" ManSagar Lake"- Study of the water and associated Soil Quality, by analyzing their various Physico-Chemical Parameters

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Abstract- :-"Mansagar Lake", popularly known as "Jalmahal" is located in the heart of Jaipur City and is a very renowned Ecologically important Wetland Site too. The Mansagar Lake is a manmade water body, created by damming Darbhawati river on the northern side of the Nahargarh Fort around 1610 A.D. by Raja Man Singh First, the then ruler of Amerfor irrigation and recreation. In 1962, the Sewage from the Walled City of Jaipur was diverted into the lake as it was no more used for recreation and the palace has been abandoned. Pollution problems presides in the Lake due to the Inflow of Waste Water by the increasing flow of partly treated wastewater and untreated wastewater with severe contamination. All this leads to the alteration of the various Physico Chemical Parameters of the water body as well as the accumulation of the heavy metals resulting in the various phenomenon like Eutrophication of the water body, Deposition of Silts and the pronounced deterioration of the Water Quality. Characteristics of water bodies influence the quality of water individually and in combination with various pollutants, thereby, affecting the living organisms present there (Srivastava et al., 2003; Smitha et al., 2007).. The Physico-Chemical study conducted about Water and Soil revealed variable ratios, which include diverse range of Ph, EC, TDS, Chloride, Hardness, Alkalinity, Acidity, D.O., BOD, Fluoride and, Nitrate of the WaterBody alongwith thePhysico-Chemical Characteristics of the Soil Bed of the Lake which includes the parameters like Ph, EC and, others include its Moisture Content and the presence of the percentage of Organic Matter and Organic Carbon in the soil.

Index Terms- Physico –Chemical Parameters, Wetland Site, Waste Water, Water Quality, Eutrophication.

I. INTRODUCTION

Water Quality testing and Monitoring is considered as very Important and needed approach in the present scenario. There are many Water Bodies surrounding us nearby and at far distances too, but it becomes more important when the water source is itself Ecologically precious and also having a great consideration towards Economic, Aesthetic and as well as Archaeologically important Heritage. "Jalmahal" or, "ManSagar-Lake" is that place which has all the above valuable characteristics. So, it becomes naturally very important and a curious issue for masses to know about it, preserve it and have to maintain its Ecological Balance by encompassing all the desired proceedings in conserving this monument as well as the two most

valuable natural resource, "Water" and the "soil". "Mansagar Lake" is an Ecologically versatile Wetland Site, where several Important Migratory Bird Species comes every year. It is their nesting, breeding and playing site which gives a treat to the Ornithologists and many nature lovers to watch them. Its wetland area is vast and spreading all around the Monument. Sight Seeing is very famous for all the tourists who come here. Many Fish Species resides inside the Water Body. On the other hand one more crucial aspect is this water body is becoming and obviously had became a partially treated and mostly untreated Sewage water dumping site. If the Waste Water is put straight in the Surface Water, Wells, Streams, Lakes or even Sea without any treatment it will inevitably pollute that water(Asia and Akporhonor, 2007). All the waste water from the Walled City and nearby area is dumped into it. Two main Nalas, one is the BrahmpuriNala from the city area and other is NagtalaiNala open their chanelling waste water inside the Jalmahal or the Mansagarlake. Resultantly, all this destroyed the Water Quality of the Lake and impacts the associated livingorganismsinside it. The effect of pollutants on the Biological Community can be considered as an early warning system for Potential Pollutants.(Walsh *et al.*, 1980). The vast sufferers are the Fish Population and other Aquatic Organisms residing in it. Once we loose fish species alongwith their afloated dead bodies accumulated the cause of Water pollution and its poisoning. In any case addition of undesirable substances from various sources into the Water Bodies cause alteration to the Physical, Chemical and Biological characters of water and give rise to conditions, which disturb the Ecological Balance(Wisdom, 1956). "Eutrophication", on the other hand is the severe impact in the Water Body and according to Vollenwieder (1968), reviewing the literature on Eutrophication of Lakes and flowing waters, pointed out that the Domestic Sewage is a major source of Eutrophication.There is a two way impact taking place, one Waste water usage in nearby agricultural areas plus circulation of various contaminants from nearby Industries and agricultural runoff into the body. This all is very crucial rising problem for the lake, its water, associated soil, living organisms, illegal agricultural practices by using untreated water from it. Keeping in view all the above considerations, Water and Soil of "ManSagar Lake" were tested seasonally over the Year by measuring their various Physico-Chemical Parameters.

II.   MATERIAL AND METHOD

The water and soil samples were collected seasonally during the winter in the month of February, summer (May), Monsoon (August) and during post monsoon((November). A year round analysis had been done for the two natural resources. Water samples were collected in clean sterilized plastic bottles and soil samples in the clear plastic bags. Water and Soil samples taken from the Mansagar Lake were analysed for various Physico-Chemical Parameters including pH, EC, TDS, D.O, B.O.D, Total Hardness including Calcium and Magnesium too; Chloride, Acidity, Alkalinity, Fluoride, Nitrate and pH, EC, Moisture percent, %Organic Matter , %Organic Carbon and chloride respectively. All the experiments were performed in the Research Laboratory of Indira Gandhi Centre for HEEPS, University of Rajasthan, Jaipur.

Result and Discussion

Physico-Chemical analysis of the   water of "ManSagar Lake"(Jalmahal) for complete one year in all the four seasons:-

s.no.	Parameter	February	May	August	November
1.	pH	7.73±0.11	7.70±0.015	7.49±0.015	8.25±0.032
2.	E.C.(µmho/cm)	1.96±0.041	1.99±0.015	1.97±0.01	1.80±0.020
3.	T.D.S.	1612.33±0.577	1589.67±0.577	1721.33±1.527	1715.67±0.577
4.	D.O.	4.066±0.057	4.033±0.152	4.76±0.152	4.26±0.057
5.	B.O.D.	239.33±1.154	229±1.00	234±1.732	199.33±1.154
6.	Total Hardness	713±1.732	644.66±0.577	729.66±1.527	722.66±1.527
7.	Calcium Hardness	402.33±0.577	414±1.00	430.33±0.577	423.66±0.577
8.	Magnesium Hardness	310±1.00	230.66±1.154	299.33±1.154	299±1.00
9.	Chloride(Salinity)	360.1±0.10	398.68±0.586	402.03±0.028	398.38±0.545
10.	Alkalinity	501.33±1.527	520±1.00	519.66±1.527	398.33±1.527
11.	Acidity	125.33±1.527	119±1.00	117.66±1.527	116.66±1.154
12.	Fluoride(ppm)	0.233±0.020	0.31±0.01	0.40±0.011	0.36±0.015
13.	Nitrate(ppm)	2.26±0.115	2.13±0.057	2.26±0.152	2.2±0.10

Table 1: Physico-Chemical Analysis of the water in "ManSagar Lake"(Jalmahal).
(*Rest all Values are in Mg/l) (Mean± Standard Deviation)

S.no.	Parameter	February	May	August	November
1.	pH	7.16±0.047	7.9±0.173	8.36±0.057	7.6±0.346
2.	E.C.(µmho/cm)	1.13±0.012	1.14±0.015	1.98±0.037	1.19±0.015
3.	%Moisture	38.53±0.040	35.67±0.090	40.36±0.603	34.43±1.463
4.	%Organic Matter	3.32±0.193	3.48±0.025	1.58±0.087	3.67±0.083
5.	%Organic Carbon	1.84±0.017	2.02±0.015	0.92±0.051	2.13±0.049
6.	Chloride(Salinity)(mg/l)	35.99±0.012	35.02±0.080	32.40±0.577	34.48±0.518

Table 2: Physico-Chemical Analysis of the Soil of "ManSagar Lake" (Jalmahal).
(Mean ±Standard Deviation).

The above Year round analysis of the Water and Soil samples from Jalmahal, clearly depicts about their deteriorating quality. While considering the water sample first and taking its pH value it shows its alkaline nature which is lower(7.70±0.015) in the month of May and greater(8.25±0.032) in the month of November. Since the pH range 5-9 is suitable for the survival of aquatic life (Lloyd, 1960), therefore enormous amount of aquatic flora and fauna sustained here. Electrical Conductivity is the measuring amount of impurities in the Water sample. There is fluctuating range of the conduction which is more than the normal range, so in terms of purity water contains impurities in many forms which are dissolved inside in it and also makes it turbid too. Here the value of Total Dissolved Soilds is more than the permissible range according to the WHO(1984) and thus makes water unsuitable for the usuage like in irrigation purposes.

Maximum TDS observed in the month of August(1721.33±1.527) due to the accumulation of the particulate material from surrounding hilly areas in Monsoonic Climate . D.O and B.O.D of the water body show the present ongoing water quality destruction and deteriorating status for the survival of aquatic life. Dissolved Oxygen in terms of life survival supports the aquatic life but on the other hand the Biochemical Oxygen Demand (B.O.D) is much more coveted by the microbial polulation which demands more oxygen and show their great status inside the water body. All this leads to the condition of the oxygen depletion , low light penetration and the process of "Eutrophication" of the water body. In terms of Hardness water of Jalmahal is hard including calcium and magnesium ion accumulation which makes the water profile hard . one reason for this condition is the ca. and mg. ion

accumulation by surrounding rock felt hilly area and another is by inlet of used domestic waste water which includes detergents, soap and other similar residual material which makes it hard. Total Hardness is higher in the month of August (729.66±1.527). Large concentration of chloride is an indicator of organic pollution of water (Venkatasubramani and Meenambal, 2007). Concentration of Chloride in the water exceeds the range. Highest range has been observed in the month of August (402.03±0.028).Increasing acidity or alkalinity may make some poisons present in water more toxic (Lloyd, 1960). Many associated reasons and altered patterns of rainfall and temperatue ranges are responsible for the Acidic or Alkaline conditions of the water body. Here the values of Alkalinity are observed higher as compared to the acidity. (520±1.00) and, (125.33±1.527) (Alkalinity and Acidity) in the month of May and February respectively. Concentration of Fluoride impacts the water and living environment directly and indirectly both. Highest conc. Of Fluoride is observed in the month of August(0.40±0.011) and lowest in the month of February(0.233±0.020). All are withing the permissible range. Slightly varying from month to month. Nitrate conc. Is also very limited and low in the water samples collected. Lowest as (2.13±0.057) to highest as much as only (2.26±0.152) (2.26±0.115) in May and August, February respectively.

Soil Quality and Characteristics impacts the associated life either it is microbial life or the Plant life. And itself is impacted by the Quality of water seeps inside it. The soil samples analyzed here are from the soil bed of the Mansagar Lake, which are associated with the water body and thus also reflects the current Physico Chemical status of the soil of the agricultural fields which receives or are irrigated by the untreated water of the Mansagar Lake. Soil is alkaline in nature supporting the plants and to some extent microbial life. pH of the soil is higher in the month of August(8.36±0.057) and lowest in the month of November (7.6±0.346). The range of Electrical Conductivity varies from (1.13±0.012) to (1.98±0.037). Percentage of Moisture in the soil at the time of measurement is medium, highest (40.36±0.603) with fluctuating values according to the moisture availability in them to the lowest upto(34.43±1.463) in the month of November. Percent amount of Organic Matter and Organic Carbon is very important for the growth and support of the Flora as well as soil micro organisms which rely upon it. It distinguishes about the condition of the soil quality and its nutritive status which tells about the soil condition, whether it is supportive for the life associated with it or not. Total amount of percentorganic matter recorded highest is in the month of November(3.67±0.083) and amount of percent Organic Carbon inside it is highest in the month of November only which is (2.13±0.049). This indicates that the nutritive percentage of Organic Matter is appropriate to somewhat extent for the cultivation. This availability of nutrition inside the soil is due the presence of some amount of Nitrate in the water body and also due to the presence of small amount of trace ions resides into the water from the surrounding outlets of the various Industries and, most importantly by the accumulation of the Domestic Waste Water inside the water body its enrichment value too increases. Chloride concentration varies from(32.40±0.577) in the month of

August to the (35.99±0.012) mg/l in the month of February and thus depicts the saline conditions of the Water Body.

III.   CONCLUSION AND RECOMMANDATIONS

The above studied Physico Chemical Parameters of Water and Soil of "ManSagar Lake" (Jalmahal) clearly depicts the ongoing contamination and deteriorating Water as well as the Soil Quality therein. For preventing further pollution the inlet Domestic Sewage should be treated before discharging it inside the Water Body. Beside this the nearby Industrial effluents should be checked priorto disposal. For the soil,theirshould be restrictions for directly using the untreated and partially treated Waste Water. These little and vital important efforts will surely be helpful in maintaining the Heritage of the structure plus the two most important natural resources viz. Water and Soil which are associated with it.

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