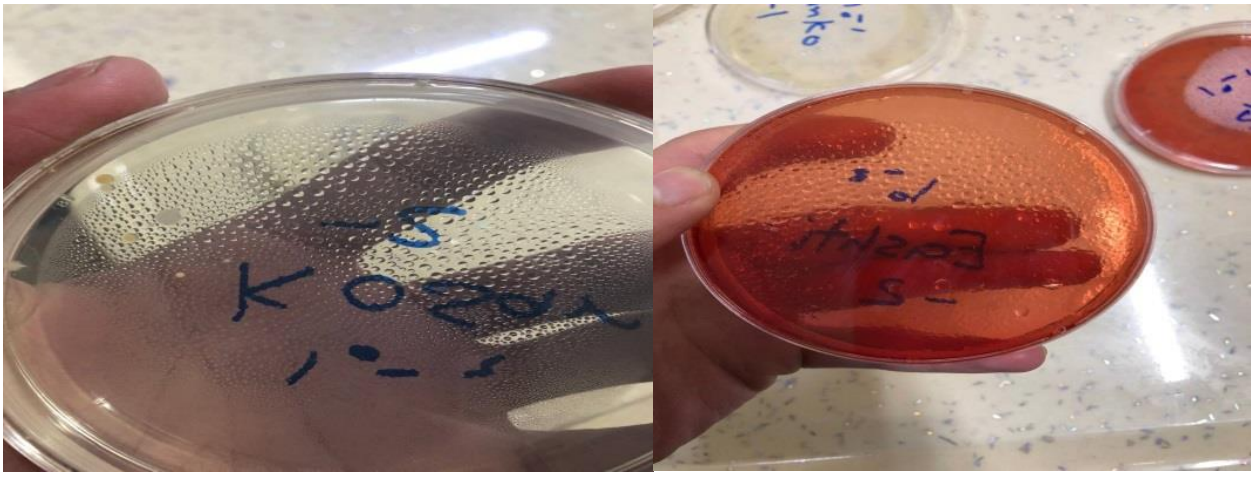

Figure 2. Shows the result of incubating samples in Petri dishes on nutrient and McConkey Agar medium

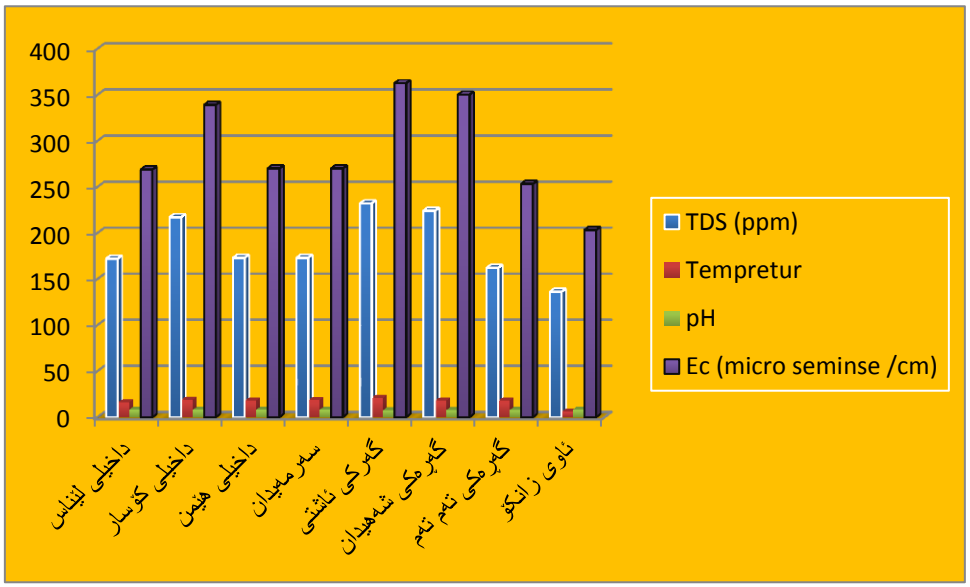

Figure 3. Shows some chemical properties of drinking water samples in Shaqlawa district

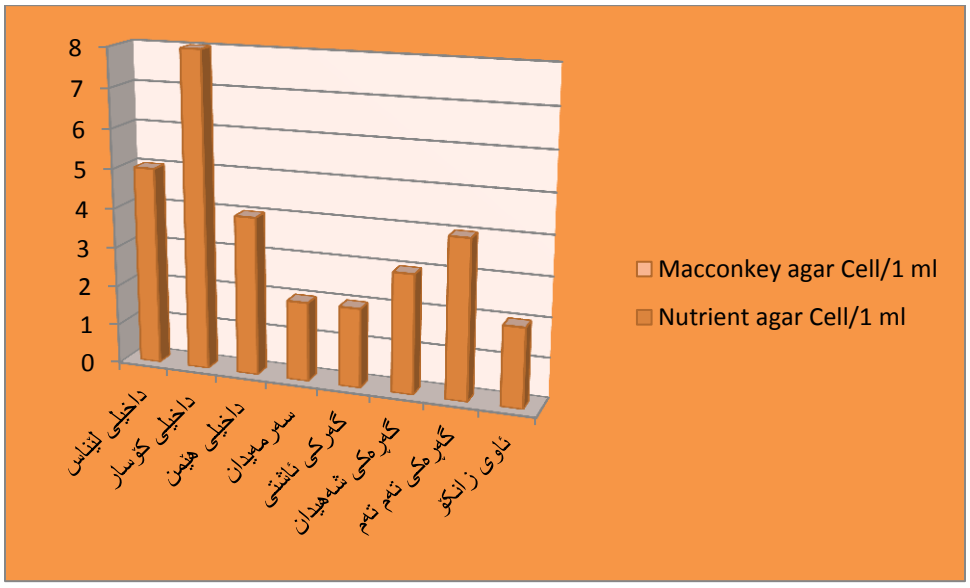

Figure 4. Shows some microbial characteristics of drinking water samples in Shaqlawa district

4. DISSCUSION

We note through the results of chemical and microbial analysis there is little contamination in the drinking water samples. This may be due to the occurrence of a break in the water transport pipes and its pollution in the sewage water, thus negatively affecting the quality of drinking water. Likewise, it is possible that there is a lack of chlorination efficiency in the Shaqlawa water project, or the low percentage of chlorine the remainder until it reaches the consumer. Therefore, we recommend increasing the efficiency of sterilization in the Shaqlawa water project and treating pipe cracks in their occurrence.

5. CONCLUSIONS AND RECOMMENDATIONS

We conclude that there is little contamination in the drinking water samples. This may be due to the occurrence of a break in the water transport pipes and its pollution in the sewage water, thus negatively affecting the quality of drinking water. Likewise, it is possible that there is a lack of chlorination efficiency in the Shaqlawa water project, or the low percentage of chlorine. The remainder until it reaches the consumer. Therefore, we recommend increasing the efficiency of sterilization in the Shaqlawa water project and treating pipe cracks in their occurrence. Although the standard specifications for drinking water in Shaqlawa are acceptable, pollution meters should be monitored periodically From Shaqlaud water sources and water transportation routes to the hands of users.

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پوختە

نمونەی هەڕەمەکی لە ئاوی خواردنەوە بۆ ٨ شوێن لە قەزای شەقڵاوە وەرگیرا. هەندێک تایبەتمەندی کیمیایی و میکرۆبی پشکنینیان بۆ کرا چونکە نمونەکان بە ڕێککەوت 136-23 ppm، 362.5-203 S/cm، و 7.8-8.3 بۆ هەر TDS، Ec، و pH یان تێدابوو. سەبارەت بە ناوەڕۆکی میکرۆبی، نمونەکان 28 cfu/mL یان تێدابوو. خۆشبەختانە هەموو نموونەکان دوور بوون لە بەکتریای کۆلیفۆرم و هەموو نمونەکان لەگەڵ ستانداردە نێودەوڵەتییەکانی ڕێکخراوی تەندروستی جیهانی و عێراقدا دەگونجێن.

ناونیشانی توێژینەوە

لێکۆڵینەوە لە چەند تایبەتمەندییەکی میکرۆبی و کیمیایی ئاوی خواردنەوە لە قەزای شەقڵاوە)

پرۆژەی دەرچوونە

پێشکەش بە بەشی بایۆلۆژی کراوە، وەک بەشێک لە پێداویستیەکانی بەدەستهێنانی بروانامەی بەکالۆریۆس لە زانستی بایۆلۆژی

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