MICROBIOLOGICAL PROFILE OF BOTTLED WATER IN EGYPTIAN MARKET

By

AMIRA FATHY MOHAMED SAYD

B. Sc. Agric. Sci., (Reclamation Technology and Culture Desert Lands), Fac. Agric., Cairo Univ., 2008

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APPROVAL SHEET

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APPROVAL COMMITTEE

Dr. GAMAL ABD ELNASSER KAMEL SABER……..…
Researcher Professor of Soil and Water Quality, National Water Research Center

Dr. GALAL MAHMOUD EL SAYD KHALFALLAH……..
Professor of Agricultural Microbiology, Fac. Agric., Cairo University

Dr. MOHAMMED ZAKARIA SEDIK……...….
Professor of Agricultural Microbiology, Fac. Agric., University

Date: 17 / 8 / 2015

SUPERVISION SHEET

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SUPERVISION COMMITTEE

Dr. MOHAMMED ZAKARIA SEDIK
Professor of Agricultural Microbiology, Fac. Agric., Cairo University

Dr. OLFAT SAYD MOHMOUD BARAKAT
Professor of Agricultural Microbiology, Fac. Agric., Cairo University

Dr. AYMAN YOUSSIF IBRAHIM EWID
Asst. Researcher Professor of Microbiology, National Water Research Center

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DEDICATION

I dedicate this work to whom my heartfelt thanks; to my hearty children , to my husband, my sisters, my brothers for their patience, help and for all the support they lovely offered during my post graduation studies.

Name of Candidate: Amira Fathy Mohamed Said **Degree:** M. Sc.
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Dr. Olfat Said Mahmoud Barakat
Dr. Ayman Youssif Ewida
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ABSTRACT

Water is the most important resource for humans. Approximately 75% of the earth's surface is covered by water, but only 1% of that is drinkable. Twelve bottled water brands {9 domestic (A1, B2, A3, D4, H5, M6, N7, S8 and S9) and 3 imported (E10, H11 and Y12} were collected. Total bacterial count at 22^{o}C and 35^{o}C for all the tested brands of bottled water are laying under the limits of the Egyptian law. The tested brands of bottled water were almost free from indicator bacteria (coliform and fecal coliform) and some other pathogenic bacteria. Unfortunately two brands (D4 and M6) were found to be contaminated with *Pseudomonas aeruginosea*, with counts of 285 and 400 CFU/ 100 ml respectively. Protozoa detected in five tested bottled water brands B2, A3, D4, N7 and S8. All samples were under the recommendable limits for physical characteristics, where the pH values ranged from 7.2 to 7.92 and the TDS values ranged from 137 to 485 mg /l. The samples showed that local brands containing bacteria at the start time and slight elevation in total count of bacteria after 3 and 6 months, but the counts start to decline again at the 9th month and continued to decrease at the end of the year while the foreign brands are free of bacteria during the study. The unsuitable storing conditions (Sunny high from temperature) has a great threat on the bacterial counts recorded in the selected bottled water brands as it is highly increased during the study period.

Key words: Bottled water, pathogenic bacteria, fungi, protozoa.

CONTENTS

INTRODUCTION

Water is the most important resource for humans. It is an essential element to life on the earth. Everyone needs water to survive, especially when up to 60% of the human body is composed of it. Approximately 75% of the earth's surface is covered by water, but only 1% of that is drinkable (Soechtig, 2009). Therefore, clean drinking water is not as abundant as it may seem. With water as a limited available resource and not as plentiful in some regions as it is in others, it has recently become common for water to be bottled and sold.

Water forms 50% to 60% in weight of our bodies and play an active role in all their vital processes. It allows digestion, food elaboration and waste elimination. Every day we drink water or we eat watery food to replenish our metabolic reserve.

Also, water is a very important element for a person so every day must continuously and be sure to use clean water, Can we rely on drinking tap water or it is preferable to buy bottled water?, especially now in Egypt we suffer from water pollution in certain parts of our country and to maintain the health resort many decide to use bottled water instead of tap water. The purity, portability and the mineral content is important for consumption by humans. This behavior is ideal when the bottled is pure water, when water companies use good tracking measurements and specifications are for wells in terms of depths and areas where these wells and ongoing analysis of the quality of this water, especially the percentage of metals, especially heavy metals in the water?

The price of bottled water is extraordinarily higher than that of tap water, but in most cases, the water quality is very similar. There is even a chance that an expensive bottle of water is just purified municipal tap water.The increasing dependency on bottled water may not have happened had our governments neglected to preserve watersheds, monitor as well as update aging pipes and infrastructure. There happens to be skeptics of both bottle and tap, but either way, good quality drinking water is going to become harder and harder to find. Overall, (Huber, 2010) wanted to prove that, bottled water is not all it is made out to be, while noting that municipal systems also need to increase their standards to provide clean drinking water to all **.**

Water is an essential requirement of all life forms. Satisfactory supply of clean, safe and hygienic water is imperative for health. Drinking unsafe and unhygienic water can cause high prevalence of waterborne diseases like diarrhea, typhoid and cholera (Fawell and Nieuwenhuijsen, 2003 and Oyedeji *et al.*, 2010). As a preventive measure, consumption of bottled water has increased in recent years in developing countries and elsewhere. Sale of bottled water has gone to more than 35 billion US dollars (Raj, 2005) and by an average of 12% increase in all over the world (Abd El-Salam *et al.*, 2008). People from all over the world drink about $13x10^{10}$ liters of bottled water annually.

A comparison between the water composition and the maximum contaminant levels imposed by the Egyptian standards and several other international guidelines for all parameters was reported and discussed. They varied in composition among the brands and from lot to lot for a particular brand.

Therefore, the aim of this study is studying the effect of storing conditions on the microbial community of each bottled water brand collected from Egyptian markets.

REVIEW OF LITERATURE

Water is an essential element to life on planet earth. Everyone needs water to survive, especially when up to 60% of the human body is composed of it (USGS, 2009). Approximately 75% of the earth's surface is covered by water, but only 1% of that is drinkable (Soechtig, 2009). Therefore clean drinking water is not as abundant as it may seem. With water as a limited available resource, and not as plentiful in some regions as it is in others, it has recently become common for water to be bottled and sold. Representative Dennis Kucinich (D) of Ohio claims that, water is a basic human right, it's necessary for survival of life. When you start modifying the necessities of life in such a way as to make it more difficult for people to gain access, you have the basis for serious political instability (Soechtig, 2009).

There are four main reasons why people buy bottled water: fear of their tap water, taste, style, and convenience (Gleick, 2010).

We no longer see water as a basic human right but as a product with an enlarged price sticker that we pick up in the store, rather than get from our kitchen sink, or water fountain. We no longer drink from public water fountains and having easy accessibility to bottled water has decreased their demand. The more we buy bottled water, the more we are convinced that, bottled water is not a luxury, but rather a necessity (Gleick, 2010). We have been persuaded by big businesses such as Nestlé, Coca-Cola and Pepsi to drink more bottled water. Our nation has been brainwashed to believe that paying a thousand times more for individual plastic bottles and not taking advantage of our readily available tap water is a rational idea (Gleick, 2010).

We all try to avoid the things that we fear. Some people fear that, the water that comes out of their tap will harm them. Fear of sickness and of invisible contamination is an effective tool (Gleick, 2010).

Due to the fear of tap water, many drink bottled water assuming it is the healthier option. “Some people have gone to drink bottled water literally because they are concerned about their water, and the problem is they are unaware of the fact that buying bottled water is not necessarily safe, that you end up being exposed to other chemical compounds. (Soechtig, 2009). The information label lists all the nutritional aspects that water lacks, but there are still lots of things in our water (Gleick, 2010).

On contrary, bottled water can actually lead to health concerns for those with a weak immune system, such as the elderly, infants, and cancer, transplant, and HIV/AIDS patients (NRDC, 1999).

Bottled water consumption has been steadily growing in the world for the past 30 years. It is the most dynamic sector of all the food and beverage industry. Consumption in the world increases by an average of 12% each year, in spite of its high price compared to tap water (Rosmann, 2005). Consumers may have various reasons for purchasing bottled drinking-water, such as taste, convenience, or fashion, but for many consumers, safety and potential health benefits are important considerations because they believe bottled water is safer than tap water. There are concerns about chlorine by-products, contaminants such as lead, nitrates, and microorganism's contamination in municipal water supplies. However, some microorganisms, which are normally of little or no public health