

ANALYTICAL STUDY TO ASSESS WATER QUALITY AND ALGAL GROWTH IN THE OPEN WATER RESERVOIR AT AJDABIYA

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ABSTRACT

Due to the important role played by the Manmade River's water system supply of the city of Benghazi and standards for drinking water, comes this study to identify water quality and assess the current status of the system as well as determine the presence of colonies of blue-green algae in the tank Ajdabiya. This study also discusses the growth of the Fish in the Ajdabiya tank system and its impact on the quality of the water. This study also brings into awareness the main connecting lines that link Ajdabiya tank in the western and eastern directions, where they have been linked directly by 4 meters in diameter pipes, causing transmission of life (fish and organic impurities) into these lines.

The results obtained from the analysis of water samples taken from Ajdabiya tank showed the presence of small colonies of blue-green algae in the tank. These algae are toxic, which produce toxic substances affect water quality. This study points out the need to control the growth of these algae continuously to avoid any serious pollution problems in future.

Due to the presence of fish in the water main line between the open water reservoir *at* Ajdabiya and the city of Benghazi (eastward), as well as the line connecting the open water reservoir *at* Ajdabiya and the city of Sirte (westward) noted the lack of food and light for fish inside the lines causing the death of the fish, and decomposition of their bodies inside the lines. It has been providing it was suggested in this study a screening system to be installed in the beginning of each branch that will be full address this problem in both branches, west and east, to reduce the organic material within this line resulting from the death of the fish, rot and decay in water and oxidation by chlorine used in the disinfection of the water.

INTRODUCTION

Water is a transparent liquid compound that is colorless, tasteless, and odorless; any physical or chemical change in water quality, either directly or indirectly, indicates water pollution, and adversely affect the organisms or makes the water unfit for its requested use. The affects of water pollution causes a significant impact in the lives of individuals, families and societies. Water is vital to humans and other living organisms. Contaminated water contains foreign materials when compared to its natural constituents, it may be solid or dissolved, organic material or inorganic dissolved, and finally it may be materials as minute as bacteria or algae or parasites; all lead to change in water's physical or chemical properties, making water unsuitable for drinking or household consumption as well as agriculture and industrial use.

WATER TREATMENT

The conversion of raw water that has been obtained from surface or ground water resources to safe drinking water (for domestic use) is called Water Treatment. This treated water should be free from any micro-organisms that cause epidemic diseases, free from any toxic substances such as heavy metals that cause chronic diseases, and finally free from any other substances that need to be removed (turbidity) or at least reduce their focus to a large degree.

There are different types of water treatment plants, but mostly the following:

- Sedimentation initial.
- Flocculation and sedimentation.
- Nomination (Filter).
- Remove hardship.
- Ventilation
- cleansing

WATER QUALITY

Determined in accordance with the standard specifications for drinking water and must be free of:

- Turbidity.
- Bacteria.
- Taste and smell.
- dissolved substances.
- Corrosive water that react quickly.

THE OBJECTIVE OF THIS STUDY

This research aims to study the situation of water reservoir at the main water source in the city of Aljadabya. This reservoir is considered to be the main distributor of the Man Made River in that region which receives water that is pumped from the groundwater fields of Alkofra and Alsarer. Usually the amount water pumped to the reservoir is up to 4 million cubic meters per day which is then distributed to the Benghazi area and the western region of Libya.

The importance of the Aljadabya water reservoir is that it's the main reservoir that directly supplies each feeding hole on the line of path when carrying water from Ajdabiya to the area Sellouk and Benghazi, thus the impact of water quality of the reservoir will have a direct impact on the quality of drinking water in the city of Benghazi and most of the villages surrounding the city.

This paper aims to shed light on the factors affecting the quality of the water in this reservoir. Amongst these factors is the study of the growth algae in the tank Aljadabya which is generally harmful but in some cases beneficial. This paper attempts to determine the presence of harmful species that may or may not be in this reservoir and also propose practical solutions to the possibility of addressing this problem. As well as the aim of this study is to make sure the biological status of the transferred water from the Aljadabya tank to city of Benghazi in a natural way and assess of water quality.

ALGAE

Is a group of organisms that self-feed by the process of photosynthesis. Algae may live in fresh water, seas and oceans, they are of different sizes and colors. The majority of marine algae is macro algae, which is divided into three main groups: green algae, brown algae and red algae. These groups are divided in such a way because of the algae's dye in each group, and its characteristic color. Marine algae's oxygen output due to the process of algae's photosynthesis represents about 9% of the total oxygen in the air of our atmosphere (Saadi, 2006).

BLUE-GREEN ALGAE

These organisms are minute and can be seen under the microscope in the form of individual cells or groups of cells called colonies or in the form of filaments (Trichomes). Some of these gatherings may be so large that they can see with the naked eye. These are known as algae also as Cyanophytes, the phenomena that is known in some of these types of algae has receptacles containing gas in the cells, allowing it to float on the water surface or dive down to the bottom in response to changes in light or facilitate food. Some types have the ability to produce toxins and this can not only be measured by the naked eye but laboratory test can determine their ability to poisoning.

Reasons for treatment of drinking water from algae:

The growth of algae in the water may cause the following problems:

- Close filters
- cause problems with taste and smell
- Drinking water containing these algae causes effects on human and animal health maybe even fatal diseases.

Clarification of the study area and the practical application:

Libya's Made River Project has three phases: the first phase contains two of the pipe systems where they first extend from Tazrbu to Sellouk and then secondly extend from the Alsarir to Sirte.

Figure 1 shows a sketch of water network system of the three phases of the Man Made River.

Figure 2 is a photocopy of the Aljadabya open tank (uncovered), its internal circular diameter is 923.2 meters and has a height of 9 meters. The tank has a capacity of approximately four million cubic meters of water. To prevent leakage the inner surface of the reservoir membrane has a packed sealant that is compressed between two layers is one of the fine sand and other is gravel.

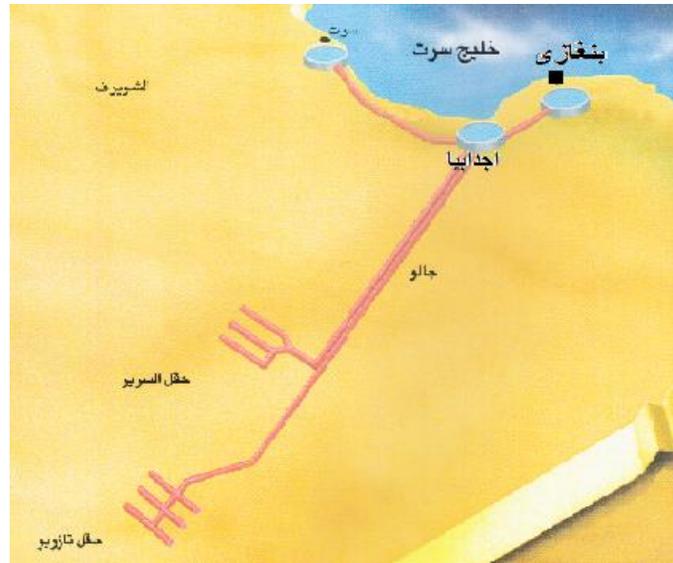


Figure 1. Illustrates the water system feeding (that's coming from The Man Made River) the industrial areas of Benghazi and Sirte. The Aljadabya tank distributes water coming from the sources of production which is from Alkofra and Alsarir feilds.



Figure 2. Shows a satellite image of the Aljadabya open water tank (Coordinates 30°34'44"N 20°20'58"E)

The water consumption of the two systems related to Benghazi east-ward and Sirte west-ward east is shown in Figure 1. Due to the design of hydraulics chosen when designing this reservoir and its circular, which did not take into account to overcome the problem stagnation areas in reservoir because the tank is open and not covered; all these problems contribute to the increase in the potential for contamination of the tank. This was main reason why this study was conducted: to highlight this problem and provide technical solutions to the possibility of address this issue.



Figure 3. Shows the entrance of the reservoir system

A visit to the site of the tank and image the reservoir shown in Figure 2 both show that the water will move from the point of entry to the exit slot via the shortest paths and thus causing a point of recession at both sides of the circular tank which increases the expected growth of algae at these stagnated areas. Samples were taken to determine type of existing species of algal growth in those areas of the reservoir and at different points to see and knowledge growth algal those areas have been sampling. Samples were taken from Aljadabya tank from four points at the entrance (A) and director (B) and parties (C) and (D) were examined these samples in the Faculty of Science, Department of Botany, University of Benghazi. The results showed the presence of several types of algae as indicated in schedules following:

Table 1. shows the types of algae located at the entrance point (A)

CYANOPHYTA	CHLOROPHYTA	DIATOMS
Phormedim	Cosmarium	Synedra
Oscillatoria	-	-
Microcystis	-	-
Gloeocapsa	-	-

Table 2. Shows the types of algae located at the exit point (B)

CYANOPHYTA	CHLOROPHYTA	DIATOMS
Microcystis	-	Synedra
Gleocapsa	-	Navicula
Phormedim	-	-

Table 3. Shows the types of algae located at the right end (C)

CYANOPHYTA	CHLOROPHYTA	DIATOMS
Gleocapsa	Cosmarium	Synedra
Phormedim	Ankistrodesmus	Navicula
Microcystis	-	-
Lyngbya	-	-
Scytonema	-	-

Table 4. Shows the types of algae located at the left end (D)

CYANOPHYTA	CHLOROPHYTA	DIATOMS
Phormedim	Cosmarium	Synedra
Microcystis	-	Navicula
Lyngbya	-	-
Gleocapsa	-	-

The laboratory results showed that algae found by few in terms of quantity. This study explains as shown in tables 1,2,3,4 the presence algae type CYANOPHYTA and small quantities of toxic algae that affect human and animal health and know as algae blue-green bacteria, blue because they are closely related to the bacteria, but much larger than bacteria and its process of photosynthesis which consists of a string of cells or several leads or colonies, and if the water like pea soup with a color of light blue and have odor like the smell of green grass cut, it indicates the presence of blue algae as they contain a pigment give their distinctive color is bluish green and also known as (CYANOPHYTA) and there are strains of toxic and non-toxic (Saadi, 2006).

As Table 3.4 explains algae type *Lyngbya* which is known that this algae blooms and presence of nutrition (NH₃) in warm alkaline water and this algae produces toxin (APLYSIA) and is known as Dibromo nerve toxin which causes:

1. Dermatitis with the blisters and the symptoms will start to show within 12 hours of exposure to this poison.
2. Acute inflammation of the mouth and digestive tract.
3. Rash.

Lyngbya alga usually floats on the surface of the reservoir in the form of aquatic weeds and persists for several years.

Tables 1,2,3,4 illustrates algae type *Microcystis* is single-cell created naturally in water and thrives in shades under certain circumstances. *Microcystis* produces multiple toxins such as liver toxin which causes damage to the liver and cause ingestion of algae cells in the water (which causes skin irritation, skin rashes, sores in the mouth, breathing problems, and upset stomach) and inhalation of water spray containing algae dense (which causes thrown, nausea, headaches, liver damage, runny eyes and nose, coughing, sore throat, and chest pain) thus the World Health Organization set up a standard amount of *Microcystis* is (0.0015 mg / l).

Table 1 illustrates the algae type *Scillatoria* which is bluish-green or brown in colour and in the form of small tufts while floating in stagnant water or maybe attached to plants and stones, some of them may also grow on the wet ground.

Table 3 also shows the presence algae type *Scytonema* and there in the form of yarn floating on the surface or attached on plants or on the surface of the soil and rocks and wet wood in the aquatic environment where there are floating on the surface or attached to aquatic plants.

RESULTS AND DISCUSSION

From the results obtained from the analysis of samples taken from the Aljadabya tank that observed the presence of algae, these algae are in small quantities and so far there is no fear for the health of individuals which has always been present in small quantities, but must be maintained and also monitor the growth of the algae on an ongoing basis so it won't become hazardous to the general population.

It was also noted that there are algae stuck on the wall of the two openings are present in abundance so we suggest coverage of the access area to prevent the passage of sunlight because sunlight helps in the growth of algae through the process of photosynthesis.

This study demonstrated the presence of algae (CYANOPHYTA), and where the water in libya is treated using chlorine because it has several beneficial , the most important: price, its lifespan in the water, antiseptic properties, and high solubility in water; also stops and kills the interactions of vital activities of bacteria. The main problem with chlorine is that it kills algae, but could not eliminate the toxins in the water resulting from this type of algae, also *Microcystis* located at the entrance of the city of Benghazi which is eradicated by the chlorine however chlorine cannot eliminate the material toxic that is dissolved in water, so you must take into account the growth of algae in the tank of Aljadabya because it is considered to be the main source of drinking water for several cities and villages.

As noted type of tilapia fish breeding in the tank, as well as at the entrance and exit, one of the fish that feed on algae in the tank, so these fish have an important role in maintaining the ecological balance of the reservoir.

The presence of algae was noted on the surface of the water in the dead points of tank because there is no circulation that prevent stagnation of water on the surface.

It was also found through this study that the connection between the Aljadabya tank and the pumping station for the city of Benghazi (Sellouk / Talhah) that there was a lack of refineries at the beginning of this line and before the forest, thus a design principle has been proposed for these refineries and the emphasis on implementation to reduce bacterial pollution within the line resulting from the death of fish. The rot and decay inside water transmission lines, and a few negative results expected to occur result Union chlorine gas that is used in the disinfection of water with the dissolved of the organic matter in the water component of halogenated organic compounds (chlorinated), which is likely to be carcinogenic. (Khalil, 2004).

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