



Evaluation of coliforms by MPN method as an indicator of water quality of Ain Ziana Lake.

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Keywords:

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ABSTRACT:

This study aimed to reveal the extent of bacterial contamination in the water of the Libyan Ain Ziana Lake, located northeast of the city of Benghazi. Water samples were collected from four areas in the lake. Fecal and environmental contamination was revealed by microbial investigation, which showed coliform bacteria to be present in all four water bodies. The results for bacteriological analysis showed that the average number of coliform bacteria / 100 ml was 183 75.93 and for number of fecal coliform bacteria/100 ml was 58.2524.07 and microbial number per colony forming unit in 1 ml was 1025 CFU/ 1ml so all the sample exceeds the acceptable limit.

تقييم القولونيات بطريقة MPN كمؤشر على جودة مياه بحيرة عين زيانة.

سعاد عبدالله صالح ادم

قسم علم الحيوان، كلية العلوم، جامعة بنغازي، بنغازي، ليبيا

الكلمات المفتاحية:

القولونيات الكلية
البكتيريا القولونية
القولونيات البرازية
العدد الأكثر احتمالا وحدة شكل
القولونيات

المخلص

هدفت هذه الدراسة إلى الكشف عن مدى التلوث البكتيري في مياه بحيرة عين زيانة الليبية الواقعة شمال شرق مدينة بنغازي. تم جمع عينات المياه من أربع مناطق في البحيرة. تم الكشف عن التلوث البرازي والبيئي من خلال الفحص الميكروبي، والذي أظهر وجود البكتيريا القولونية الكلية والبكتيريا القولونية البرازية في المناطق الأربعة. أظهرت نتائج التحليل البكتريولوجي أن متوسط عدد البكتيريا القولونية / 100 مل كان 183 بنسبة 75.93 و متوسط عدد البكتيريا القولونية البرازية / 100 مل كان 58.25 بنسبة 24.07 و كان عدد الميكروبات لكل وحدة تكوين مستعمرة في 1 مل 1025.

1. INTRODUCTION:

Water is an essential element in life, as it is a necessary element in the vital processes of animal organisms, such as digestion, absorption, and excretion, and an important element for the growth of plant organisms. Recently, environmental pollution has continued to increase due to human activities and consumption of natural resources and the subsequent changes in the surrounding environmental systems and human actions that lead to water pollution disturb the dynamic balance of aquatic ecosystems [1]. Disease-causing bacteria pose a serious threat to human life as well as to fish production. Pathogenic bacteria are considered as etiological agents of infectious diseases to human and marine animals [2], [3]. We know that there are two types of bacteria: Gram-positive bacteria and Gram-negative bacteria, but Gram-negative bacteria are the main disease-causing bacteria for humans as well as for fish. They are zoonotic in origin and can infect humans [4], [5].

The levels of *Escherichia coli.*, total coliform, and faecal coliform indicate the quality of water. Numerous different types of bacteria make up the coliform category as a whole. Faecal coliforms are specific types of total coliforms that are mainly detected in feces. *Escherichia coli.* is included in the subgroup known as fecal coliform. *Escherichia coli.* O157:H7 is a particular strain of the bacteria that has been responsible for the majority of outbreaks [6]. Total coliform suggests environmental contamination, while fecal coliform frequently implies recent fecal contamination in a water sample. [7]. Due to increased consumption from ever-increasing population and industrial activity, water bodies - valuable natural resources - are becoming more scarce and polluted. This underscores the urgent need for water management, the first step in which is to check water quality. Due to different environmental conditions.

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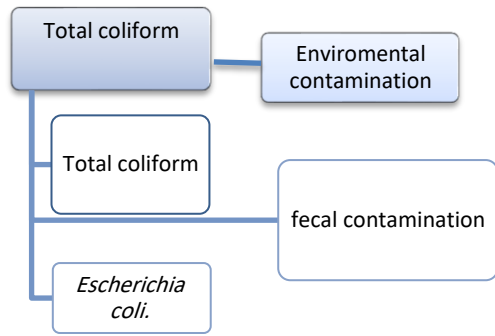


Fig. 1: A diagram showing environmental contamination and fecal contamination resulting from bacteria.

2. STUDY AREA:

The study was conducted on one of the natural lakes in the city of Benghazi, which is Lake Ain Ziana, located 15 km north-east of the city of Benghazi. Lying between latitude 32°12'59"NNorth and longitude 20°09'09"E. 32°12'52"N 20°09'10"E. It is a natural lake connected to the sea by A water channel.

This lake has a high biological diversity, as it contains more than 14 different types of marine plants, many of which are medicinal, and flamingos also feed on its fish. In addition, the lake is teeming with aquatic life, with fourteen different species of fish belonging to eight families, the most common of which are *Cichlid zilli* and *Gambusia affinis*. With seven species accounting for half of the lake's fish, the *Mogilidae* is the most abundant species family[8].

Samples were collected from four sites around the lake, represented by its four sides: north, south, east and west, as follows:

site A: It is the southern side of the lake, or what is locally called (Al-Qadr).

site B: This is the eastern side of the lake.

site C: It is the northern side of the lake, or what is called locally (Al-Khurma).

site D: This is the western side of the lake.

3. MATERIALS AND METHODS:

Water samples were taken in opaque, pre-sterilized bottles with a minimum capacity of 200 ml from each of the four regions.

The bottles were opened, their mouths facing the current, and the samples were taken to the microbiology lab where ice cubes were used to encircle the bottles in order to inhibit the growth of microorganisms.

MPN is the method that applied to estimates the average number of bacteria in a sample [9] using probability tables developed according to the Assumption of a Poisson distribution.

This test is carried out in three stages: (presumptive examination, confirmatory examination, and supplementary examination), as in Table (1).

Table 1: illustrates the stages of the MPN method.

Purpose	Test
Identify the types of gram-negative bacteria that are able to ferment lactose.	Presumptive test
By detecting the presence of both acid and gas simultaneously as a result of the bacteria's growth and their fermentation of lactose sugar, it is confirmed that the type of bacteria that appeared in the previous test is the type of bacteria that needs to be detected (the two groups of total coliform bacteria, fecal coliform, and <i>Escherichia coli</i>).	Confirmed test
Isolation and confirmation of the morphological and taxonomic traits of the bacteria that grew in the previous test.	Complete test

Table 2: showing results of MPN test

Microbial number per colony forming unit in 1 ml	Most Probable Number (MPN) of fecal coliform bacteria/100 ml	Most Probable Number (MPN) of coliform bacteria / 100 ml	Sample source
100	3	11	site A
500	10	21	site B
500	70	240	site C
3000	150	460	site D
100-0	0.05>	0.05>	The permissible limit according to Libyan specifications

Table 3: showing the values of the number of bacteria, the average, and the percentage difference between them.

3	11	site A
10	21	site B
70	240	site C
150	460	site D
58.25	183	An average
24.07	75.93	The Ratio

4. RESULTS AND DISCUSSION:

The results were analysed based on the Libyan Standards Guide issued by the National Centre for Standardization and Criteria for Drinking Water – 2013[10] and were also compared with the World Health Organization guide for protecting swimmers' health and the safe use and disposal of wastewater [11]. Every water sample surpassed the allowable level, according to the microbiological analysis. Table 2 and 3

The bacteria found in feces are pathogenic and non-pathogenic, in contrast to total coliform bacteria, which are generally healthy. They are therefore a sign that sewage has contaminated the water when found in water samples [12], [13]

.Microbial analysis suggested the presence of coliform bacteria in all four water samples indicating fecal contamination. Through these results it found area D was the most polluted with bacteria, followed by Area C. It was observed in these areas, especially Area D, it was crowded with garbage that contained human and animal remains and waste, and all the waste and waste resulting from human activities. Also, discovered that plastic shopping bag leachate was more bioavailable and had a different chemical makeup than natural organic materials [14].

5. CONCLUSION:

Through the results of this study conducted on Lake Ain Ziana, it was found that there was contamination with total coliforms and fecal coliforms. The percentage of environmental pollution was higher than the fecal contamination, and it was determined that the total number was higher than the recommended limit. Therefore, Lake Ain Ziana is considered microbiologically unsafe.

6. Recommendations:

- 1- Preserving the environment and marine life requires reducing pollutants in lakes or seawater to a permissible level.
- 2- Raising public awareness is essential to maintaining the integrity of the lake and the safety of vacationers.
- 3- Decision-makers in the city of Benghazi, including the mayor of the municipality, the Environmental Protection Agency, the Lakes Development Authority, and others, must pay attention to the lake's suffering from the accumulation of garbage around it, as this was one of the most important reasons for its contamination with bacteria.

7. ABBREVIATION:

8. MPN:Most Probable Number

CFU:colony forming unit

E. coli:*Escherichia coli*.

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