

Bottled Water Potability (BWP)

Scope:



Organoleptic & Physical Parameters:

Appearance, True Colour Units, Odour, pH, Turbidity;
Electrical Conductivity (EC) and
Total Dissolved Solids (TDS) estimated from EC (TDSE).



Chemical Parameters:

Total Alkalinity; Total hardness of water (THW),
Calcium (Ca) & Magnesium (Mg);
Nitrites (NO₂), Nitrates (NO₃);
Chloride, Fluoride, Sulfate,
Iron, Manganese, Sodium & Potassium.



Bacteriological Parameters:

MPN (Total coliforms),
[MPN= Most probable number],
Thermotolerant coliforms (TTC) & *E. coli*

Total parameters: $7 + 13 + 4 = 24$

Rationale:

Bottled water means safe drinking water that is sealed in bottles or other containers and is synonymous with packaged drinking water other than packaged natural mineral water. In addition to health benefits consumers value the convenience of bottled water. Commercially bottled water is emerging as the primary source of drinking water while travelling, hotels and restaurants and at the work place. About 13% households in Hyderabad primarily use bottled water for drinking. Groundwater is the primary source of raw water for most bottled water plants. Bottled water is being produced by a variety of plants ranging from micro and small to very large enterprises. New bottled water plants often start as micro enterprises hoping to gradually expand in size. Wide variation in age and size of bottled water plants mean concomitant variation in quality control measures.

Almost all bottled water plants use reverse osmosis (RO). One of the side effects of RO is excessive removal of minerals. Low mineral content water tastes poorly, does not quench thirst so well. Mineral free, low pH water tends to leach impurities into drinking water, from metallic containers (WHO 2011; Kozisek, 2005). Some researchers have recommended that, the minimum level of calcium in drinking water should be 20 mg/L and the optimum should be 50 (40-80) mg/L. Similarly, the minimum level of magnesium in drinking water should be 10 mg/L and the optimum level should be about 20-30 mg/L (Kozisek, 2005, Pages 156-57). An expert committee constituted by the National Green Tribunal, recommended that bottled water for drinking should have a minimum TDS concentration to 150 mg/L (NGT, 2019). As of 2022, the mineral content in most of the bottled waters available in Hyderabad is low. When consumers test bottled water ask their suppliers about desirable mineral content, the aesthetics and stability of bottled water is bound to improve.

Once selected, consumers often continue with the same bottled water supplier. Testing for quality of bottled water is critical for initial selection of suppliers. Thereafter,

quality should be checked periodically, to reassure that delivered bottled water continues to be potable.

There are 3 Indian standards for drinking water, namely; IS10500, IS13428, and IS14543. IS10500, originally published in 1983 and revised in 2012 has been developed for safe water supply to general public by municipal and other water utilities. IS13428, originally published in 1992 and revised in 2005, applies to natural mineral waters packaged and sold for drinking. IS14543, first published in 2004, applies to water from various sources, treated and packaged for drinking. The key difference between the two packaged drinking water standards appears to be that, IS13428 applies to pristine raw water minimally treated for safe drinking and IS14543 applies to a wider range of source water adequately treated to ensure safe drinking.

Table-1: Comparative list of reference values for selected parameters, in 3 Indian Standards (IS) for drinking water

Sl	Parameter	IS:14543	IS13428	IS10500: Acceptable	IS10500: Permissible
1	True colour units, PCU	≤ 2	≤ 2	≤ 5	≤ 15
2	Odour	Agreeable	Agreeable	Agreeable	Agreeable
3	pH	6.5 to 8.5	6.5 to 8.5	6.5 to 8.5	6.5 to 8.5
4	Turbidity, NTU	≤ 2	≤ 2	≤ 1	≤ 5
5	Total dissolved solids, mg/L	≤ 500	150 to 700	≤ 500	≤ 2000
6	Alkalinity, as CaCO ₃ mg/L	≤ 200	75 to 400	≤ 200	≤ 600
7	Hardness, as CaCO ₃ mg/L			≤ 200	≤ 600
8	Calcium, mg/L	≤ 75	≤ 100	≤ 75	≤ 200
9	Magnesium, mg/L	≤ 30	≤ 50	≤ 30	≤ 100
10	Ammonia-Nitrogen, mg/L			≤ 0.5	≤ 0.5
11	Nitrite-Nitrogen, mg/L	≤ 0.02	≤ 0.02		
12	Nitrate, as mg/L	≤ 45	≤ 50	≤ 45	≤ 45
13	Chloride, mg/L	≤ 200	≤ 200	≤ 250	≤ 1000
14	Fluoride, mg/L	≤ 1.0	≤ 1.0	≤ 1.0	≤ 1.5
15	Sulphate, mg/L	≤ 200	≤ 200	≤ 200	≤ 400
16	Sodium, mg/L	≤ 200	≤ 150		
17	Iron, mg/L	≤ 0.1	≤ 0.1	≤ 0.3	≤ 0.3
18	Manganese, mg/L	≤ 0.1	≤ 2.0	≤ 0.1	≤ 0.3
19	Free residual chlorine, mg/L	≤ 0.20		≥ 0.2	≤ 1.0
20	Total coliforms	Absent	Absent	Indicator of cleanliness	
21	Thermotolerant coliforms	Absent	Absent	Absent	Absent
22	<i>E. coli</i>	Absent	Absent	Absent	Absent

In BWP, we have packaged a good number of physical, bacteriological, general chemical parameters to check for quality with reference IS14543, which is Indian Standard applicable to bottled water.

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The Indian standard for packaged drinking water (IS14543, 2004) lists 51 parameters including, 10 bacteriological, 6 physical & sensory, 24 general chemical parameters, 9 toxic and 2 radioactive substances. Inclusion in the standard specification does not mean that all 50 quality parameters have to be tested all the time. Choice of parameters for monitoring and verification of quality is to be based on reliability of the source, variability of parameter values, prevalence of attributable risk, consumer concerns and clues leading to suspicious contamination. The bottled water

potability tests covers all physical & sensory parameters, except for taste, which would be known to the consumer. Three essential bacteriological parameters are included. The coliform tests leading up to identification of faecal coliforms and *E. coli* is essential for determining whether a health risk exists. The MPN (Total coliforms) gives an indication of the post-treatment disinfection process, akin to aerobic microbial count. And 13 out of 24 general chemical parameters listed in IS14543 of 2004 are included. BWP does not include any of the toxic or radioactive substances listed in IS14543. Where contamination with pesticides and any other toxic substances is suspected, additional tests should be considered.

Sample - Collection, Storage & Transportation:

Follow methods of sampling specified in IS3025pt1:1987 for chemical tests and in IS1622:1981 for bacteriological tests. Sample should be representative of the water to be tested and should be collected with utmost care to ensure that no contamination occurs at the time of collection or prior to examination by the laboratory.

Pouring of bottled water into a separate sample collection bottle may not be required. For acceptance testing, selected sample of packaged water bottles should be sent to the laboratory unopened ((IS14543 Annex E.1). In case of large bottles such as 20 litre cans, meant to be used with help of dispensers, pour from a freshly opened can into a sterile sample collection bottle. If you are interested in testing potability of a partially used packaged water bottle, no need to pour it into a sterile bottle. Instead, place the bottle into a dark-coloured bag, along with some ice pack and deliver the partially used bottle to the Laboratory for analysis.

Information About Source, Context, Intended Use & Concerns:

Provide as much detail as you can about the supplier, batch number, bottling date, date of opening of bottle, etc. Mention about intended use of the water, the reason why you are ordering the test, as well as doubts and concerns, if any. These information help in interpretation of test results. Occasionally, the IHS Laboratory may contact you for clarifications and additional information about the source and its environment, to help interpretation of test results.

Test Method & Duration:

Physical and chemical characteristics of water sample are tested according appropriate parts of the IS3025 and/or American Public Health Association (APHA). For bacteriological analysis methods specified in IS1622 of 1981 are used.

Depending on duration of bacteriological analysis, and gathering of additional information for interpretation of results; report will be available in 3 to 5 days.

To pick up sample collection bottle and/or schedule collection of samples:
Email: ihslab@ihs.org.in; WhatsApp: +919848011251; Call:040-23211013/4

References:

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http://www.who.int/water_sanitation_health/dwq/nutrientsindw.pdf
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