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INVESTIGATING THE QUALITY OF BOTTLED WATER IN SOME OF LIBYAN CITIES

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ABSTRACT

This study was conducted to assess the quality of bottled drinking water using in some middle and eastern regions of Libya, 13 samples were collected then analyses the most important physicochemical properties and compare the results .The specifications of Libyan bottled drinking water through the study of physicochemical properties pH, electrical conductivity, total dissolved salts, calcium , magnesium , sodium, total alkalinity , hardness, potassium , chloride . The results showed that the physicochemical properties of the studied samples were in conformity with the Libyan standard for bottled water No. 10, and it was noted that most of the values were below the minimum limits of the standard .

تقييم جودة المياه المعبأة المتداولة في بعض المدن الليبية

أجريت هذه الدراسة لتقييم جودة مياه الشرب المعبأة المتداولة في بعض المناطق الوسطى والشرقية من ليبيا، وتم جمع 13 عينة من شركات مختلفة، ثم تحليل أهم الخواص الفيزيائية والكيميائية ومقارنة النتائج مع مواصفات مياه الشرب المعبأة الليبية، من خلال دراسة الخواص الفيزيائية والكيميائية pH، التوصيل الكهربائي، الأملاح الذائبة الكلية، الكالسيوم، المغنيسيوم، الصوديوم، القلوية الكلية، والبوتاسيوم، والكلوريد، وأظهرت النتائج أن الخواص الفيزيائية والكيميائية للعينات المدروسة كانت ضمن الحدود الموصى بها في المواصفة الليبية للمياه المعبأة رقم 10، ولوحظ أن معظم القيم كانت دون الحد الأدنى للمعايير.

INTRODUCTION

Drinking water should be clear from the effect of pathological factors and chemicals affecting the health and to be water within standard limits sometimes the crude water from source to consumption need many tages of treatment before.

In the current decade, an increase in water-packed water consumption is made according to the belief The prevailing is the high quality taste and its characteristics

are not changed over time compared to many drinking water sources used because they are reserved in the Packs of the Closure Court, which is a small pollution if we compared to the water pumped into public water supply process, which are vulnerable to pollution From the surrounding environment, whether it is tanks or long distance pipes contain nurse factors and diseases that cause many long-term health problems if they do not apply the standards for water quality. (zahed et al, 2012) (fadel., et al 2018) (ramadan et al 2108) (Abdullah et al., 2007)

Regular monitoring of the quality of bottled water is important for public health, particularly in areas where water is highly circulating, the drinking water should be tested monthly and should include a test of both the source and the bottled water. If the analyzes show that the water does not within drinking water standards, the test should be re-tested, a health survey should be carried out to determine the source of pollution and the action to be taken to remove the risks of submerged pollution. " (Abdullah *et al.*, 2007, from WHO 1984).

Bottled water consumption, bottled water consumption in the UK increased from 1415 to 2275 million liters between 2000 and 2006 and 2003 (Ward *et al.*, 2010), consumers in the UK spent £ 1 billion on bottled water (The drinking water industry has been widely prevalent in Libya, where the construction of water factories is increasing significantly compared to the field of food industries since the 1970s and this has been in the last 10 years .This increase in the number of factories was accompanied by a sharp decrease in quality and there is no monitoring to follow up their compliance with Libyan standards for bottled drinking water, which has led to the flooding of many brands in the local markets without taking into consideration their suitability for consumption." (Balga *et al.*, 2019). One of the problems facing consumers is that drinking water is bacteria contamination, and the only way to verify its presence or bacteria-free is by examining it in specialized laboratories and verifying its suitability for consumption, compared to the specifications for drinking water set by international organizations such as the World Health Organization and the Agency Environmental Protection (EPA) and country-specific specifications (Aether *et al.*, 2011).

There are several studies in several countries to assess the quality of bottled water consumed including the study (PIP, 2000) which estimated chloride, sulphate, nitrate-nitrogen, cadmium, total soluble solids TDS, lead, copper, and radioactivity on 40 local brands and imported water from Canada” The samples showed a significant difference in quality, and some exceeded Canadian water quality specifications for drinking water soluble solids, chloride and lead. Carbonate, ozone, and coating type were not related to differences in metal levels, carbonate and solids were high, and the product label had a mismatch with the values on it ". showed (Aether *et al.*, 2011) In addition to the discovery of the total coli and *E. coli* bacteria in bottled water sold in Uganda, it was found to be free of pollution, and (Zahid., *et al.* 2012) evaluated the characteristics of 23 locally made varieties and seven imported drinking water varieties in circulation in Riyadh, Saudi Arabia. The physical, chemical and microbe properties were measured and compared with the specifications of the

bottled drinking water of Saudi Arabia , the International Society for bottled drinking Water, and the American Food and Drug Administration, it was found that the water results of local and imported varieties were in conformity with the specifications except pH, fluoride and manganese, the results of the statistical analysis showed a rise in levels of sodium, fluoride, sulphate and nitrate in local varieties compared with imported items in the order of two to seven times. He explained that the values of most of the measures mentioned on the containers do not reflect the real content of the bottled water, as studied between 2008 and 2011 [1-3] the imported and local bottled water that is most repeatedly used in the country of Iraq by evaluating the characteristic, chemical and microbe characteristic. TDS, EC, calcium, lead and iron specifications, and chloride in some studied water samples. Showed (Mohamed. *et al.* 2020) results that the quality of bottled drinking water in Sudan was assessed for seven different companies, and that the quality of bottled water was 9.3% compliant with Sudanese and WHO standards.

Concludes of Studies [3-7] were to assess the quality of bottled water in Libyan and local markets in several cities between 2007 and 2021. The types of water studied (Fezzan, Tazirbu, Oasis, Zahra, Zlitan, Tiba, spring, Spring of Life, Table, Bidakh, Al-Fayha, Al-Diyafa, Al-Safi, Al-Safiyah, Al-Wahah, Seven Oasis, Akwa, Safari, Al-Waha, Al-Wazzir, Ruba, Amazon, Sama, Farwa, Mawihana, Al-Jawf, Asaria). The analysis of the physical properties and some of the heavy elements and chemical properties researchers compared the results obtained with the Libyan Specifications for Bottled Water (No. 2008) and the WHO Standard Specifications for Bottled Water. The researchers compared the results obtained with the Libyan Specifications for Bottled Water (2008) and the World Health Organization's Standard Specifications for Bottled Water (WHO). The researchers compared the results obtained with the Libyan Specifications for Bottled Water (No10.), the WHO standard that most of the actual results do not reflect the actual content of the bottled water therefore; some of them contained microbial contamination with fecal coli bacteria, which is an indicator of its unsuitability for human consumption. (Kamoka and Awn 2021) assessed some physical and chemical properties of five samples of the imported bottled drinking water circulated in the markets of Sabratha (Sabrine-Net-Genes-Kimia) made in Tunisia, (Abant) made in Turkey (Ieva water), (Italian water), including pH desalination EC, Total Robin TDS, No3, No2, chloride Cl and bicarbonate, HCO₃, the study results found that the characteristics studied of the five water types were close to the Libyan specifications for bottled drinking water in most of analyzes, except for dissolved solids TDS, which were found to be below the limits allowed in Eva and Bent water. Comparing the results obtained with the concentrations stated on

packaging, it was found that most of the results were close to the concentrations stated on the packaging. Drinking water from the CPUs in Ghariel Municipality was found to be within the limits of the Libyan International Standard Specifications. The results of the first two statistical correlation factors showed that there was confidence in the concentration of the first two correlations between the concentration of calcium ions and sulfate and the similarity between each pair 84% between the concentration of the estimated variables, and the fact that water in the target treatment units is fit for human consumption.

Assessment (ramadan *et al.*, 2108) of the Water in the city of Misrata (Libya) treated in commercial water plants also indicated that pH values for eight studied samples were below the minimum allowed specifications, while TDS results, The total price exceeded the maximum allowed in the Libyan specification for one sample, the global health specification was not exceeded, one sample was found to have exceeded the maximum permissible for iron and chlorides, and the elements (Na, Ca, Mg, K, HCO₃, Cu, Pb, Zn) did not exceed the maximum permissible in all samples studied. However, this study was designed to assess the quality of bottled water to determine its suitability for consumption

MATERIALS AND METHODS

Sampling

Thirteen brands of bottled water from several regions of (Central middle, and East) Libya locally produced and traded in retail stores were randomly collected from the city of Hun, Sirte, Ben Jawad, Ejdabiya and Benghazi from October to November 2021 four replications of each brand were collected in volumes ranging from 330-500 ml, each sample was analyzed quantitatively and qualitatively two packs were used for physical and chemical analysis.the brands is Sophia Alnaqa ,Hala ,Awafi ,Aldeyafa Alhana, Shaima, Sultan, Areen, pure, Aseal, Alain, Aseel.

Measurement of physical and chemical parameters of samples

The PH was measured by pH meter and the electrical conductivity EC by the electrical conductivity meter, as well as the temperature, and the values of the dissolved solids (TDS) were found mathematically according to standard methods.

Chloride Titrate with 0.1 Silver Nitrate, hardness and alkalinity in the water samples were calibrated according to the standard methods prescribed in the amount of calcium and magnesium, Titrate with 0.1 EDTA Solution according to the standard methods. The contents of phosphate (Po₄) were estimated by spectrophotometer, sodium Na and potassium K using a flame photometer.

RESULTS AND DISCUSSION

The results in Table (1) showed the analysis values mentioned on the labs of the various brands of bottled drinking water that were measured in this study, the pH value found between (6.44-7.71) was in the recommended range by the World Health Organization (WHO) and Libya standard limits 6 to 8 ,The pH values were almost close to the values on the packaging label, and the results were in agreement with the study of (Muhammad 2017) According to (Mohamed *,et al* 2020) , the decrease of PH occurs by 0.45 when the temperature rises above 25 C⁰ and it changes when treated with chlorination as this process affects TDS, although did not exceed the upper limit of the standard for the measurement of most of the elements studied

Other results, such as the EC value (0.03-0.23 ms.cm⁻¹) Libyan standard 800 ms.cm⁻¹Total Dissolved Solids (21.76-144) showed that these concentrations were within the Libyan standards for bottled drinking water, which states that the permissible concentration should not exceed 500 who , Alkaline (CaCO₃) is found in two samples at only 0.6, 1 at the same total hardness 3, 5 respectively, but in all brands there is non-invasive These values did not exceed the permissible limits HCO₃ 150 allowed in the Libyan standard.

The results in the Table 1 show that the calcium concentration ranged from 8 to 40.8 and these values within the recommended limits of the Libyan and international standards calcium 75, a significant decrease in sodium and potassium concentrations was observed, with concentrations ranging from 0.26 to 0.77 to sodium and 0.06 to 2.5 to potassium and the recommended limits in the Libyan standard are 100 and 50 mg/l respectively Na and K. The presence of iron in the studied bottled water samples is almost non-existent, as it was found in only three brands and the measured concentrations exceeded the upper limits of the Libyan standard of 0.3 mg/L and very high values are 1.09, 3.2 and 19 respectively, magnesium concentrations ranged from 1.92 to 19.2 and these values are within the limits of the Libyan standard for bottled water 30 mg/L, However the range of chloride between 13.01 to 50.06 ppm.

CONCLUSION

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The results present clearly that the physicochemical properties of bottled drinking water using in some middle and eastern regions of Libya It was in

accordance with most of the standards mentioned in the Libyan Standard No. 10.

RECOMMENDATIONS

- Activating the role of control over factories on an ongoing and periodic basis and imposing conditions on the need to conform the product presented to the Libyan standard specifications.
- Educate citizens about the importance of ensuring the quality and safety of the Consumer Produce.

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