
CHAPTER 3

PHYSIOCHEMICAL ANALYSIS OF WATER SUPPLIED BY PUBLIC WATER SUPPLY SYSTEM AND GROUND WATER IN CHENNAI METROPOLITAN CITY

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3.1 SAMPLING SITES

For physio-chemical and microbiological evaluation, potable water supplied to households during the period 2005-2006 in Chennai metropolitan city, was used. Water quality in the water source (Porur lake) and in 3 sites in Public Water Supply System (PWSS); for which water is being supplied from Porur lake after treatment at Kilpauk water purification plants were selected for water sampling. The sites selected from the public water supply system were at Anna Nagar, T.Nagar and Adampakkam. These three points were selected based on their distance from the water purification plant at Kilpauk. Viz; Annanagar (Nearest point) → T. Nagar (Middle point) → Adampakkam (Far end). For comparative study Ground Water (GW) was also collected from the above three stations and analysed.

Sl. No.	Public Water Supply System (PWSS)	Ground Water GW
1.	Porur Lake (Source for PWSS)	---
2.	Anna Nagar	Anna Nagar
3.	T. Nagar	T. Nagar
4.	Adampakkam	Adampakkam

3.2 SAMPLE COLLECTION

Water samples were collected for three seasons during the period, January 2005 to December 2006. In Chennai area three distinct seasons are seen Viz.,

Summer months : March - May

Rainy months : September to November

Winter months : December – February

During these periods samples were collected on 1st, 15th and last day of every month. Water samples were collected in to sterile glass bottles of the volume of 1000 ml from the above sampling points. During the collection, temperature of the sample and the environment was recorded. Before sampling the water every sampling tap was sterilized with 75% ethyl alcohol, then the water was allowed to pass for one minute and then the samples were collected in the sterile glass bottles without touching the sampling (Bore well) tap. From Porur lake water sample was collected directly (before treatment). Ground water samples were collected from Annanagar, T.Nagar and Adampakkam from 'Bore well pump' using the procedure as mentioned above to collect water samples from PWSS. Water samples were taken to the laboratory in an aseptic container and used for physio-chemical and microbiological analysis immediately.

3.3 PHYSIO-CHEMICAL ANALYSIS

For Physio-chemical analysis the following parameters were tested in the water samples Viz., turbidity, color, total dissolved solids(TDS), pH, total hardness, calcium, magnesium, chlorides, total alkalinity, total iron, fluoride, sulphate and nitrate. These parameters were analysed as per APHA (1989) (American Public

Health Association) protocols and the results were compared with IS : 10500 drinking water standard.

Outline of protocol used for physio-chemical analysis of water samples

S.No	PARAMETER	TEST PROTOCOL PROCEDURES	Permissible level of physio – chemical constituents as per Indian standard BIS 1991
1	pH	IS 3025 (Pt. 11)	6.5 – 8.5
2	Turbidity	IS 3025 (Pt.10)	10
3	Total Dissolved Solids (mg/L)	IS 3025 (pt. 16)	2000
4	Total Hardness (mg/L) (as CaCO ₃)	IS 3025	600
5	Calcium (mg/L) (as Ca)	IS 3025 (pt. 40)	200
6	Magnesium (mg/L) (as Mg)	IS 3025 (pt. 46)	-
7	Chloride (mg/L) (as Cl)	IS 3025 (pt. 32)	1000
8	Sulphate (mg/L) (as SO ₄)	IS 3025 (pt. 24)	400
9	Nitrate (mg.L) (as NO ₃)	IS 3025 (pt. 34)	100
10	Total Alkanlinity (mg/L)as CaCO ₃)	IS 3025 (pt. 23)	600
11	Iron (mg/L) (as Fe)	IS 3025 (pt 32)	1
12	Fluoride (mg/L)(as F)	IS 3025 (pt 23)	1.5
	Residual Free Chlorine (ppm)	IS 3025 (pt. 26)	0.2

For the estimation of various physio chemical constituent the standard methods according to the protocols given by APHA 1989 was followed. As these procedures are common the details for each procedure is not mentioned.

3.4 RESULTS AND DISCUSSION

An analysis of physio-chemical parameters in the water sample collected from Porur lake Annanagar, T.Nagar and Adampakkam showed variation. (Table 3.1). Turbidity was high in the water samples taken from Porur lake and the turbidity level was less in Annanagar samples as it was close to the Kilpauk water purification plants. In Adampakkam water samples, the turbidity was relatively higher when compared to other stations. The further the water supply unit from purification system, the greater level of physio-chemical constituents. In ground water the turbidity level was less. But in the water supplied by PWSS and Porur lake turbidity level was higher than the WHO permissible limits. Other parameters like pH, total suspended solids calcium, fluoride, sodium, chloride were within permissible limit. Due to chlorination for water treatment the down of the water had chlorinous odour.

Hence the present study clearly indicates that the water supplied by public supplier system and the ground water the people use are safe and most of the characters tested were within the permissible level. The variation in different sampling sites is due to local environmental influence and it does exceed the normal range.

Table 3.1 Physio chemical characteristics of potable water in Porur lake and at three public supply sites selected and in the ground water in Chennai city

Parameter	Drinking water Permissible Limit BIS:10500-1991	SOURCE OF WATER		PUBLIC DISTRIBUTION				GROUND WATER				
		PORUR LAKE		ANNANAGAR	T.NAGAR	ADAMBAKKAM	A.NAGAR	T.NAGAR	ADAMBAKKAM			
Colour	25 Units											
Odour	Unobjectionable	Nil		Chlorinous	Chlorinous	Chlorinous	Nil	Nil	Nil			Nil
Turbidity (NTU)	10	21		12	18	23	5.8	9.8	4.9			
pH	6.5 - 8.5	7.4		7.3	7.3	7.5	7.2	7.3	7.8			
Total Dissolved Solids (mg/L)	2000	210		225	230	217	631	927	1047			
Total Hardness (mg/L) (as CaCO ₃)	600	103		105	103	105	298	184	571			
Calcium (mg/L) (as Ca)	200	21		24	18	20	48	32	129			
Magnesium (mg/L) (as Mg)	-	10		11	11	9	21	26	61			
Chloride (mg/L) (as Cl)	1000	45		41	38	38	102	279	128			
Sulphate (mg/L) (as SO ₄)	400	32		30	23	25	43	64	24			
Nitrate (mg/L) (as NO ₃)	100	4		4	3	4	24	21	14			
Total Alkalinity (mg/L) (as CaCO ₃)	600	47		48	51	55	117	122	236			
Iron (mg/L) (as Fe)	1	0.2		0.15	0.25	0.1	0.2	0.45	0.3			
Fluoride (mg/L) (as F)	1.5	0.12		0.1	0.12	0.1	0.8	0.4	0.35			