

**SURVEY ON THE QUALITY OF BOTTLED NATURAL
DRINKING WATER**

By

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B. Sc. Agri. Sc. (Food Industries), Ain Shams University, 1998

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ABSTRACT

Hussein Fahim Mohamed Abd EL-Salam: Survey on the Quality of Bottled Natural Drinking Water M.Sc. Thesis, Department of Food Science, Faculty of Agriculture, Ain Shams University, 2015.

The present study was carried out to determine the physicochemical and microbiological quality of bottled drinking water (BDW) brands which available in retail shops in Egypt comparing to those of drinking water standards. Various physicochemical parameters [pH, turbidity, total dissolved solids (TDS), electrical conductivity (EC), hardness, alkalinity, chloride, sulfate, nitrite, nitrate, calcium, magnesium as well as fluoride] and microbiological analysis [total bacterial count (TBC), *E. coli* and *Pseudomonas sp.*] were considered. The changes of physicochemical and microbiological properties were recorded when the BDW was exposed to sunlight for 20 days or when stored at different temperatures for 30 days. In another side, the study deals with the suitability of using moringa seeds powder (MSP) as natural environmentally friend, alone and in combination with calcium hypochlorite $\text{Ca}(\text{OCl})_2$ for remediation of contaminated well water.

- Electrical conductivity changes in were initiated at 15 days of exposure in all investigated.
- Similar proportionally trend was also noticed when TDS content was followed.
- Turbidity changing was started just at 5th day of direct sunlight exposure.
- The pH and alkalinity, generally showed an decremental trend during twenty days of direct sunlight exposure started at 10th day.
- Nitrite level was clearly affected after 15 days of exposure and continuously increased till 20 days.
- Total hardness was reached to its maximum level at 15th day of exposure.
- Similar trend was strongly correlated with those of calcium hardness and calcium levels.
- leaching was started at 10th day of exposure with a noticeable level.
- DEHA level at 10th day was increased by (1.24-7.06) folds depending on exposure bottle brand.

- The aforementioned findings in case of DEHA level were similarly found in case of CH₂O compound.
- The presence of *E. coli* in most of investigated collected brands with slightly increase at the end of experiment period.
- Salts and ions that playing the essential role in total hardness assured the earlier findings of total hardness.
- *E. coli* was appeared when samples stored at 45°C.
- Treated water with *M. oleifera* seeds extract at different concentrations lead to drastic reduction in water microbial counts. As well as, the antimicrobial activity of *M. oleifera* is dependent on extract dose; i.e. the lower the concentration, the lower the activity.

Key words:

Moringa oleifera, water treatment, Bottled water, water quality, water standards, water labeling, water storage.

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LIST OF APPREVIATIONS

°C	Degree Celsius
μs	microseconds
APHA	American Public Health Association
AWWA	American Water Works Association
BDW	Bottled drinking water
BPA	Bisphenol A
BTES	Benzene, toluene, ethylbenzene, styrene (BTES)
Ca(OCl)₂	Calcium hypochlorite
CFU	Colony forming unit
CIP	Cleaning In Place
DEHA	N, N-Diethylhydroxyl adipate
<i>E. coli</i>	<i>Escherichia coli</i>
EBT	Eriochrome black T
EC	Electrical conductivity
EDTA	Ethylenediaminetetra-acetic acid
EPA	Environmental Protection Agency
ESS	Egyptian Standards of Specification
FDA	Food and Drug Administration
GMP	Good Manufacturing Practices
IBWA	International Bottled Water Association
MF	Membrane filtration
MOSP	<i>Moringa oleifera</i> seed powder
MPN	Most probable number
MSP	Moringa seed powder
N	Normality
NI	Not included

nm	nanometer
NTU	Nephelometric turbidity units
O.T	Orthotolidine
PAHs	Polycyclic aromatic hydrocarbons
PET	Polyethylene terephthalate
PPb	Part per billion
PPm	Part per million
SDWA	Safe Drinking Water Act
SODIS	Solar water disinfection
SOQ	Standard of quality
SPC	Standard plate count
SPE	Solid phase extraction
TBC	Total bacterial count
TDS	Total dissolved solids
TH	Total hardness
TVPC	Total viable plate count
WEF	Water Environment Federation
WHO	World Health Organization