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RESEARCH ARTICLE

Physicochemical Analysis of Son River, at Bansagar Devlond, Shahdol (M.P.) India

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ABSTRACT

Fresh water is prime necessary for fit & healthy living Dam and River water is used for miscellaneous purpose such as – for drinking, bathing etc. This natural resource is being polluted by increasing human development activities and by indiscriminate disposal of waste, effluents from Industries as industrial waste and many anthropogenic activities which effect & disturb the quality of the Dam and River. The piece of investigation is carried out to study the water quality & suitability of Bansagar Dam, Devlond, Shahdol for irrigation and drinking purpose. This study is don during 2019-20 to assess seasonal variations is the water of the lake/Dam by observing different physico-chemical parameters.

Therefore, it is very necessary for monitoring the water quality of a Dam by analyzing of Various physico–chemical parameters. The purpose and objectives of the study (on the seasonally) and physic-chemical parameters of Bansagar Dam (at Sone River) at Bansagr (Devlond), Shahdol, Madhya Pardesh, India.

Different variable dates of samples are collected under prescribed limits – suggested by world Health organization, Indian standard institute and other standard Indian agencies… desirable limit for irrigation, drinking etc. purpose. Seasonality variation in physical and chemical parameters like pH, D.O. (dissolved oxygen), COD (Chemical oxygen demand), BOD (Biochemical oxygen demand), EC (Electrical Conductivity), Turbidity, Dissolved organic matter, Total hardness, total alkalinity etc. In water were analyzed for a seasonally period. The analysis of the water quality parameters of the Dam (Bansagar Dam) Clearly indicated high pollution load on the Dam / River water. To maintain the sound environment and healthy ecosystem of the Dam and the surrounding areas, proper management and monitoring of water quality of the Dam is needed.

Keywords- : Bansagar Dam, water quality, physico-chemical characteristics, pollution, BOD, COD etc.

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INTRODUCTION

Water is one of the essential elements for the origin, existence and sustenance of life on Earth. It is regarded as raw material for civilization water is a precious natural gift and is an planet Earth. Hydrological cycle means continuous circulation of water between the different spheres of the environment. Due to rapid development, highly urbanization and industrialization together with the Lack of wisdom to live in harmony with nature, has led to the deterioration of quality of water thus resulting in water Pollution. Any degradation in natural water quality making the water unfit for intended use. Hence suitability of water for various purposes needs to meet different quality standards. Water is an essential resource component for all kinds of lives from micro-organism to man. The unplanned urbanization and industrialization (Singh et al., 2002) has resulted in over use of environment (Petak, 1980) in particular of water resource. Everyone is facing a crises situation (has made) to get clean water is a serious problem.

Water bodies like Rivers, Ponds, Dams, Reservoir, lakes etc. are subjected to pollution comprising of organic and inorganic matter (constituents) Dam water also necessary for healthy lining which is used for different purposes such as drinking, bathing, irrigation industrial use, aquaculture etc. A Dam can also be used to collect water or for storage of water which can be evenly distributed between locations. This natural resource is being polluted by indiscriminate disposal of sewage, industrial waste and human activities which affect quality of Dam (River) water – Therefore, it is necessary for monitoring the water quality of river/Dam by analysis of various physico-chemical parameters. (Bhatnagar et al. 2002) studies physico – chemical analysis of some water samples in Rewa city (M.P.), India.

The overall result of study indicate that water quality at Rewa region is not good and major cause of pollution is population density and obviously discharge of domestic sewage domestic effluents, agricultural runoff in the area. (Kanse at al. 2005) studied the physico-chemical characteristics of flowing water of major rivers in pune city.

Monitoring of quality of water is imitative step to be taken up for the management and conservation of any aquatic ecosystem. Hence, an assessment was conducted to relevant limnological conditions of Bansagar Dam located in Shahdol District.

STUDY AREA:-

The Bansagar Dam (at Sone river) site is located 0.5 km of devlond bridge across Sone river, 51 kms away from Rewa city, on rewa-Amarkantak state way/Highway and 109 kms away from the District head quarter shahdol Madhya Pradesh State of central India. The river drains 71259 km^2 area (Rao 1995) and joins the Ganga about 30 km upstream city of Patna. The Dam lies on 24'11'30^N latitude and 81'17'5'$_E$ longitude. Left flank of the Dam is located in Satna District & right flank in Shahdol District. Power house of the dam is located in Rewa & Shahdol districts. Bansagar Dam is a multipurpose river value project on Sone River situated in the Ganges Basin in MP, India with both irrigation & 435 MW of hydroelectric power generation. The height & length of Dam is 67 meters & 1020 meters. The catchment area of the dam is 18648 km^2. The water of this dam is used for irrigation & fish culture. Bansagar Dam on Son River is a Joint Venture of the state of Madhya Pradesh, Uttar Pradesh and Bihar who are sharing the cost as well as benefits from the project. The reservoir feeds to eight canal systems having a total length of 478 kms. The Dam water was sampled at near main gate of the Dam (Station – A), Centre of the Dam, near Sapta, Old Mahadev temple (station B) and near vijaysota railway bridge (Station C).

MATERIAL AND METHODS:-

To study the water quality and its seasonal variations, the water samples are collected from the surface at a depth of 20 cm. from three different station (points) integrated and a representative sample was taken. Samples of water were collected during morning hours in between 8 : 30 to 10 : 30 am. With one litre containers from the Dam in three seasons i.e. during summer, monsoon and winter seasons

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from Dec. 2018j to August 2019. Sampling was done at three sites. Some of the results were recorded at the sampling sites whereas the others were recorded in the laboratory. The parameters observed were air and water temperature, relative humidity, Dissolve oxygen (DO), Total Dissolved Solid (TDS), Free CO_2, pH, Conductivity and Hardness of the Dam water. Samples of the water for Physicochemical characteristics were analysed according to standard methods of APHA (1998 & 2005).

RESULTS & DISCUSSION: -

Present paper results pH, EC, DO, BOD, COD, Turbidity, Dissolved organic matter, Total hardness, Total alkalinity for Sone River water of Bansagar Dam Deolond, Beohari, Shahdol, Madhya Pradesh, India.

Hydrogen Ion concentration (pH): -

pH plays vital role of examining the quality of water assessment as it has great influence on biological and chemical processes in the water body (Ahmed et al. 2011) In the study area the pH of water collected at Bansagar Dam site of 03 seasons of 2019 year. Ranged from 6.73 to 8.62, The highest pH was found 8.62 and the lowest pH was found 6: 73. The pH values were within the permissible level set by CPCB i.e. 6.5 to 8.5, its express the Bansagar Dam (at sone river) water pH was moral, pH=>7 But all these pH values at different seasons of year were within the permissible limit.

There were not significance variations in pH values in this analysis. Due to loss or gain of dissolved gases such as CO_2 and O_2, affect value of pH change quickly. pH measure of the alkanity or acidity of water sample (Afrin et al. 2011) these study are water was weak alkaline. The pH is in alkaline ranged which can be due to presence of alkali metals.

Dissolved oxygen (DO): -

Dissolved oxygen is a most important aquatic parameter. It is vital fauna, It plays an important role in the respiration process. DO in adequate quantity is necessary for good water quality. In the present study, the DO values ranged from 6.8 mg/L to 7.9 mg/L. Previous studies reported by Benerjee (1967) and Torzwell (1957), stated that the DO concentration 5 mg/L (approx.) (standard limit 5 mg/L as per WHO (1984). Throughout the year was found to be productive for fish culture. As DO levels in water drop below 5.0 mg/L, many life forms are put under pressure (Bowman et al., 2008). For the determining the water quality criteria of an aquatic system, the value of dissolved oxygen is remarkable. Dissolved oxygen is one of the most important parameters in water quality assessment and reflects the physical and biological processes prevailing in the water (Trivedi and Goel, 1984). When water body is highly polluted due to big amount of organic matter, a lot of DO would be rapidly consumed in the biological aerobic decay which would affect the water quality, the decreased DO in water would affect the aquatic lives. (Chhatwal, 2011). Any forms of life cannot sustain without oxygen. DO is an excellent indicator of water quality.

Chemical Oxygen Demand (COD):-

Chemical Oxygen Demand is a measure of the oxidation of reduced chemicals in water. It is commonly used to indirectly measure the amount of organic compounds in water (Kumar et al. 2011). The measure of COD determines the quantity of organic matter found in water. This makes COD useful as an indicator of organic pollution in surface water. (Faith, 2006) COD values are always greater than BOD values. Chemical Oxygen Demand was found to be 6 mg/L to 60 mg/L in 2019. High COD and BOD Value indicates organic pollution. In the present investigation COD showed higher than BOD values at all the water sample than BOD values at all the water sample throughout the period of investigation. Relatively maximum COD may cause oxygen depletion on reason of decomposition by microbes to a level detrimental to aquatic Life (Ravindra and Kaushik 2003). Therefore Dam's water wasn't relatively safe for drinking and aquatic ecosystem during study session. Showed high COD of water due to massive municipal, Agricultural off, Sewage and industrial activities around the Dam/River.

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Bio-Chemical Oxygen Demand (BOD)

Biochemical Oxygen Demand is a measure of the oxygen in the water that is required by the aerobic organisms. The biodegradation of organic materials exerts oxygen tension in the water and increases the biochemical oxygen demand (Abida, 2008) BOD tests measures only biodegradable fraction of the total potential DO consumption of a water sample. High BOD levels indicates decline in DO, because the oxygen that is available in the water is being consumed by the bacteria leading to the inability of fish and other aquatic organisms to survive in the River (Pathak and Limaye, Zoll). The BOD value was in the range of <1 mg/L to 5.6 mg/L so BOD values are within the permissible limit i.e. 6.0 mg/L as prescribed by WHO (1991).

Electrical Conductivity:-

Conductivity itself is not a aquatic or human health concern because it is simply and easily measured. It is an indicator of (other) water quality problems. If conductivity suddenly increases of a water body it means source of dissolved ions in the vicinity.

Thus measurement of conductivity can be used as a quick way to check water quality problem. If dissolved solids are higher value means greater the ions amounts in water (Bhatt et al., 1999) Increasing levels of conductivity and Cations are the products of decomposition and mineralization of organic materials (Abida, 2008) In present study, minimum 153 μmhos/cm and maximum 548 μmhos/cm in 2019, all data of EC within limits prescribed by WHO (1400 μs/cm and hence fit, for irrigation. Thus proper treatment is required before releasing to the sewage.

Turbidity:

It had a range from 1 NTU to 8 NTU in August 2019 during post monsoon it was low and during monsoon season it was high. Water turbidity fluctuated between the lowest in January 2019 and highest recorded in August 2019. Higher Turbidity affects the life indirectly as it cut of light which is utilized by plants for photosynthesis there by lowering the rate of primary productivity. (Verma et al., 2012) thus our results are supported by previous workers.

TDS:

The TDS value ranged from 92 to 338 mg/L. The lowest value of TDS was found in winter season and highest value of TDS was recorded in rainy season. The values are within per mission limits (BIS – 1995) (WHO – 1982) Total hardness of water is not a parameter of pollution but of water quality mainly terms of Ca^{++} and Mg^{++} above 200 mg/L total hardness is not suitable for the purpose of domestic uses. Hence present study values found are under the permissible range as per prescribed by WHO, BIS and ICMR.

Total Alkalinity: -

The pH is in alkaline ranged which can be due to presence of alkali metals. Alkalinity of water is a major of its capacity to neutralize acids and provide index nature of salt present in the samples. Total alkalinity of water samples ranged from 36 mg/L to 180 mg/L. The low value of alkalinity shows absence of weak & strong bases such as carbonate, bicarbonate, and hydroxides.

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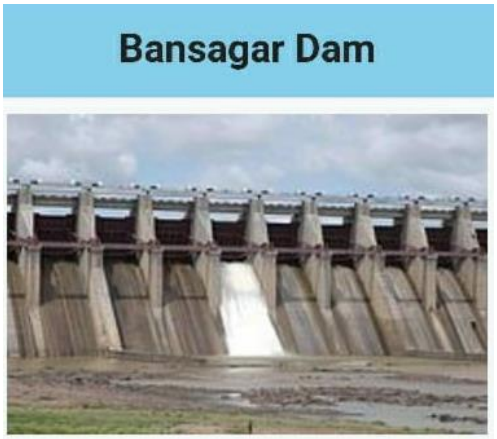

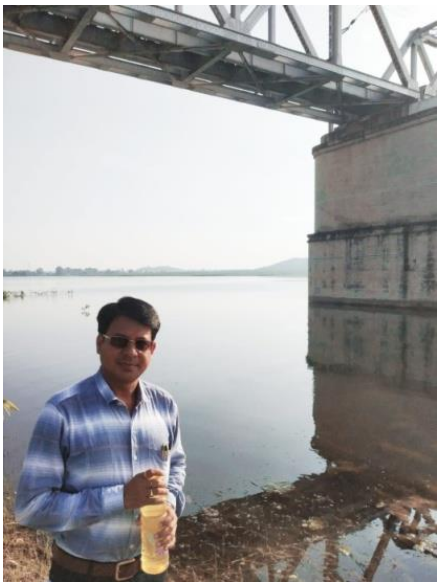

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TABLE – 1 WATER QUALITY ANALYSIS (SUMMER)
Note : Values are in mg/L, otherwise stated.

S. No.	Parameters	Dam Water Station – A (Near old Mahadev temple Sapta)	Dam Water Station –B (Near Dame main gate)	Dam Water Station –C (Near Railway Bridge Vijaysota Railway Station)
1.	Colour	Colourless	Colourless	Colourless
2.	Odour	Odourless	Odourless	Odourless
3.	Taste	Tasteless	Tasteless	Tasteless
4.	Temperature	25^0C	26^0C	28^0C
5.	Turbidity (NTU)	3	9	5
6.	PH	8.62	6.99	7.48
7.	Alkalinity (mg/L)	56	60	102
8.	Total Solids	92	119	177
9.	Total hardness	14	22	94
10.	DO	7.9	7.2	7.4
11.	Free CO_2	Nil	4.4	2.6
12.	BOD	>1	2.4	1.8
13.	COD	8	16	12

TABLE – 2 WATER QUALITY ANALYSIS (RAINY)
Note : Values are in mg/L, otherwise stated.

S. No.	Parameters	Dam Water Station – A (Near old Mahadev temple Sapta)	Dam Water Station –B (Near Dame main gate)	Dam Water Station –C (Near Railway Bridge Vijaysota Railway Station)
1.	Colour	Colourless	Colourless	Colourless
2.	Odour	Odourless	Odourless	Odourless
3.	Taste	Tasteless	Tasteless	Tasteless
4.	Temperature	25^0C	26^0C	28^0C
5.	Turbidity (NTU)	4	1	8
6.	PH	6.86	7.23	6.73
7.	Alkalinity (mg/L)	42	36	68
8.	Total Solids	128	110	132
9.	Total hardness	68	54	82
10.	DO	7.7	7.4	7.9
11.	Free CO_2	Nil	Nil	2.9
12.	BOD	<1	1.4	2.2
13.	COD	6	10	16

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TABLE – 3 WATER QUALITY ANALYSIS (WINTER)
Note : Values are in mg/L, otherwise stated.

S. No.	Parameters	Dam Water Station – A (Near old Mahadev temple Sapta)	Dam Water Station –B (Near Dame main gate)	Dam Water Station –C (Near Railway Bridge Vijaysota Railway Station)
1.	Colour	Colourless	Colourless	Colourless
2.	Odour	Odourless	Odourless	Odourless
3.	Taste	Tasteless	Tasteless	Tasteless
4.	Temperature	25^0C	26^0C	28^0C
5.	Turbidity (NTU)	1	4	3
6.	PH	7.41	7.37	7.09
7.	Alkalinity (mg/L)	150	164	152
8.	Total Solids	338	289	270
9.	Total hardness	190	176	168
10.	DO	7.8	7.4	6.8
11.	Free CO_2	1.6	1.6	2.2
12.	BOD	1.8	4.8	5.6
13.	COD	16	52	60

CONCLUSION: -

To understanding Physicochemical and Biological conditions, the management of water bodies are essential overall productivity of a Dam (water body) is directly regulated by Physicochemal parameters. From the above study and investigations, it may be concluded that the values of different physico – chemical parameters are in the range prescribed by WHO, BIS, ICMR. So, the water of Sone River Dam at Deolond Shahdol can be conveniently used for both irrigation and fish culturing purposes.

Thus, we can conclude that the Sone River Dam/Bansagar Dam getting seriously polluted due to agricultural run off, untreated sewage and effluents from industries and residues of insecticides, weedicides, Pesticides etc. used in the agriculture (cultivation farms) these toxic substances accumulate in the food chain, food web which might be very dangerous hazards in long run. These elements have been discussed and become a research topic. Present deterioration and pollution from nearly anthropogenic inputs. Therefore, any future pollution should be reduced and this, of course, should involve the authority to control the pollution sources that would aggravate the pollution levels of Bansagar Sone Dam strict law enforcement and regular monitoring is needed to develop a trategy to manage the environmental hazards due to these Toxic elements and to improve environmental protection of this area. Our present data should serve as baseline for further reference. From the Physico-chemical analysis of Bansagar Dam (at Sone River), it has been concluded that PH, EC, DO, BOD, COD etc. are higher concentration in some sites compared to prescribed range by WHO, BIS etc.

These effluents must not be thrown in the nearby water bodies or in the soil without proper treatment high level of these effluents causes environmental problems and affect plants, animal and human life.

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