



## Packaged Drinking Water

### Are you choosing the safest one?

The director of 1974 popular movie *Roti, Kapda Aur Makaan* could have added *Paani* in the title had he been realised the scarcity of drinking water we are facing now in India. Yes, we have unemployment, low GDP and a slow economy in our list too, but we all agree that food, water, shelter, and clothes are the basics of human survival. And unfortunately, sufficient safe potable water is not available everywhere in the country. Either harmful chemical substances are found in the layers of the earth which enter into water or it may be contaminated due to pathogenic micro-organisms. Consuming such water may cause water-borne diseases. Hence, it becomes imperative to process bottle safe potable water in prevailing conditions. In the following report, we tested 7 packaged water bottle brands to bring the best one for consumers. A report!

*A Consumer Voice Report*

Water with a very low amount of TDS gives it an insipid taste. BIS standard IS:14543 says quality drinking water should contain 500 mg/ per liter TDS maximum. Now, if we go back and brush up our knowledge about packaged drinking water, we may fall short of our knowledge about it. Packaged drinking water (other than packaged natural mineral water) is water derived from surface water or underground water or seawater which is subjected to herein under specified treatments. (Like-decantation, filtration, a combination of filtration, aeration filtration with membrane filter depth filter, cartridge filter, activated carbon filtration, demineralization, remineralization and reverse osmosis). This treated water is packed after disinfecting it to a level that should not lead to any harmful contamination in the drinking water through chemical agents or physical/UV methods. After processing to a level where it is consumable, the packaged drinking water needs to be filled in sealed containers of various compositions, forms, and capacities matching the suitability for direct consumption without further treatment. In case demineralization is a part of the treatment process, the ingredients used need to be of food-grade quality and conform to the requirements of Food Safety and Standard Authority of India (FSSAI) and rules framed thereunder.

### How We Test

To make it easy for everyone, the Consumer Voice



team had undertaken the comparative testing of 7 popular brands of packaged drinking water. The comparative test programme was based on the mandatory Indian standard IS 14543:2016. The test parameters for this study were mainly based on Indian Standard to judge the overall quality of packaged drinking water and also by following the FSS Regulations/ requirements. The test was conducted in a NABL accredited lab and analysis of packaged drinking water was done as per the above reference standard.

### Brands Tested

The following table will guide you to buy the best-packaged drinking water.

Rank	Total Score Out of 100 (rounded off)	Brand	Net volume, liter	MRP, Rs.	Best before, Months	Manufactured/Marketed By
1	94	Bisleri	1 L	20	6 months	Bisleri International Pvt. Ltd.,
2	93	Bailley	1 L	20	6 months	Parle Agro Pvt. Ltd.,
2	93	Rail Neer	1 L	15	6 months	IRCTC_
2	93	Kingfisher	1 L	20	6 months	Ghai Overseas
3	91	Bonaqua	1 L	20	12 months	Hindustan Coca Cola Beverages Pvt. Ltd.,
3	91	Kinley	1 L	20	12 months	Moon Beverages Ltd.,
4	89	Aquafina	1 L	20	9 months	Varun Beverages Ltd.,



### Key Findings

Bisleri scored number 1 position followed by Bailey, Rail Neer and Kingfisher.

Also, Rail Neer is the Value for Money brand, being priced at Rs. 15/litre against Rs. 20 for all other brands.

In parameters such as Colour, TDS, Turbidity, and pH, and organoleptic parameters with colour, taste and odour, all the brands were found meeting the minimum requirement of national standard.

None of the brands was found surpassing the maximum permissible limit of various minerals in excessive amounts, toxic substances, residual pesticides, and microbiological parameters.

We found all the brands are safe for consumption as they met national standard requirements.

### CV RECOMMENDATIONS

**Bisleri  
&  
Value for Money  
Rail Neer**

### COMPRATIVE PERFORMANCE SCORE

Brands Parameters	% Weight-age	Bisleri	Bailley	Railneer	Kingfisher	Bonaqua	Kinley	Aquafina
Microbiological tests	18	18	18	18	18	18	18	18
Organoleptic Tests								
Odour	3	3	3	3	3	3	3	3
Taste	5	5	5	5	5	5	5	5
Physical parameters								
Colour	2	2	2	2	2	2	2	2
Turbidity	3	3	3	3	3	3	3	3
Total Dissolved solids	10	8.30	5.80	8.20	4.70	3.90	4.10	3.24
pH	5	4.34	4.15	3.05	4.34	4.46	4.23	3.06
Substances Undesirable in excessive amount	28	24.82	26.19	24.79	26.65	25.94	25.84	25.91
Pesticide Residues	7	7	7	7	7	7	7	7
Toxic substances	12	12	12	12	12	12	12	12



## General Observations

General observations were made on the packing of drinking water and markings/labeling requirements were verified as per the Indian standard requirements.

## General Parameters Concerning Undesirable Substances

Apart from the toxic 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 Indian standard requirements. In our test, we found all the brands were within the limits set by the Indian Standard for these substances.

### Nitrate (as $\text{NO}_3$ )

Nitrate is a colorless, odorless 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 under six months. 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 to nitrite ( $\text{NO}_2$ ). Nitrate was not detected in Aquafina and Bonaqua. All other brands were found to contain some amount of nitrate but well within the maximum permissible limit.

### Fluoride

Fluoride compounds are salts that form when the element fluorine combines with minerals in soil or rocks. Exposure to excessive consumption of fluoride over a lifetime may lead to an increased likelihood of bone fractures in adults and may result in effects on bone leading to pain and tenderness. Children aged 8 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 to teeth. As per the national standards, the maximum amount of fluoride permissible in packaged drinking water is 1mg/litre. All the brands were found within the limit.

### Chloride

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. The chemical element chlorine is a corrosive, poisonous that has a suffocating odor. Liquid chlorine is mixed into drinking water to destroy bacteria. The maximum permissible limit of Chloride as per the Indian standard is 200mg/litre. All the brands were found well below the maximum permissible limit of Chloride.

### Sulphate (as $\text{SO}_4$ )

Sulphate is a naturally occurring substance that contains sulphur and oxygen. Sulphate is generally considered to be non-toxic. The consumption of drinking water containing high amounts of sulphate may result in intestinal discomfort, diarrhea and consequently dehydration. The standard requirement of Sulphate is 200mg/L maximum. So, in the test that we carried out, we found all the brands were well below the permissible limits of Sulphate, while some were found not detected.

### Alkalinity (as $\text{HCO}_3$ )

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.

The standard requirement for the same is 200mg/Ltr. In our test, Alkalinity was found well below the Indian standard permissible limit.

### Calcium (as Ca)

Calcium and certain other minerals in water are healthy. Calcium-rich water has a higher pH and better than drinking acidic water. Calcium in high amounts are the part of hardness, thus undesirable in drinking water.

Calcium should be at 75mg/L maximum. All the brands were within the specified limit. However, as per the notification dated 30 October 2019 (applicable from 1<sup>st</sup> July 2020), calcium should be at 20-75 mg/litre.



### Magnesium

Magnesium should be at 30mg/L max. Also, as per the notification (applicable from 1<sup>st</sup> July 2020), magnesium should be in the range of 10-30 mg/ litre. We found all the brands contained a low amount of 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 prescribed requirement is 200mg/Ltr maximum. All the brands were found well within the maximum permissible limit of sodium as per the national standard.

### Microbiological Testing

Microbiological contamination of water has long been a concern. Many infectious microorganisms found in the environment such as Shigella, Escherichia coli, Vibrio, Salmonella, Coliform, S.aureus, Faecal streptococci, yeast and mold, Vibrio cholera, Vibrio parahaemolyticus, and pseudomonas aeruginosa. These microorganisms can cause symptoms such as nausea, vomiting, diarrhea, 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. All the 7 tested brands passed in the above parameters.

### Parameters Concerning Toxic Substances

As per the national standard, the toxic substances which should be within prescribed limit of Indian standard present in packaged drinking water are Mercury, Cadmium, Arsenic, Cyanide, Lead, Chromium and Nickel. So, we tested the packaged drinking water bottle on these parameters and the results are given below in a table:

S. No.	Brands	Results (mg/L)	Score out of 12
1.	Aquafina	Below detection limit	12
2.	Bailley	Below detection limit	12
3.	Bisleri	Below detection limit	12
4.	Bonaqua	Below detection limit	12
5.	Kingfisher	Below detection limit	12
6.	Kinley	Below detection limit	12
7.	Railneer	Below detection limit	12



All the brands tested for toxic substances and they were found not detected below the quantification limit.

### Total Dissolved Solids (TDS)

TDS is directly related to the quality of water purification systems and affects everything that consumes, lives in, or uses water, whether organic or inorganic. As per the Indian standard, TDS in packaged drinking water should be 500 mg/liter maximum. Drinking-water becomes significantly and increasingly unpalatable at TDS levels greater than 1000 mg/litre. Hard concentrations of high TDS may cause adverse taste effects. TDS are the number of minerals, salts or metals dissolved in a given volume of water. 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.

### The national standard requirement for TDS is 500mg/litre maximum.

All the brands were found in a low value of TDS than the maximum permissible limit of 500 mg/liter. Bisleri was found to contain the highest quantity of TDS (116) followed by Rail Neer at

114 and Aquafina was found the lowest at 14.8. Other brands such as Aquafina, Bonaqua, Kinley, and Kingfisher had TDS below 50 mg/liter which is undesirable for human health.

Water is a good solvent and picks up impurities easily. As per the WHO guidelines for quality drinking water, 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.

### Residual Pesticides

For the testing of residual pesticides, parameters tested were as 2,4-D, Alachlor, Butachlor, Chloropyrifos, DDT (o,p and p,pIsomers of DDT, DDE & DDD), Endosulphan (alpha, beta & Sulphate), Malathion, Methyl Parathion, Methyl Paraxon, Phorate, Phorate Sulfone, Phorate Sulphoxide, Alpha HCH, Beta HCH, Delta HC, Aldrin/ Dieldrin, Atrazine, Monocrotophos, and phorate.

The individual residual pesticide requirement is 0.0001g/L maximum. The total pesticide residues limit is 0.0005 mg/l maximum. All the brands were found within the standard requirement.

## pH

The pH level of 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 0-14. 7 is neutral, indicating there is no acid or alkalinity present. A measurement below 7 indicates acid is present and a measurement above 7 indicates alkalinity.

As per the Indian standard, pH of packaged drinking water should be in the range of 6.0 - 8.5. We found, all the packaged drinking water brands were within the specified range of pH and therefore they had met the standard requirement. However, Bonaqua scored highest in this parameter.

## Marking/Labeling

The packaged drinking water should be legibly marked with the following:

a) Name of the product, b) name and address of the processor, c) brand name, if any, d) batch or code no, e) date of processing/packaging, f) treatment of disinfection, if any and g) best before date, h) mandatory ISI mark, MRP, net volume, FSSAI license number, and customer care details.

As per the FSS Regulation, green dot marking is not applicable for packaged drinking water. All the brands were found with the mandatory marking requirements. The brands were marked with ISI mark, which is a mandatory requirement.

## Sensory Tests

The sensory tests were conducted in a reputed lab that is capable of judging the sensory attributes of such products. The test was conducted for the acceptability of odour and taste. All the brands had agreeable odour and taste.

## PHYSICAL PARAMETERS

### Colour (in true colour unit)

As per the prescribed requirement, the true

colour unit should be 2 maximum. We found color was less than 2, true colour units in all the brands. Thus all the brands complied with the requirement.

### Turbidity

Turbidity is the main 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, and finely divided inorganic and organic matter, soluble colored organic compounds. The requirement is not more than 2 NTU (*Nephelometric Turbidity Units*). Turbidity was 0.1 in all the brands thus passed the test.

### Packing

The packaging material of packaged drinking water should be of food-grade material and also the cap must not have any colour migration on the product. Expert panelists have judged the packaging based on the ease of use, handling, and other related parameters and ratings were given accordingly. All the brands were found in the plastic (PET) bottle. The packing of all brands was found to be convenient and acceptable.

### Conclusion

The test programme for comparative testing of packaged drinking water was based on IS 14543: 2016. To judge the overall quality, test parameters were based on Indian standard and FSS Regulation, which cover the product requirements. Seven regular selling brands of packaged drinking water were tested following the mandatory standard IS 14543:2016 to check the physical, chemical, undesirable substances, toxic metals, and microbiological and sensory requirements. All the tested brands were found safe for human consumption as they had complied with the Bureau of National Standard requirements IS 14543. Brand Bisleri secured top position in overall performance followed by Bailey, Rail Neer and Kingfisher.