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Study Of Physico-Chemical Parameters To Assess The Water Quality Of Bilawali Talab, Indore City (M.P.)

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Abstract

This study has been done during 2013-14 to find out the different parameters of water because the physical & chemical parameters are supports the water body assessment. Chemical analysis of any sample of water will give us a complete picture of its physical and chemical constituents. pH affected by air temperature and mixing of sewage. Biological oxygen demand increases by the organic pollution and disposal of water from agricultural land. The value of chemical oxygen demand provides a direct measure of state of pollution in water bodies. As Bilawali talab is surrounded by so many small villages, agricultural lands and marriage gardens so we need to assess the water quality.

Key words: Physico-chemical parameters, Water quality, Bilawali talab, Assessment

Introduction

Life doubtless originated in Water. It makes up 71% of earth's surface and represents the most extensive medium for animal life. Water is a transparent fluid which forms the world's streams, lakes, oceans and rain. It is the major constituent of the fluids of living things.

Water is one of the abundantly available substances in nature. It is an essential element of our body & also a factor indispensable to our economic and social development. It is the basic and primary need for all vital life processes and it is now well established that the origin of life first took place in aquatic environment. It is a necessity for life and provides a variety of uses from drinking water in cities to the irrigation of crops in agricultural areas. Water also provides recreational uses as well as habitat for wildlife. Rivers and streams are very important natural environment and linked to human lives, animals and vegetations.

Water pollution is a major global problem which requires ongoing evaluation and revision of water resource policy at all levels (International down to individual aquifers and wells). Water is typically referred to as polluted when it is impaired by anthropogenic contaminants and either does not support a human use, such as drinking water or undergoes a marked shift in its ability to support its constituent biotic communities, such as fish. Natural phenomena such as volcanoes, algae blooms, storms and earthquakes also cause major changes in water quality and the ecological status of water. Water pollution may be analyzed through several broad categories of methods: physical, chemical and biological.

Physical testing: Common physical tests of water include temperature, solids concentrations e.g., total suspended solids (TSS) and turbidity.

Chemical testing: Water samples may be examined using the principles of analytical chemistry. Many published test methods are available for both organic and inorganic compounds. Frequently used methods include pH, Biochemical oxygen demand (BOD), Chemical oxygen demand (COD), nutrients (nitrate and phosphorus compounds), metals (including copper, zinc, cadmium, lead and mercury), oil and grease, total petroleum hydrocarbons (TPH) and pesticides.

Biological testing: Biological testing involves the use of plant, animal or microbial indicators to monitor the health of an aquatic ecosystem. They are any biological species or group of species whose function, population or status can reveal what degree of ecosystem or environmental integrity is present.

Limnological studies were carried out by many workers like, Kumar & Singh (1997), Omchandra & Balsare (1980, Sinha & Das (1993), Sharma et al. (2007), S.V. Rama Rao, V.P. Singh, L.P. Mall (1978), Pathak, Mudgal L.K. (2005), Dutta & Sharma S.(2002).

Material & Method

Study Area

The well known industrial capital and thickly populated city of Madhya Pradesh, Indore situated in the western part of Madhya Pradesh. It is situated between 22°20" N latitude and 75°25" E to 75°15" E longitude. The presently investigated area the Bilawali talab is situated in 1,823 fit above mean sea level in the south of Indore city. It is situated 6 km. away from Indore in Madhya Pradesh. The catchment area of talab is 117 ha. This talab was completely made in 1914 by Maharaja Tukoji Rao Holkar under the supervision of Sri Gaddes. After its completion, the talab was connected to pipliyapala talab by means of a canal near the Limbodi village. It is based on the plan of the contemporary resident Shri Bhojket in 1905. The talab used to provide water to the textile industries in the past. Now-a-days the talab caters to the need of a particular area for its various uses like drinking, fish culture etc.

Sampling Stations

The present study was conducted for the period of one year from September 2013-August 2014. This study was carried out at four selected sampling stations identified in the East, West, North and South.

For the assessment of water quality following parameters such as Water temperature, Hydrogen Ion Concentration (pH), Dissolved Oxygen (D.O.), Biochemical Oxygen Demand (B.O.D.), Chemical oxygen demand (C.O.D.), Total Hardness were estimated. Following physico-chemical parameter were estimated as per methods given in APHA (2002), Welch (1998), Trivedi and Goel (1986), and Golterman (1978).

Result

Temperature

In the present study water temperature ranges from 20-38.9°C. The minimum water temperature was recorded at station IV in December and maximum value was recorded at station I in June.

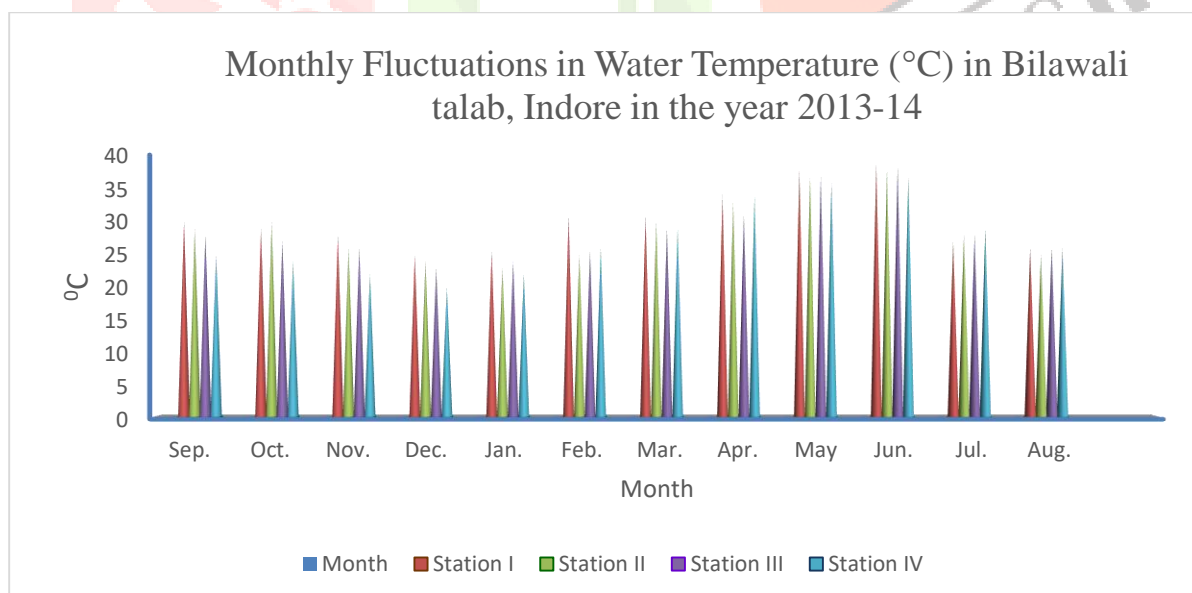
Table 1.

Monthly Fluctuations in Water Temperature (°C) in Bilawali talab, Indore (Station wise) in 2013-14

Month	Station I	Station II	Station III	Station IV
Sep	30	29	28	25
Oct	29	30	27	24
Nov	28	26	26	22
Dec	25	24	23	20
Jan	25.5	23	24	22
Feb	30.9	25	25.5	26
Mar	30.9	30	29	29
Apr	34.1	33	31	34
May	38	37	37	36
Jun	38.9	38	38.5	37
Jul	27	28	28	29
Aug	26	25	26	26

Graph 1.

Monthly fluctuation in water Temperature (°C) in Bilawali Talab, Indore from 2013-14



pH

pH fluctuated between 7.4 to 8.9. The minimum pH was recorded at station I in April and the maximum pH was recorded at station IV in October & at station III in December.

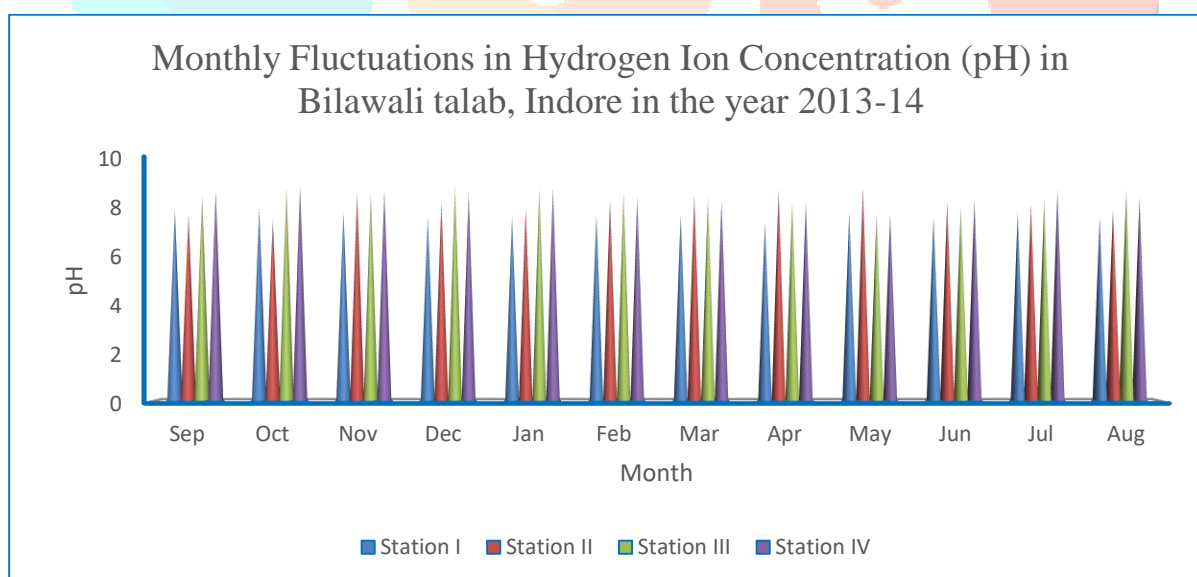
Table 2.

Monthly Fluctuations in Hydrogen Ion Concentration (pH) in Bilawali talab, Indore in 2013-14

Month	Station I	Station II	Station III	Station IV
Sep	7.9	7.7	8.5	8.7
Oct	8	7.5	8.8	8.9
Nov	7.8	8.6	8.6	8.7
Dec	7.6	8.2	8.9	8.6
Jan	7.6	8	8.8	8.8
Feb	7.7	8.3	8.6	8.4
Mar	7.7	8.5	8.4	8.3
Apr	7.4	8.7	8.2	8.2
May	7.8	8.8	7.7	7.7
Jun	7.6	8.2	8	8.3
Jul	7.8	8.1	8.3	8.7
Aug	7.6	7.9	8.7	8.4

Graph 2.

Monthly fluctuation in Hydrogen Ion Concentration (pH) in Bilawali Talab, Indore from 2013-14



Dissolved Oxygen

In general dissolved oxygen varied between 6.9 – 9 mg/l. The minimum value was recorded at station I in June and the maximum dissolved oxygen value was recorded at station IV in December.

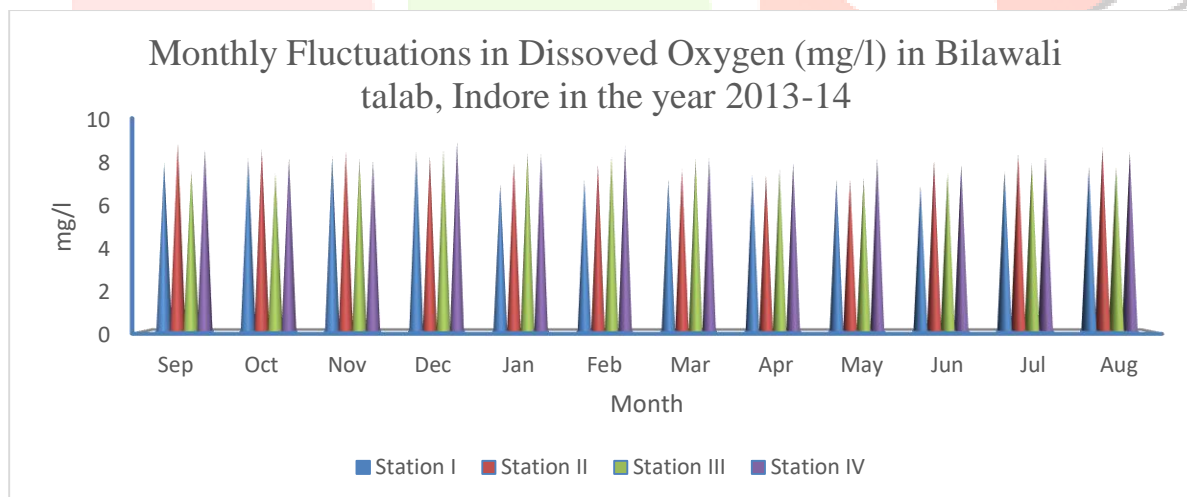
Table 3.

**Monthly Fluctuations in Dissolved Oxygen (mg/l) in
Bilawali talab, Indore in 2013-14**

Month	Station I	Station II	Station III	Station IV
Sep	8	8.9	7.6	8.6
Oct	8.2	8.6	7.5	8.2
Nov	8.3	8.5	8.2	8.1
Dec	8.5	8.3	8.6	9
Jan	7	8	8.5	8.4
Feb	7.2	7.9	8.3	8.8
Mar	7.2	7.7	8.2	8.2
Apr	7.4	7.4	7.7	8
May	7.2	7.2	7.3	8.2
Jun	6.9	8.1	7.5	7.9
Jul	7.6	8.4	8	8.3
Aug	7.8	8.7	7.8	8.5

Graph 3.

**Monthly fluctuation in Dissolved Oxygen (mg/l)
in Bilawali Talab, Indore from 2013-14**



Biochemical Oxygen Demand

The biochemical oxygen demand value fluctuated between 2 – 3.9 mg/l. The minimum biochemical oxygen demand value was recorded at station IV in December and the maximum value was recorded at station III in October.

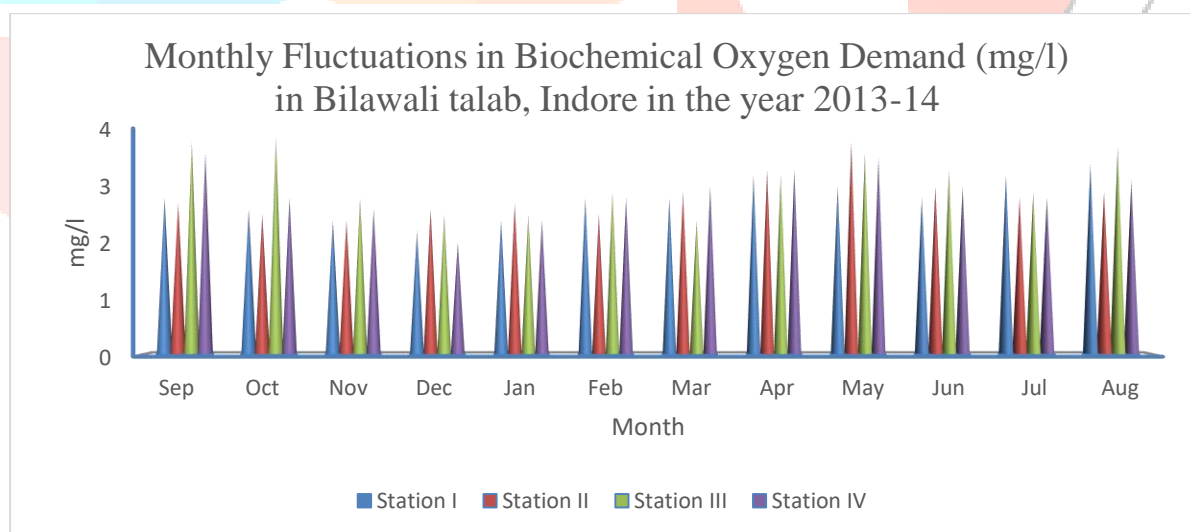
Table 4.

Monthly Fluctuations in Biochemical Oxygen Demand (mg/l) in Bilawali talab, Indore in 2013-14

Month	Station I	Station II	Station III	Station IV
Sep	2.8	2.7	3.8	3.6
Oct	2.6	2.5	3.9	2.8
Nov	2.4	2.4	2.8	2.6
Dec	2.2	2.6	2.5	2
Jan	2.4	2.7	2.5	2.4
Feb	2.8	2.5	2.9	2.8
Mar	2.8	2.9	2.4	3
Apr	3.2	3.3	3.2	3.3
May	3	3.8	3.6	3.5
Jun	2.8	3	3.3	3
Jul	3.2	2.8	2.9	2.8
Aug	3.4	2.9	3.7	3.1

Graph 4.

Monthly fluctuation in Biochemical Oxygen Demand (mg/l) in Bilawali Talab, Indore from 2013-14



Chemical Oxygen Demand

The value of chemical oxygen demand fluctuated between 18-55 mg/l. The minimum chemical oxygen demand was recorded at station-I in December and the maximum value was recorded at station-III in July.

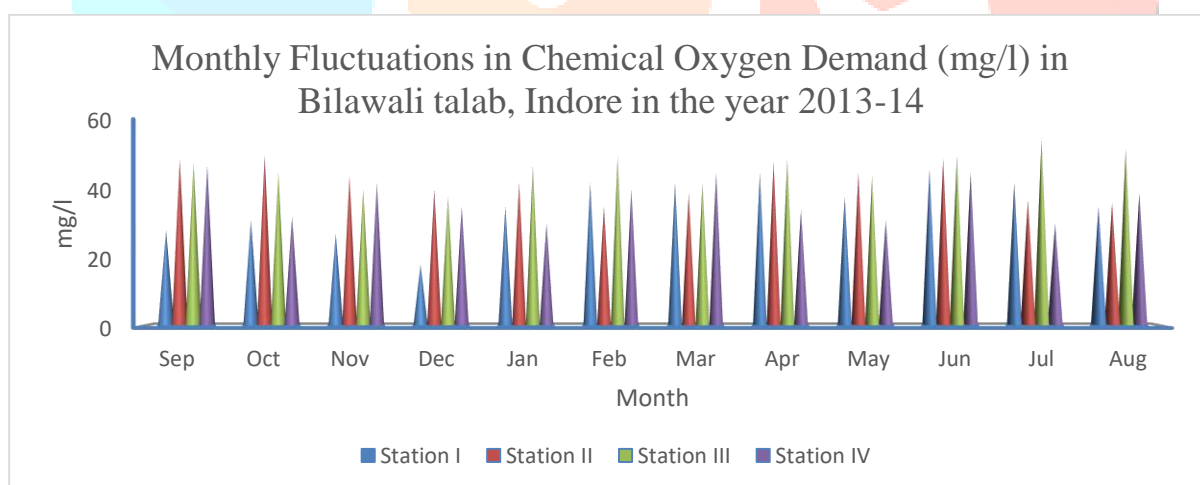
Table 5.

**Monthly Fluctuations in Chemical Oxygen Demand
(mg/l) in Bilawali talab, Indore in 2013-14**

Month	Station I	Station II	Station III	Station IV
Sep	28	49	48	47
Oct	31	50	45	32
Nov	27	44	40	42
Dec	18	40	38	35
Jan	35	42	47	30
Feb	42	35	50	40
Mar	42	39	42	45
Apr	45	48	49	34
May	38	45	44	31
Jun	46	49	50	45
Jul	42	37	55	30
Aug	35	36	52	39

Graph 5.

**Monthly fluctuation in Chemical Oxygen Demand (mg/l)
in Bilawali Talab, Indore from 2013-14**



Total Hardness

The total hardness varied between 100 – 255 mg/l. The minimum total hardness was recorded at station I in December and maximum total hardness at station I in June.

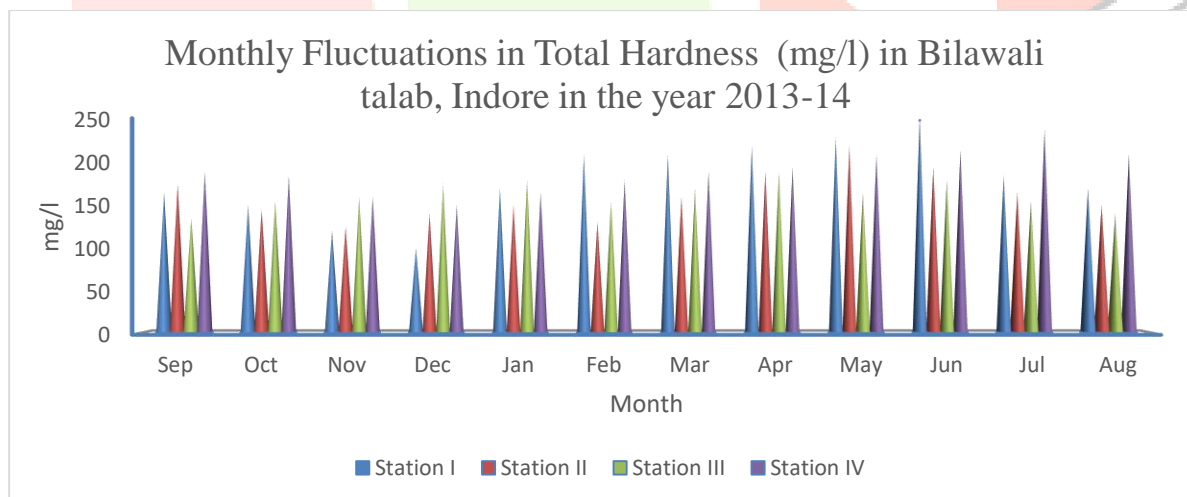
Table 6.

**Monthly Fluctuations in Total Hardness (mg/l) in
Bilawali talab, Indore in 2013-14**

Month	Station I	Station II	Station III	Station IV
Sep	165	175	135	190
Oct	150	145	155	185
Nov	120	125	160	160
Dec	100	140	175	150
Jan	170	150	180	165
Feb	210	130	155	180
Mar	210	160	170	190
Apr	220	190	190	195
May	230	220	165	210
Jun	255	195	180	215
Jul	185	165	155	240
Aug	170	150	140	210

Graph 6.

**Monthly fluctuation in Total Hardness (mg/l)
in Bilawali Talab, Indore from 2013-14**



Discussion

The Temperature is one of the most important factor in an aquatic environment and profoundly influences the nature of water body. pH is greatly affected by photosynthetic activity of aquatic plants, by exposure of air temperature, disposal of sewage and disposal of industrial water etc. Dissolved Oxygen is important for aquatic system and also essential for the metabolism in the organisms. There are two main sources of dissolved oxygen in water i.e. by diffusion from air and photosynthetic activity. Biochemical oxygen demand is an index of organic pollution and help in deciding the suitability for water consumption. (BOD) was measured of the degraded organic material present in water sample and defined as the amount of oxygen required by the micro-organism in stabilizing the biologically

degradable organic matter under aerobic conditions. Chemical Oxygen Demand (COD) test determines the oxygen requirement equivalent of organic matter that is susceptible to oxidation with the help of a strong chemical oxidant. It is important, rapidly measured parameters as a means of measuring organic strength for streams and polluted water bodies.

Chemical oxygen demand (COD) gives us a reliable parameter for judging the extent of pollution in water. COD is the measure of the oxygen required for chemical oxidation of organic matter. The water that consumes considerable quantity of soap produce lather and / or that also produces scale in hot-water pipes, heaters, boilers and utensils used for cooking is called as hard water. Hardness is caused by divalent metallic ions that are capable of reacting with soap to form precipitates with anions present in water to form scale.

Conclusion:

The temperature is found maximum in June due to summer season. pH & Dissolved oxygen were found maximum in December because in winter, the aquatic flora were grown properly in bilawali talab so that the rate of photosynthesis also increased that is why these two parameters increased. By the heavy rainfall in 2013, the water of agricultural lands discharges in this talab so the organic pollution were increased and due to this Biological oxygen demand found maximum in October. In summer so many marriages held in the gardens near to this talab that is why organic matter increased and we got the high Chemical oxygen demand in July. The maximum value of total hardness in june is due to continuous leaching an accumulation of salts in the absence of flow in summer months. From the above findings, the impacts of socio-biological and anthropogenic activities on the water quality is clear now.

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