



# **QUARTERLY REPORT BOTTLED WATER QUALITY**



**PAKISTAN COUNCIL OF RESEARCH IN WATER RESOURCES**

**Ministry of Science & Technology**

**Khyban-e-johar, H-8/1, Islamabad.**

[www.pcrwr.gov.pk](http://www.pcrwr.gov.pk)

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## INTRODUCTION

Drinking water quality is deteriorating continually due to biological contamination from human waste, chemical pollutants from industries and agricultural inputs. Piped water also gets contaminated because pipes are laid very close to sewerage lines or open drains and cause many serious water borne diseases. It was found that 45% of infant deaths have been attributed to diarrhea and about 60% to overall infectious waterborne diseases in Pakistan. According to the World Health Organization (WHO) 25-30% of the diseases are gastro-intestinal in nature. The poor quality of drinking water has forced a large cross-section of citizens to buy bottled water. As a consequence of this expanding market a mushroom growth of bottled water industry in the country is witnessed during the last five years. However, many of the mineral water companies were found selling contaminated water. To monitor and improve the quality of bottled water, the government of Pakistan has designated the PCRWR as focal point agency.

1. Ministry of Science & Technology informed PCRWR Vide U.O. No. 5(21)/2004-ATA-II dated 17.10.2005 that the Cabinet in its meeting under the chairmanship of Prime Minister directed Ministry of Science & Technology to undertake regular survey/samples of bottled/mineral water at source of production publicize the results on a quarterly basis and follow up with punitive/legal action.
2. Ministry of Science & Technology has assigned the task of quality monitoring of bottled water and publicize the results to PCRWR Vide U.O. No.1(1)/2005-Secy (MoST) dated 8.12.2005.

## PCRWR SAMPLING METHODOLOGY

<b>No. of brands collected</b>	27
<b>No. of cities targeted</b>	7 (Islamabad, Rawalpindi, Lahore, Peshawar, Quetta and Hyderabad)
<b>Composition of sampling Team</b>	One Research Officer and Two Laboratory Assistants
<b>Sampling Procedure</b>	Twenty seven commercially available brands of mineral/bottled water were collected from seven cities of four Provinces of Pakistan These samples were collected by the senior staff members of Head Office and Regional Offices of the Council in February, 2009. A set of four bottles of each brand was collected and sealed on site.
<b>Transparency</b>	One out of these four sealed bottles was handed over to shopkeeper at the time of sample collection; second sample was preserved in the National Water Quality Laboratory of PCRWR, Islamabad for future record, and rest of the samples were used

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for analysis. Identification codes were allotted to all the brands according to PCRWR Bottled Water Classification System.

### PCRWR BOTTLED WATER CLASSIFICATION SYSTEM

Sr. No	Brand Name	PCRWR Code	City	Date Collected	Bottled Water Type	Container Size	Manufacturer
1	Nestle	BWG-01	Tandojam	31-03-09	Purified Water	0.6 Liter	Nestle Pakistan Ltd. 308- upper Mall, Lahore 54000 Pakistan
2	Kinley	BWG-02	Tandojam	31-03-09	Purified Water	0.6 Liter	Coca-Cola Beverages Pakistan Ltd O-51
3	Sufi	BWG-03	Tandojam	31-03-09	Purified Water	0.6 Liter	Hadayat Foods Staffs Industries Pvt Ltd 1-B Gardon Block Garden Town Lahore.
4	First	BWG-04	Tandojam	31-03-09	Purified Water	0.6 Liter	D-38, S.I.T.E Karachi 75700
5	Aquafina	BWG-05	Tandojam	31-03-09	Natural mineral water	0.6 Liter	Survey no 212, Distt Malir Karachi
6	Maza	BWG-06	Tandojam	31-03-09	Purified water	0.6 Liter	Popular food Industries limited Hyderabad road Tando jam
7	Legend	BWG-07	Tandojam	31-03-09	Pure Water	0.6 Liter	Multi food industries plot no 92
8	Avisa	BWG-08	Tandojam	31-03-09	Purified water	0.6 Liter	Fun factory C-18 al hilal society Karachi Pakistan
9	Hydropsy	BWG-09	Tandojam	31-03-09	Purified water	0.6 Liter	Hydropsy premium drinking water head office U.S.A
10	Rainbow	BWG-10	Tandojam	31-03-09	Purified water	1.5Lit	B-88 Latifabad no 2 Hyderabad.
11	Crystal	BWG-11	Bahawalpur	31-03-09	Safe Drinking Water	1.5 Liter	Pak taiba enterprises, 157-B small industrial estate sahiwal pakistan
12	Piyaas	BWG-12	Bahawalpur	31-03-09	Strong Healthy Water	1.5 Liter	Arshad industry mouza zakira, samman satta head office 59-A Grain market Bahawalpur Pakistan.
13	Pino	BWG-13	Bahawalpur	31-03-09	Purified water	1.5 Liter	Under licence gusing pak DDR-1, PSIE Bahawalpur
14	Al Saudia	BWG-14	Islamabad	31-03-09	Natural Water	1.5 Liter	Water industries 77-K, Gulistan colony, Faisalabad.
15	Life care	BWG-15	Islamabad	31-03-09	Safe Drinking Water	1.5 Liter	Faisalabad Pakistan.041-8756696
16	Dew drops	BWG-16	Islamabad	31-03-09	Mineral Water	1.5 Liter	308-upper mall Islamabad 54000, Pakistan
17	Nectar	BWG-17	Islamabad	31-03-09	Pure	1.5 Liter	Bottle by nector water

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					Drinking Water		Islamabad plot no 14/10 markaz G-7 ISLAMABAD
18	Al Falah	BWG-18	Lahore	15-04-09	Pure Drinking Water	1.5 Liter	Al falah food avenue, 19 Umar Town Majid, street no. 2 shire kot band road Lahore.
19	Nation	BWG-19	Lahore	15-04-09	Pure Drinking Water	1.5 Liter	Hamza brothers 9-km G T road rachna town Shashtra Lahore
20	Sparkletts	BWG-20	Lahore	15-04-09	Purified water	1.5 Liter	64 Khayaban-e-Soharwardi G/6-4 Islamabad
21	Water king	BWG-21	Lahore	15-04-09	mineral water	1.5 Liter	Off 57 ground floor al latif centre main boulevard gulberg III lahore
22	Aqua national	BWG-22	Lahore	15-04-09	Pure Drinking Water	0.6 Liter	Miilli brothers 8-km G T road ferozwal shashtra lahore
23	Active	BWG-23	Lahore	15-04-09	Pure & Natural Water	0.6 Liter	Ali enterprises 160-E Plastic dana market, shah Alam market, Lahore
24	Shine aqua	BWG-24	Lahore	15-04-09	Purified water	1.5 Liter	Wapda town Lahore
25	Gourmet	BWG-25	Lahore	15-04-09	Purified water	1.5 Liter	Gourmet foods 1-5 sundar industrial estate Lahore
26	Abaseen	BWG-26	Peshawar	15-04-09	Pure Drinking Water	0.6 Liter	148, industrial estate Jamroad road Peshawar
27	Aqua water	BWG-27	Peshawar	15-04-09	Pure Drinking Water	1.5 Liter	Nasir bagh road university board Peshawar N.W.F.P Pakistan

### PCRWR LABORATORY TESTING PROTOCOLS

APHA, AWWA and WEF. 1992. Standard Methods for the Examination of Water and Wastewater. American Public Health Association, American Water Works Association and Water Environment Federation, Washington, DC.

<b>Physical</b>	Color, Odor, Taste, pH, Turbidity (NTU), Conductivity ( $\mu\text{S}/\text{cm}$ )
<b>Chemical</b>	Alkalinity (m.mol/l as $\text{CaCO}_3$ ), Arsenic (ppb), Bicarbonate, Calcium (mg/l), Carbonate (mg/l), Chloride (mg/l), Lead (ppb), Hardness (mg/l), Magnesium (mg/l), Nitrate Nitrogen (mg/l),



	Potassium (mg/l), Sodium (mg/l), Sulfate (mg/l), Phosphate (mg/l), TDS (mg/l), Fluoride (mg/l), Iron (mg/l)
<b>Microbiological</b>	Total Coliforms, Fecal Coliforms, E-coli

### WATER QUALITY PERMISSIBLE LIMITS FOR BOTTLED WATER

Sr. #	Parameter	Units	Permissible Limits		
			WHO	IBWA	PSQCA
1.	Alkalinity	(m.mol/l)	NGVS	NGVS	NGVS
2.	Bicarbonate	(mg/l)	NGVS	NGVS	NGVS
3.	Calcium	(mg/l)	NGVS	NGVS	100
4.	Carbonate	(mg/l)	NGVS	NGVS	NGVS
5.	Chloride	(mg/l)	250	250	250
6.	Co lour	Hazen	15	NGVS	5
7.	Conductivity	(µS/cm)	NGVS	NGVS	NGVS
8.	Fluoride	(mg/l)	1.5	3	0.7
9.	Hardness	(mg/l)	NGVS	NGVS	NGVS
10.	Iron	(mg/l)	0.3	0.3	0.3
11.	Magnesium	(mg/l)	NGVS	NGVS	50
12.	Odor	-	Odorless	NGVS	Unobjectionable
13.	Nitrate-N	(mg/l)	10	10	10
14.	pH	-	6.5-8.5	NGVS	6.5-8.5
15.	Potassium	(mg/l)	NGVS	NGVS	10
16.	Sodium	(mg/l)	200	NGVS	50
17.	Sulfate	(mg/l)	250	250	250
18.	Taste	-	Unobject.	NGVS	Unobjectionable
19.	TDS	(mg/l)	1000	500	500
20.	Turbidity	(NTU)	5	NGVS	0.5
21.	Phosphate	(mg/l)	NGVS	NGVS	NGVS
22.	Arsenic	ppb	10	10	10
23.	Total Coliform	MPN/100ml	Nil	Nil	Nil
24.	E-Coli	MPN/100ml	Nil	Nil	Nil

Abbreviations:

- WHO** world Health Organization
- IBWA** International Bottled Water Association
- PSQCA** Pakistan Standards and Quality Control Authority

### SUMMARY OF RESULTS OF PCRWR MONITORING

### CONTAMINANTS OF POTENTIAL CONCERNS FOUND IN BOTTLED WATER BRANDS



PHYSICO-CHEMICAL: ARSENIC				
Sr. No	Brand Name	Code	Unit	Level of Contamination
1.	Crystal	BWG-11	ppb	27
2.	Piyaas	BWG-12	ppb	17
3.	Pino	BWG-13	ppb	11
4.	Nation	BWG-19	ppb	45
5.	Water King	BWG-21	ppb	17
6.	Aqua National	BWG-22	ppb	139
7.	Active	BWG-23	ppb	28
8.	Shine Aqua	BWG-24	ppb	40

**PCRWR TESTING: SAFE BRANDS**

Sr. No	Brand Name	Code	Quality (Safe/Unsafe)	
			Chemical	Microbiological
1.	Nestle	BWG-1	Safe	Safe
2.	Kinley	BWG-2	Safe	Safe
3.	Sufi	BWG-3	Safe	Safe
4.	First	BWG-4	Safe	Safe
5.	Aquafina	BWG-5	Safe	Safe
6.	Maza	BWG-6	Safe	Safe
7.	Legend	BWG-7	Safe	Safe
8.	Avisa	BWG-8	Safe	Safe
9.	Hydropsy	BWG-9	Safe	Safe
10.	Rainbow	BWG-10	Safe	Safe
11.	Al Saudia	BWG-14	Safe	Safe
12.	Life care	BWG-15	Safe	Safe
13.	Dew drops	BWG-16	Safe	Safe
14.	Nectar	BWG-17	Safe	Safe
15.	Alfalah	BWG-18	Safe	Safe
16.	Sparkletts	BWG-20	Safe	Safe
17.	Gourmet	BWG-25	Safe	Safe
18.	Abaseen	BWG-26	Safe	Safe
19.	Aqua water	BWG-27	Safe	Safe

**PCRWR TESTING: UNSAFE BRANDS**

Sr.	Brand Name	Code	Quality (Safe/Unsafe)
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No			Chemical	Microbiological
1	Crystal	BWG-11	Unsafe	Safe
2.	Piyaas	BWG-12	Unsafe	Safe
3.	Pino	BWG-13	Unsafe	Safe
4.	Nation	BWG-19	Unsafe	Safe
5.	Water King	BWG-21	Unsafe	Safe
6	Aqua National	BWG-22	Unsafe	Safe
7	Active	BWG-23	Unsafe	Safe
8	Shine Aqua	BWG-24	Unsafe	Safe

MARKET CONSISTENCY IN TWO NEIGHBORING QUARTERS

Sr. No	Consistent Brands	New Brands	Unavailable Brands
1.	Nestle	Maza	Droplet
2.	Kinely	Legend	Tahoor
3.	Aqua Fina	Avisa	Salsabeel
4.	Sufi	Hydropsy	Pak aab
5.	First	Rainbow	Fiji
6.	Nation	Pino	Everest
7.	Gourmet	Al saudia	Pure vital
8.	Active	Life care	Aqua safe
9.	Crystal	Dew drops	Uni pak
10.	Piyaas	Nectar	Snow mountain
11.	Sparkletts	Al Falah	Classic
12.		Nation	Moya
13.		Water king	Aqua bara
14.		Aqua national	atlantis
15.		Shine aqua	Aqwa
16.		Abaseen	Zindagi
17.		Aqua water	Natural
18.			Ab-e-Hayat
19.			Élan
20.	-		Amfah
21.	-		
22.	-		
23.	-		
24.	-		
25.	-		

DISEASE POTENTIAL FROM CONTAMINATED BOTTLED WATER

Sr. No	Contaminant	Diseases Impacts
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1.	Microbiological Contamination	Cholera, Diarrhea, Dysentery, Hepatitis, Typhoid
2	Arsenic	Cancer (lungs, bladder, skin, prostate, kidney, nose and liver), diabetes kidney diseases, hypertension, heart diseases, birth defects, black foot diseases.
3.	Potassium	Lung cancer, Hyperkalema, Abnormal breakdown of protein

## CONCLUSIONS

Sr. No	Item	Conclusion	
		No.	% age
1.	Total No. Brands Collected	27	100
2.	overall safe brands	19	70
3.	No. of overall unsafe brands	08	30
4.	No. of Chemically safe brands	19	70
5.	No. of Chemically unsafe brands	08	30
6.	No. of Microbiologically safe brands	27	100
7.	No. of Microbiologically unsafe brands	0	0
8.	No. of Consistent brands in Market	11	42
9.	No. of brands disappeared from market	20	74
10.	No. of new brands	17	63

Detailed Water quality status of each bottled water brand is available at Annexure-1

## Chemical and Microbiological Quality of Bottled/Mineral water Brands

## Annexure I

Brand Name	Brand Code	Turbidity	pH	EC	TDS	Ca	Mg	Hard	HCO <sub>3</sub>	Cl	Na	F	PO <sub>4</sub>	Fe	K	NO <sub>3</sub>	SO <sub>4</sub>	As	Coliform	E.Coli
Units		NTU		µS/cm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppb	MPN /100ml	MPN /100ml
<b>PSQCA Bottled Water Standards</b>		0.5	6.5 - 8.5	NGVS	500	100	50	NGVS	NGVS	250	50	0.7	NGVS	0.3	10	10	250	10	Nil	Nil
Nestle	BWG-01	BDL	7.06	320	179	38	7	125	40	73	10	0.31	BDL	BDL	0.5	BDL	15	4.91	Nil	Nil
Kinley	BWG-02	BDL	7.15	558	307	46	14	175	40	130	30	0.1	BDL	BDL	2	BDL	13	0.27	Nil	Nil
Sufi	BWG-03	BDL	7.24	462	254	48	9	155	35	91	9	0.12	BDL	BDL	0.4	1	29	0.55	Nil	Nil
First	BWG-04	BDL	7.25	350	193	44	5	130	20	85	6	0.05	0.06	BDL	6.9	1	15	0.14	Nil	Nil
Aquafina	BWG-05	BDL	7.06	202	111	2	14	65	20	31	12	0.12	0.06	BDL	3.1	BDL	26	0.26	Nil	Nil
Maza	BWG-06	BDL	6.81	291	160	38	2	105	25	71	8	BDL	0.02	BDL	2.4	1	3	0.14	Nil	Nil
Legend	BWG-07	BDL	6.99	295	162	26	4	80	25	61	10	0.03	BDL	BDL	2.9	1.7	7	BDL	Nil	Nil
Avisa	BWG-08	BDL	7.3	312	177	36	4	105	35	65	11	0.07	0.04	BDL	5.9	0.4	21	0.59	Nil	Nil
Hydropsy	BWG-09	BDL	7.19	280	154	10	2	35	40	33	33	0.04	BDL	BDL	6.7	BDL	27	0.19	Nil	Nil
Rainbow	BWG-10	BDL	7.63	310	170	42	2	115	25	81	10	0.03	BDL	BDL	6.2	BDL	14	0.16	Nil	Nil
<b>Crystal</b>	BWG-11	BDL	7.96	430	237	34	12	135	90	33	33	0.27	0.02	BDL	3.2	BDL	73	<b>27</b>	Nil	Nil
<b>Piyaas</b>	BWG-12	BDL	7.97	440	242	22	11	100	115	22	40	0.2	BDL	BDL	2.2	2	40	<b>17</b>	Nil	Nil
<b>Pino</b>	BWG-13	BDL	7.91	430	236	50	15	185	130	49	11	0.13	0.06	BDL	3.1	2	29	<b>11</b>	Nil	Nil
Al Saudia*	BWG-14(A)	BDL	7.47	615	362	86	18	290	255	20	20	0.33	0.05	BDL	5.2	1.7	54	0.5	Nil	Nil
Al Saudia**	BWG-14(B)	BDL	7.09	561	308	34	23	180	160	40	42	0.1	0.05	BDL	1.9	9	31	0.2	Nil	Nil
Life care	BWG-15	BDL	7.67	378	211	38	11	140	165	11	23	0.09	BDL	BDL	3.3	0.7	23	0.95	Nil	Nil
Dew drops	BWG-16	BDL	7.09	340	187	46	1	120	25	89	11	BDL	BDL	BDL	0.6	BDL	8	BDL	Nil	Nil
Nectar	BWG-17	BDL	7.33	437	240	58	11	190	190	10	13	0.18	BDL	BDL	1	5	15	BDL	Nil	Nil
Al Falah	BWG-18	BDL	7.35	610	347	58	32	275	290	27	23	0.21	0.16	BDL	5.6	0.8	24	8.09	Nil	Nil
<b>Nation</b>	BWG-19	BDL	7.71	783	470	58	21	230	255	36	<b>76</b>	0.27	0.09	BDL	4.5	0.8	122	<b>45</b>	Nil	Nil
Sparkletts	BWG-20	BDL	7.4	348	194	46	12	165	165	6	13	0.16	0.17	BDL	0.9	2	12	0.5	Nil	Nil
<b>Water king</b>	BWG-21	BDL	7.23	371	210	22	11	100	160	9	42	0.18	0.05	BDL	1.6	1	24	<b>17</b>	Nil	Nil
<b>Aqua National</b>	BWG-22	BDL	7.43	430	244	52	10	170	200	4	27	0.22	0.16	BDL	2.3	2	20	<b>139</b>	Nil	Nil

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<b>Active</b>	BWG-23	BDL	7.68	277	152	24	12	110	120	4	13	0.37	0.08	BDL	2	0.2	20	<b>28</b>	Nil	Nil
<b>Shine aqua</b>	BWG-24	BDL	7.66	393	229	24	12	110	180	11	42	0.33	0.17	BDL	2.4	2	21	<b>40</b>	Nil	Nil
Gourmet	BWG-25	BDL	6.5	375	206	38	11	140	45	72	18	0.03	0.07	BDL	0.2	0.2	39	0.37	Nil	Nil
Abaseen	BWG-26	BDL	7.55	481	265	46	24	215	180	10	17	0.37	BDL	BDL	1.8	1	40	0.49	Nil	Nil
Aqua water	BWG-27	BDL	7.58	402	198	32	21	165	145	11	17	0.25	BDL	BDL	1.6	BDL	28	0.46	Nil	Nil

\* Bottled from Mardan Cantt

\*\* Bottled from Faisalabad

NGVS =No Guideline Value Set