

**PHYSICO-CHEMICAL ANALYSIS OF SURFACE WATER SAMPLE
FROM PASHAN LAKE, PUNE. (MAHARASHTRA). INDIA.****Nirbhay S.Pimple* and Pranjali S. Amrujkar**

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Pune-4.**ABSTRACT**

Pashan lake is an artificial lake built in 1990 to accommodate the water requirement of the neighbourhood. Its 12 kms from the city center of Pune. It has a catchment area of 40 square kilometers. The present study was undertaken to study the physico-chemical parameters of water samples collected from lake. The physicochemical parameter like, temperature, pH, total dissolved solids (TDS), turbidity, dissolved oxygen (DO), total alkalinity (TA), total hardness (TH), calcium (Ca⁺⁺) magnesium (Mg⁺⁺), sodium (Na⁺), potassium (K⁺), chloride (Cl⁻), was determined. The results were compared with standards prescribed by WHO (1973). It was found that the water samples collected from (Jan 2014-Dec 2014) showed contamination .All

sample showed physicochemical parameters above the water quality standards (except in the month of June-August) and the quality of water is very bad and it is unfit for drinking purpose. The reason behind this contamination is the human interference and the use of water for washing clothes and vehicle inspite the area being less populated compared to the other part of Pune city.

KEYWORDS: Surface Water, Physicochemical Parameter, Pashan Lake, Contamination.**INTRODUCTION**

Water is the prime life supporting component of the abiotic factor on which the entire life cycle of biotic forms is dependent. Water dissolves more than 95 components from the environment. Water is needed for almost every physiological process of biotic factor.

The principal source of water is rainfall. Water flow or surface flow in our country takes place through 14 major rivers and water is also collected in dams and lakes which from the

major source of drinking water. Any change in the physical, chemical and biological properties of water leads to great disturbance in the biotic component as well as disturb the equilibrium of the nature. Heavy metals are priority toxic pollutants that severely limit the beneficial use of water for domestic and industrial application. The lakes have complex and fragile ecosystem, as they do not have self cleaning ability and therefore readily accumulate pollutants. In the present study Pashan lake from Pune district was selected which is located at latitude 18.533752° N and longitude 73.785717° W, having surface elevation of 589 m. The major purpose of selecting this Lake was it has no direct influx of water from any water bodies in the area. There is a large anthropological activity which is carried out around the lake. Researchers have done Study on Physicochemical and Biological characteristic of Standing and Running Water Resources.^[1-4]

MATERIALS AND METHODS

For the present study the water samples were collected from the lake for a period of twelve months for the year (Jan 2014-Dec2014). The experiment was planned and undertaken. The temperature was recorded at the time of sampling on the site using centigrade thermometer.

Preparation of Water Samples

Every fortnight between 10:30am-12:30pm from the Month of (Jan 2014 upto Dec 2014) the water sample were collected for physico-chemical examinations, based on the standard procedure different methods of collection and handling were adopted. The samples were collected in plastic canes of five liters capacity without any air bubbles. The samples were kept in refrigerator maintained at 08°C. The sample collected and stored was further used for assessment of physicochemical parameter status of ground water are given in **Table 1**. Estimated in the Laboratory was carried out by using Standard Methods.^[2, 3, 5]

Physico-Chemical Analysis

All The reagents used for the analysis were AR grade and double distilled water was used for preparation of solution.^[6] Analysis was carried out for various water quality parameters such as Temperature, pH, total dissolved solids (TDS), dissolved oxygen (DO), free CO₂, total alkalinity (TA), total hardness (TH), calcium (Ca⁺⁺) magnesium (Mg⁺⁺), sodium (Na⁺), potassium (K⁺), chloride (Cl⁻), salinity.

RESULTS AND DISCUSSION

The physico-chemical parameters of the water sample were calculated, and are tabulated as below.

Temperature (T) in °C

The measurement of temperature is one of the most primary factors, since it affect the chemistry and biology of all biotic factors. Temperature is an important biologically significant factor, which plays an important role in the metabolic activities of the organism.^{[7,}

^{8]} The temperature was ranging from 21.60°C to 31.03°C during the Period from (Jan2014 upto Dec 2014). The maximum temperature was recorded in the Month of May and lowest in the month of December.^[9, 10]

pH

It is the scale which measures the intensity of acidity and alkalinity of water measures the concentration of H⁺ ions. pH of water is an important environmental factor which affect the biology and the life cycle of the biotic life..The variation of pH directly affects the life processes of biotic flora and fauna inhabiting the water bodies.^[7, 11] Most of the water samples are slightly alkaline due to presence of carbonates and bicarbonates. The pH values of water samples for the period Jan 2014 upto Dec 2014) varied between 9.7 to 5.6 and were found above the limit prescribed by WHO.^[12] The higher range of pH indicates higher productivity of water.

Dissolved Oxygen (DO) in mg/L

The amount of oxygen in the lake depends on the extent of direct contact between water and air and on the circulation of water and on the amount produced and consumed by the biotic component of the lake. Dissolved oxygen is important parameter in water quality assessment as it regulates many metabolic and physiological processes of biotic components. The DO values indicate the degree of pollution in water bodies. The DO values varied from 6.8 to 4.8. The lower concentration of dissolved oxygen is a sign of organic population in the lake.^[4, 5] Carbon dioxide presence in the water is the result of respiration of aquatic flora and fauna harboring the water body. Carbon dioxide is extremely important in a minimum quantity for growth and development of flora.^[11] The average carbon dioxide content calculated for Pashan lake ranges from 10mg/lit-1mg/lit. Free CO₂ in water form carbon acid, which after dissociation gives H⁺ thus increasing pH.^[13]

Total Alkalinity

The Alkalinity of water calculated for Pashan Lake in the present study ranges from 112 mg/L to 338mg/L. Alkalinity can be defined as the capacity to neutralize a strong acid and it is normally due to the presence of salts like bicarbonate, carbonate and hydroxide compound of calcium, sodium and potassium. The results clearly indicate the presence of sodium and potassium salts due to methyl orange alkalinity.^[14, 15]

Total Hardness

Hardness of water is due to presence of bicarbonates ions. In case of Pashan lake the total hardness ranges from 111mg/lit to 234mg/lit, which is in permissible limit as stated down by WHO.^[12] Similar work was carried out on water quality by researchers.^[14, 15]

Chloride

The Concentration of Chloride with reference to Pashan lake ranges between 16mg/lit-33mg/L which is in permissible range. Excess chloride is the indicator of pollution due to sewage water. Since there is no influx of sewage water in the lake the range of chloride is very less and hence the water is not at all salty to taste.^[16, 17] also carried out similar studies on the Chloride content in water bodies.

Total Dissolved Solids

The total dissolved content ranges from 428mg/L-620mg/L which is 50% of the value stated by WHO.^[12] Higher concentration affects the clarity of water and directly affects the penetration of solar energy up to the bed of the lake, thus promoting decaying process. The water is not suitable for drinking purpose. Similar studies were carried out by researchers.^[18,19]

Calcium and Magnesium

Concentration of calcium and magnesium in case of Pashan lake ranges from 19mg/L-34mg/L and 6mg/L-17mg/L respectively which is in permissible range. Related studies were done by researchers.^[10, 20]

Salinity

The present study shows the variation in salinity as per the season and it ranges between 43.33mg/L-134.73mg/L. Salinity affects the taste of the water. Salinity is a good indicator of pollution.^[13, 20]

Sodium and Potassium

In case of Pashan lake it was found out that the range of sodium and potassium are above the permissible range. The major source of potassium increased the polluted water due to disposal of wastewater. The lake is the source for washing clothes, animals and vehicles for the people of the area. This would be the major reason for the high concentration of these salts in the water body.^[21]

Table 1: Average Results of the Physicochemical Parameters of Pashan Lake For the Year (Jan 2014-Dec 2014)

S. No.	Parameter	WHO	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1.	Temp(°C)	-----	21.2	22.8	25	27.3	30.5	26.2	26	26.2	25	27.2	25.2	20.5
2.	pH	6.5-9.00	5.4	6.2	8.7	9.1	9.3	9.0	8.7	7.6	8.7	9.6	9.0	6.3
3.	DissolvedOxygen (mg/lit)	> 4	0.00	0.00	6.3	6.8	7.3	5.8	5.4	6.0	5.4	4.7	6.5	0.00
4.	Free CO2(mg/lit)	10	1	2	3	4	6	3	3	2	3	2	3	1
5.	TotalAlkalinity (mg/lit)	200	135	140	336	345	366	115	110	109	133	175	162	155
6.	TotalHardness(mg/lit)	300	187	209	231	247	271	111	104	118	131	172	183	184
7.	Chloride	200	21	26	27	31	33	21	18	16	17	19	20	21
8.	TDS	1000	568	580	618	638	639	452	435	426	514	523	540	552
9.	Calcium	100	31	29	33	34	33	28	24	19	25	30	34	33
10.	Magnesium	30	10	12	15	16	17	14	13	08	06	07	09	11
11.	Salinity(Mg/lit)	250	104.73	113.21	123.33	128.17	134.73	76.84	54.17	41.33	72.21	87.34	93.21	97.03
12.	Sodium	200	262	271	274	275	273	174	161	146	136	178	194	202
13.	Potassium	----	8.22	9.00	10	10.65	10.53	7.3	6.2	4.6	3.8	7.6	8.00	8.13

CONCLUSION

The above study which was carried out from (Jan2014-Dec 2014) clearly shows that all the parameters which were analyzed showed permissible amount of concentration. Since there is no influx of sewage water, the water shows concentration of various salts below the average level which is extremely important factor and the water can be used for drinking purpose by boiling and filtrations. If the human anthropological activities could be stopped it would be a great source of drinking water.

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