



Packaged Drinking Water

Some are microbiologically unsafe. Don't drink them

In a country where sufficient and safe potable water is not available everywhere, either because harmful chemical substances are found in the layers of earth which enter into water or because the water may be contaminated due to pathogenic microorganisms, packaged drinking water is serious business. However, what if the packaged drinking water – the one that you and I buy at a price in the belief that it is the safest – is not drinkable enough? What if it has harmful organisms? In such a case, there cannot be two opinions that the seller is not only breaching the consumer's trust but is also putting their health at risk. Considering that packaged drinking water is consumed by an ever-increasing population, the rules governing its sourcing and treatment processes have to be strictly conformed to. In order to find out if unhealthy packaged drinking water brands are being sold in the Indian market, *Consumer Voice* tested a dozen top brands – on the basis of their market share – in an NABL-accredited laboratory. While most brands passed all tests and fulfilled the parameters set by the national standards, the samples of a few failed in crucial microbiological tests. Is your bottled water brand one of them? Here's a complete report for you to find that out.

A Consumer Voice Report

The test programme for packaged drinking water is based on IS: 14543: 2004 with the latest amendments. Test parameters were mainly based on IS in order to judge the overall quality, as also on the requirements of FSS Regulations, 2011, which cover the product requirements.

We tested 12 brands of one-litre packaged drinking water on quality, acceptability and sensory

parameters. The testing was conducted in an NABL-accredited laboratory capable of testing and analysing packaged drinking water as per the mentioned standards.

The key parameters for which the 12 brands were tested included presence of undesirable substances and microbiological organisms, pesticide residues, toxic/heavy metals, total dissolved solids (TDS), pH level, radioactivity, turbidity and colour.

As per Gazette Notification dated 15 November 2015, issued by the ministry of health and family welfare, FSS Amended Regulation 2016 (as per revised version of IS 14543: 2016) has come into force from 1 March 2017. For the latest Consumer Voice report on packaged drinking water, since the samples of water were drawn from the market before 1 March 2017, the test programme was carried out on the basis of IS: 14543: 2004.

What Is 'Packaged' Drinking Water?

It is water derived from varied sources including surface, ground or sea and subjected to treatment like decantation, filtration (including aeration filtration with membrane filter, cartridge filter, activated carbon filtration), demineralisation, mineralisation and reverse osmosis. The packaged water is also disinfected before being packed so that it does not get contaminated until consumed within a specific time.

The packaged drinking water shall be filled in sealed containers of various compositions, forms and capacities that are suitable for direct consumption without further treatment. In case demineralisation is a part of the treatment process, the ingredients used shall be of food-grade quality and conform to the requirements set by Food Safety and Standards Authority of India and rules framed thereunder.

BRANDS TESTED

Rank	Total Score out of 100 (Rounded off)	Brand	MRP (Rs)	Net Volume (Litres)	Best before (Months)	Manufactured/Marketed by
1	97	Rail Neer	15	1	6	Indian Railway Catering and Tourism Corporation Ltd, Delhi
2	96	McDowell's	20	1	6	Mahaveer Aqua Pvt. Ltd, Ghaziabad, Uttar Pradesh
2	96	Bisleri	20	1	6	Bisleri International Pvt. Ltd, Mumbai
3	95	Bonaqua	20	1	12	Hindustan Coca Cola Beverages Pvt. Ltd, New Delhi
3	95	Xalta	20	1	6	VHV Beverages Pvt. Ltd, Haryana
4	94	More	20	1	6	Begud Beverages Ltd, Hapur Uttar Pradesh
5	93	Kinley	20	1	12	Moon Beverages Ltd, Greater Noida, Uttar Pradesh
5	93	Icelings	20	1	6	Sarthak Aqua India Pvt. Ltd, Ghaziabad, Uttar Pradesh
Downgraded to poor as they do not comply with microbiological requirements		Bailley	15	1	6	Parle Agro Pvt. Ltd, Mumbai
		Royal Blue	20	1	6	SG Beverages, Delhi
		A4X	20	1	6	Ansh Beverages Ltd, New Delhi
		Aquafina	20	1	9	Varun Beverages Ltd, Mathura, Uttar Pradesh

*Not recommended for consumption as these failed in microbiological test

Score Rating: >90: very good*****, 71-90: good*****, 51-70: fair***, 31-50: average**, up to 30: poor*

Comparative Test

CV RECOMMENDATION |
TOP PERFORMER

Rail Neer

VALUE FOR MONEY

Rail Neer



BRANDS TO AVOID

**Aquafina | Royal Blue |
Bailey | A4X**

These brands did not meet safe microbiological parameters and are therefore considered unsafe for drinking.



Key Findings

- Based on the overall test findings, Rail Neer is the top performer. Next in ranking are McDowell's and Bisleri.
- Rail Neer is also the value-for-money brand – it costs Rs 15 a litre, as against the general price of Rs 20 per litre.
- Except for Bailey, Aquafina, A4X and Royal Blue, all other brands were found to be meeting the requirements of Indian Standard.
- Aquafina, Royal Blue, Bailey and A4X had total colony count (of bacteria) higher than the maximum permissible limit set by Indian Standard. *P. aeruginosa* bacteria were also found in these four.
- Yeast and mould count was found in Aquafina.
- None of the brands was found surpassing the maximum permissible limit for various minerals, toxic substances and residual pesticides.
- In physical tests (colour, TDS, turbidity, pH), all brands met the requirement set by Indian Standard.

TEST RESULTS FOR MICROBIOLOGICAL ACTIVITY

Microbiological contamination of water has long been a matter of concern to the public. Many infectious microorganisms found in the environment – such as shigella, *E. coli*, vibrio, salmonella, coliform, *S. aureus*, faecal streptococci, yeast and mould, *V. cholerae*, *V. parahaemolyticus*, *Pseudomonas aeruginosa* – can contaminate the water supplied to us. These microorganisms can cause symptoms such as nausea, vomiting, diarrhoea and stomach cramps. In healthy adults, these illnesses are usually mild and do not last long. In infants, children, the elderly, and persons with weakened immune systems, these illnesses can be more severe.

The results of our tests, conducted as per the requirements set out by Indian Standard, are reproduced here.

- *Aquafina, Bailey, Royal Blue and A4X failed to meet the microbiological requirements – hence they are not safe for consumption. Total viable colony count was found to be high in all four brands. Also, Pseudomonas aeruginosa was detected in these brands.*
- *Yeast and mould was found in Aquafina.*



Pseudomonas aeruginosa can cause a range of infections but rarely causes serious illness in healthy individuals without some predisposing factor. It predominantly colonises damaged sites such as burn and surgical wounds, the respiratory tract of people with an underlying disease and physically damaged eyes.



Comparative Test

Parameter ↓	Requirement	Rail Neer	McDowell's	Bisleri	
Yeast and mould (per 250 ml)	Absent	Absent	Absent	Absent	
Total viable colony count (cfu/ml)					
a) At 20–22 degrees C	100	Less than 1	Less than 1	Less than 1	
b) At 37 degrees C	20	Less than 1	Less than 1	Less than 1	
<i>E. coli</i> (per 250 ml)	Absent	Absent	Absent	Absent	
Coliform (per 250 ml)	Absent	Absent	Absent	Absent	
Faecal streptococci (per 250 ml)	Absent	Absent	Absent	Absent	
Shigella (per 250 ml)	Absent	Absent	Absent	Absent	
<i>S. aureus</i> (per 250 ml)	Absent	Absent	Absent	Absent	
Sulphite-reducing anaerobes (per 50 ml)	Absent	Absent	Absent	Absent	
<i>Pseudomonas aeruginosa</i> (per 250 ml)	Absent	Absent	Absent	Absent	
<i>Vibrio cholerae</i> (per 250 ml)	Absent	Absent	Absent	Absent	
<i>Vibrio parahaemolyticus</i> (per 250 ml)	Absent	Absent	Absent	Absent	
Salmonella (per 250 ml)	Absent	Absent	Absent	Absent	
Score out of 20		20	20	20	
Applying downgrading*		20	20	20	

*Downgraded because these did not comply with the microbiological requirement

FOR PHYSICO-CHEMICAL PARAMETERS

Undesirable Substances | Toxic/Heavy Metals | Pesticide Residues | TDS | pH | Turbidity | Colour

◆ Undesirable Substances

Apart from the toxic metals and substances, there are a few undesirable substances that can make drinking water unhealthy/unhygienic or hamper its taste. All these undesirable substances were tested as per the requirements of IS, and a handful of brands contained some of these in negligible quantities.

- All brands were found to be within the limits set by Indian Standard for these substances: aluminium, anionic surface-active agents, antimony, barium, borates, copper, iron, manganese, mineral oil,

nitrite, phenolic compounds, residual chlorine, selenium, sulphide and zinc.

Nitrate is a colourless, odourless and tasteless compound that is present in some groundwater. High nitrate levels in water can cause methemoglobinemia or blue baby syndrome, a condition found especially in infants less than six months old. The stomach acid of an infant is not as strong as in older children and adults. This causes an increase in bacteria that can readily convert nitrate into nitrite (NO₂).

- **Nitrate (as NO₃):** Nitrate in drinking water can be a maximum of 45 mg/litre. Except for Aquafina, Kinley and More, all brands contained some amount of nitrate, but it was well within the maximum permissible limit.

Packaged Drinking Water

	Bonaqua	Xalta	More	Kinley	Icelings	Bailley	Royal Blue	A4X	Aquafina
	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Present
	Less than 1	790	1,100	170	9,100				
	Less than 1	100	560	86	1,600				
	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
	Absent	Absent	Absent	Absent	Absent	Present	Present	Present	Present
	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
	20	20	20	20	20	13	13	13	11
	20	20	20	20	20	0	0	0	0

Exposure to excessive consumption of fluoride over a lifetime may lead to increased likelihood of bone fractures in adults and may also result in effects on bone, leading to pain, tenderness and fluorosis on long intake of affected water. Children aged eight years and younger exposed to excessive amounts of fluoride have an increased chance of developing pits in the tooth enamel, along with a range of cosmetic effects on teeth.

- **Fluoride (as F):** As per the national standard, the maximum amount of fluoride permissible in packaged drinking water is 1 mg/litre. All brands were found to be within the permissible limit.
- **Silver (as Ag):** Levels of silver up to 0.1 mg/litre can be tolerated without risk to health. Silver was not detected in any of the tested brands.

Chloride in drinking water is generally not harmful to people until high concentrations are reached, although chloride may be injurious to some people suffering from diseases of the heart or kidneys. Restrictions on chloride concentrations in drinking water are generally based on taste requirements rather than on health. Liquid chlorine is mixed into drinking water to destroy bacteria. The maximum permissible limit for chloride and sulphate as per IS is 200 mg/litre.

- **Chloride (as Cl):** The maximum permissible limit for chloride is 200 mg/litre. Chloride was well below the maximum permissible limit in all tested brands.
- **Sulphate (as SO₄):** The permissible limit for sulphate is 200 mg/litre. It was well below the

Comparative Test

maximum permissible limit in some of the brands, while in some it was not detected at all.

Sulphate is a naturally occurring substance that contains sulphur and oxygen. Sulphate is generally considered to be non-toxic. However, the consumption of drinking water containing high amounts of sulphate may result in intestinal discomfort, diarrhoea and consequently dehydration.

- **Alkalinity (as HCO_3):** Alkalinity is not considered to be detrimental to humans, but is generally associated with hardness, high pH values and excessive dissolved solids, all of which may be undesirable. HCO_3 should not exceed 200 mg per litre. All the brands were found well below the permissible limit for alkalinity
- **Calcium (as Ca) and Magnesium (as Mg):** Calcium in water and certain other minerals in water are healthy. Calcium-rich water has a higher pH and that is better than drinking acidic water. However, calcium and magnesium are components of permanent hardness, and thus are undesirable in drinking water. The amount of calcium should not exceed 75 mg per litre, while magnesium should not be more than 30 mg per litre. In the tests, all brands were found to contain very slight amounts of calcium and magnesium
- **Sodium (as Na):** Sodium is an essential mineral in our diet. It is commonly found in the form of sodium chloride (salt). Salt has no smell and it

dissolves easily in water and gives water a salty taste at high levels. The amount of sodium should not exceed 200 mg per litre. All the brands were found well within the maximum permissible limit for sodium.

◆ Toxic/Heavy Metals

As per the national standard, the toxic substances that should not be present in drinking water include mercury, cadmium, arsenic, cyanide, lead, chromium and nickel.

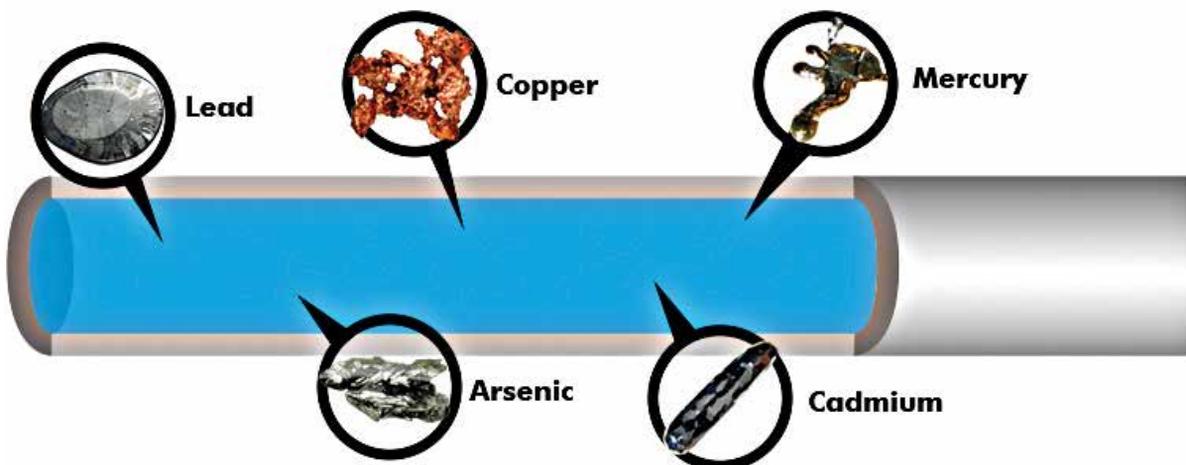
- *All the brands passed these tests as none of the said substances was detected.*

◆ Pesticide Residues

Pesticide is a chemical or biological agent (such as a virus, bacterium, antimicrobial, or disinfectant) that deters, incapacitates, kills, or otherwise discourages pests. Pesticides may cause acute and delayed health effects in people who are exposed. Such adverse health effects range from simple irritation of the skin and eyes to more severe effects like affecting the nervous system, mimicking hormones causing reproductive problems, and causing cancer.

As per Indian Standard, the maximum permissible limit is 0.0001 mg/litre for individual pesticide and 0.0005 mg/litre for total pesticide residues.

- *All tested brands were within the requirement set by the national standard. Traces of 2,4-dichlorophenoxyacetic acid were found in four brands but these were well below the specified limit.*



◆ Total Dissolved Solids (TDS)

Total dissolved solids are the amount of minerals, salts or metals dissolved in a given volume of water. TDS is directly related to the purity of potable water and the quality of water purification systems, and affects everything that consumes, lives in, or uses water, whether organic or inorganic, whether for better or for worse. The standard/regular practice of packaged drinking water in industry is to take the potable water from a regular source (for example, groundwater or as permitted by the Indian Standard) and demineralise the water through the RO system and in the required quantity to balance the TDS level as permitted in the national standard.

As per Indian Standard, total dissolved solids in packaged drinking water shall be a maximum 500 mg/litre.

- TDS in all brands was lower than the maximum permissible limit.
- Rail Neer was found to contain the highest quantity of TDS (126 mg/litre) and Aquafina the lowest (9 mg/litre).

Consumer Voice suggests that there be a lower-side limit for TDS – no TDS means there are no minerals as well. Water with extremely low concentrations of TDS may also be unacceptable because of its flat taste.

Water is a good solvent and picks up impurities easily. As per WHO guidelines for drinking water quality, water with extremely low concentrations of TDS may be unacceptable to consumers because of its flat, insipid taste. At the same time, drinking water becomes significantly and increasingly unpalatable at TDS levels greater than about 1,000 mg/litre.

◆ pH

The pH level of your drinking water reflects how acidic it is. pH stands for 'potential

hydrogen', referring to the amount of hydrogen mixed with the water. pH is measured on a scale that runs from 0 to 14. A measurement of seven is neutral, indicating there is no acid or alkalinity. A measurement below 7 indicates presence of acid and a measurement above 7 indicates alkalinity. The



normal range for pH in packaged drinking water as per Indian Standard is between 6.5 and 8.5.

- All the brands of packaged drinking water were within the specified range for pH.

◆ Turbidity

Turbidity is a principal physical characteristic of water. It is caused by suspended matter or impurities that interfere with the clarity of the water. These impurities may include clay, silt, finely divided inorganic and organic matter, and soluble coloured organic compounds.

Turbidity in water shall not be more than 2 nephelometric turbidity units (NTU).

- Turbidity was not detected in any of the brands. They were all free of suspended matters and impurities.

◆ Colour (in hazen unit)

- Colour was not detected in any of the brands and they were all given full scores.

Radioactivity

Radioactive minerals occur irregularly in the bedrock, similar to other minerals such as iron and arsenic. Radioactive alpha and beta emitters dissolve easily in water. The principal health concerns associated with regulated radionuclides in water include: radon gas increases the risk of lung cancer; uranium increases toxicity risk to the kidneys; and radium increases one's risk of bone cancer.

No radioactive emitters were found in any of the tested brands.

Parameters	Weightage (%)	Rail Neer	McDowell's	Bisleri	Bonaqua
Undesirable substances	20	19.22	19.28	19.39	19.6
Toxic/Heavy metals	12	12	12	12	12
Pesticide residues	10	10	10	10	10
TDS	10	9.04	7.6	7.44	6
pH	7	6.16	6.02	5.74	6.72
Turbidity	3	3	3	3	3
Colour	1	1	1	1	1

FOR SENSORY ATTRIBUTES

The sensory test was conducted in a reputed lab by qualified and experienced members who were capable of judging the sensory attributes of such products.

- *Aquafina, Bailey, Royal Blue and A4X were not included in the sensory test for taste as they had failed the microbiological test and could be unsafe to drink.*
- *The remaining eight brands scored equally well on odour and taste parameters.*

FOR GENERAL QUALITIES

Marking/Labelling

The bottle of packaged drinking water should be legibly marked with these details: a) name of the product; b) name and address of processor; c) brand name, if any; d) batch or code number; e) date of processing/packaging; f) treatment of disinfection, if any; g) 'best before' date; and h) mandatory ISI mark, MRP, net volume, FSSAI license number and customer care details.

- *All the brands were found to have the marking/labelling requirements and hence were given full scores. All the brands were marked with ISI mark.*
- *The green dot (indicating vegetarian status) is not a mandatory requirement and some brands do not carry it.*

Packing

The packaging material of packaged drinking water should be of food-grade material and the cap of the bottle must not have any colour migration on the product. Expert panellists judged the packaging based

on ease of use, handling and other related parameters, and ratings were given accordingly.

- *All the brands were in PET plastic bottle. Packaging of all brands was found to be convenient and acceptable.*

Manufacturers' Comments

As a matter of policy, before publication, the test results of the brands are shared with their respective manufacturers/marketers inviting their views/comments. We reproduce here the comments of manufacturers as well as our reply:



SCORES

	Xalta	More	Kinley	Icelings	Bailley	Royal Blue	A4X	Aquafina
	19.42	19.58	19.46	19.14	19.25	19.42	19.82	19.87
	12	12	12	12	12	12	12	12
	10	10	9.4	6.08	10	9.44	7.36	10
	6.64	4.72	5.32	8.6	8.16	7.12	4.92	4.4
	5.6	6.58	6.3	5.74	5.6	6.16	6.16	5.88
	3	3	3	3	3	3	3	3
	1	1	1	1	1	1	1	1

Brand	Manufacturer's Comment	Consumer Voice
Aquafina	<p>a) It is not justifiable to ask for comments on the basis of ex-parte test results that are merely typed on plain paper and that too without any reference to an NABL-accredited lab wherein such alleged test has taken place, and also without giving us any opportunity to confirm or deny the same on an objective basis.</p> <p>b) It is further pertinent to mention here that the presence of such high count of total viable colony and <i>Pseudomonas aeruginosa</i> is not at all possible in our product Aquafina. Presence of mould in our product was never ever reported. Such high count is possible only when the sample is contaminated during plating, in a non-sterile plating environment, or due to use of contaminated media during the microbiological test.</p> <p>The same batch no. was found well within the parameters by an NABL-accredited lab, Microchem Silliker Pvt. Ltd, and by our in-house lab.</p> <p>c) You are requested to take utmost care before you rely on such data which is not in sync with the test reports issued by independent NABL-accredited labs.</p>	<p>The original test report was issued by the lab in NABL-approved format; however, as a policy matter we reproduce the test results in our standard format and share the same with concerned manufacturers. The tests were conducted in a reputed NABL-accredited and independent laboratory. Our designated NABL lab has confirmed that the earlier test results are in order as per specified protocol.</p>



Comparative Test

Difference between Packaged Natural Mineral Water and Packaged Drinking Water

	Mineral Water	Packaged Drinking Water
Description	Mineral water contains dissolved mineral salts. Such water is especially considered to be healthy to drink.	Packaged drinking water is from any source and has to be treated and disinfected. It is sealed water that ensures that the water will be safe, clean and potable for human consumption.
Treated	The water is not at all chemically treated	The water is chemically treated.
Filtration	There is a small process for filtration in which no addition is done. In fact, the natural contents remain in water.	It is chemically filtered.
Shelf life	It has a longer shelf life.	It is a synthesised product and therefore has a shorter shelf life.
Healthy	It is healthier for the human body because no chemicals are added.	It is not as healthy as compared to mineral water because it is chemically treated.

Source: <http://www.differencebetween.info/difference-between-mineral-water-and-packaged-drinking-water>



Dear readers: We are open to hearing your suggestions on products and services that you believe should be reviewed/tested by Team Consumer Voice. You may write to editorial@consumer-voice.org