

# LIMNOLOGICAL STUDY OF WATER OF BHEEMGARH DAM, CHHAPARA DISTRICT SEONI (M.P.)

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**ABSTRACT:-** The present study was aimed to investigate limnological parameters of water of the Bheemgarh dam Chhapara, Seoni. Bheemgarh dam that is also known as Sanjay Sarovar Bandh is built up on the Wainganga river in Chhapara tehsil of Seoni district of Indian state of Madhya Pradesh. The Bheemgarh Sanjay Sarovar Dam is located 43km away from the Seoni. It is known as the biggest mud/Earthen dam of Asia. It is situated 22°20'41"N 79°36'16"E. It has an average elevation of 611metres (2004 feet). The city is 2,043 ft. above the sea level, half-way between Nagpur and Jabalpur. Limnological study was performed to know the present status of water of Bheemgarh Dam from January 2015 to December 2015. Some physico-chemical parameters were also performed including surface water temperature, turbidity, pH, dissolved oxygen, hardness, alkalinity, phosphate and nitrate content. The unmanaged and unwanted anthropogenic activities of surrounding population of the area are deteriorating the quality of water continuously.

**KEYWORDS:** Physicochemical parameters, turbidity, anthropogenic activities, Limnological study.

## INTRODUCTION:-

Water is one of the indispensable renewable natural resources, used for domestic, industrial, irrigation, and electricity generation. Any changes in the water quality are due to the combination of natural and anthropogenic factors like inputs from agriculture, discharge of sediments from erosion and urban and industrial runoff (Huang et al., 2014). These sources hampers the quality of water and its use for agriculture, domestic and aesthetic. Major threat to the domestic use of water is through microbial contamination (Joshua et al., 2015; Matta, 2014). Most of the rivers cater's dam for electricity generation and public water supplies. Hydroelectricity emerged as one of the best alternative for power generation to satisfy the ever-increasing

human demand for electricity and domestic use in a sustainable way (ICOLD,2000).

Water is an inert compound therefore it transport various essential elements unchanged into the cells of biotic components. The water has the properties of cohesion and adhesion due to which high surface tension is advantageous for the existence of many organisms in the water surface.

The water has high specific heat which enhances the water bodies to resist more fluctuation of temperature than the land. Due to this reason the aquatic organisms are not adapted for wide range of temperature and are vulnerable to temperature changes. Water has also high latent heats of vaporization and fusion which is helpful to various organisms found in water bodies.

Water is essential for life on earth without it, life is impossible. Water, due to its great solvent power, is constantly threatened to get polluted easily. The requirement of water in all forms of lives, from micro-organisms to man, is a serious problem today because all water resources have been reached to a point of crisis due to unplanned urbanization and industrialization (Singh, *et. al.* 2002). Aquatic ecosystem is the most diverse ecosystem in the world. The first life originated in the water and first organisms were also aquatic where water was the principal external as well as internal medium for organism. The inter-relationship between the physico-chemical parameters and plankton production of dam water and its relation with fluctuation of zooplankton are of great importance and basically essential fish culture. Fishes are dependent on physico-chemical parameters. Any changes of these parameters may affect the growth, development and maturity of fish. Different casual influences, which determine the quality of water, show a characteristic change from season to season.

The water body is a eutrophic dam where the amount of nutrient is very high and oxygen depletion is prominent (Varughese *et al.*, 2004). Anaerobic conditions predominate throughout extensive areas of highly eutrophic lakes observed by Hutchinson (1975). Hypolimnion is often observed with the phenomenon of frequent oxygen depletion with the consequent increase in BOD, COD reported by Pani and Misra (2000). Johri (1990) studied the limnological and water quality status of two lakes of Bhopal. Saxena (1990) assessed the limnological and water quality status of Lower Lake of Bhopal.

The present study Beemgarh dam water some physico-chemical parameters were analysed such as surface water temperature, turbidity, pH, dissolved oxygen, hardness, alkalinity, phosphate and nitrate contents. The unmanaged and unwanted activities of surrounding population of the area are deteriorating the dam water quality continuously.

#### MATERIAL AND METHODS:- STUDY AREA

Bheemgarh dam also known as Sanjay Sarovar Bandh is built Across the Wainganga river in Chhapara tehsil of Seoni district of Indian state of Madhya Pradesh. The Bhimgarh Sanjay Sarovar Dam is located 43 km away from the Seoni. It is known as the biggest Mud / Earthen dam of Asia. It is situated 22°20'41"N 79°36'16"E. It has an average elevation of 611 metres (2004 feet). The city is 2,043 ft. above sea-level, half-way between Nagpur and Jabalpur. It is bordered by Jabalpur, Narsinghpur and Mandla districts to the north, Balaghat to the east and Chhindwara to the west and the shares its southern boundary with Nagpur (Maharashtra). National Highway No. 7 connects the Kanyakumari-Banaras passes through the district from north to south. Fair weather roads connect the major towns in the district. The narrow gauge Chhindwara- Nainpur Central Railway passes through Seoni connecting Jabalpur, Nagpur, Chhindwara, Balaghat, Katani, Keolari and Nainpur. The problems of pollution at many other place, is due to sewage inflow, animal carcasses, plastic bags etc. Lake has always been the most important fresh water resources along the banks of which our ancient civilizations have flourished and most developmental activities are still dependent upon them. Dam water has

multiple uses in every field of development like agriculture, aquaculture etc. The present study was conducted from January 2015 to December 2015.

#### Salient features of dams are:

1) Catchments area	-	2007.75 Sq. Km.
2) Submerged area	-	105253Hect.
3) Total Length	-	3870.06M.
4) Top width of bundh	-	330.25mt.
5) Population of affected	-	5655 families
6) Maximum annual rainfall	-	1748.00mm
7) Minimum annual rainfall	-	647mm
8) Average annual rainfall	-	1225.00mm
9) Cost	-	243.478Crore

Note: This data was collected from irrigation department of Seoni district of Madhya Pradesh.

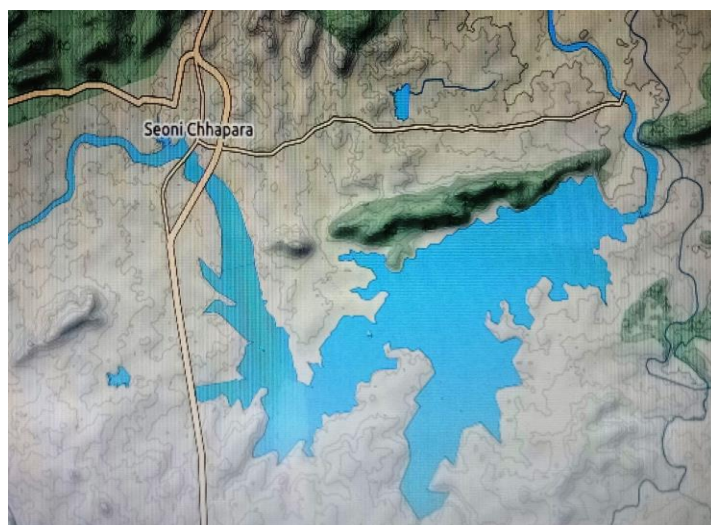


FIG.1. MAP OF BHEEMGARH DAM STUDY SITE

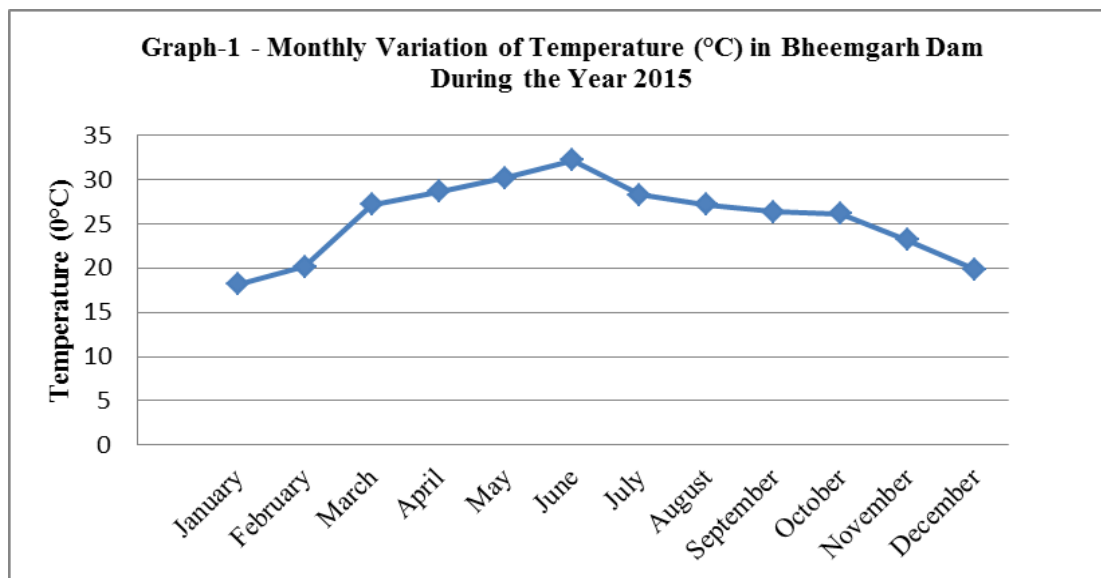
Water samples were collected monthly in the morning between 8-10 am from surface layer of the dam. Physicochemical and biological analysis of water samples were performed following standard methods of APHA, AWWA, WPCI (2005).

#### RESULTS AND DISCUSSION:-

The physicochemical analysis of water of Bheemgarh dam as shown (Table 1) describes the ranges of various parameters various parameters including water temperature, pH, DO, total hardness, alkalinity, phosphate and nitrate as reported in the present study. The detail description of each parameter is as under:

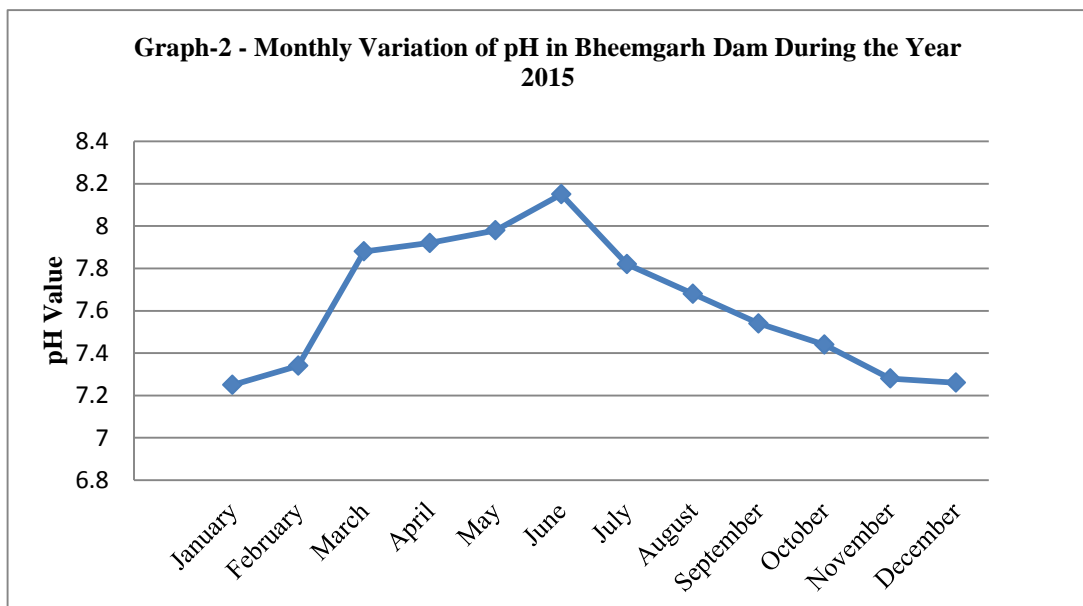
**Water temperature ( $^{\circ}\text{C}$ ) –**

The water temperature range reported in the present study period from Jan. 2015 to Dec. 2015 was between  $18.16 \pm 0.14^{\circ}\text{C}$  to  $32.14 \pm 0.18^{\circ}\text{C}$ . Similar observations were reported by Jayabhaye *et al.* (2006), Salve and Hiware (2006). From the results it was observed that according to the climatic conditions the range of temperature increases from January to June and then decreases from June to December. Maximum temperature was reported in the month of June and minimum temperature was reported in the month of January as shown (Table 1 and Graph 1).



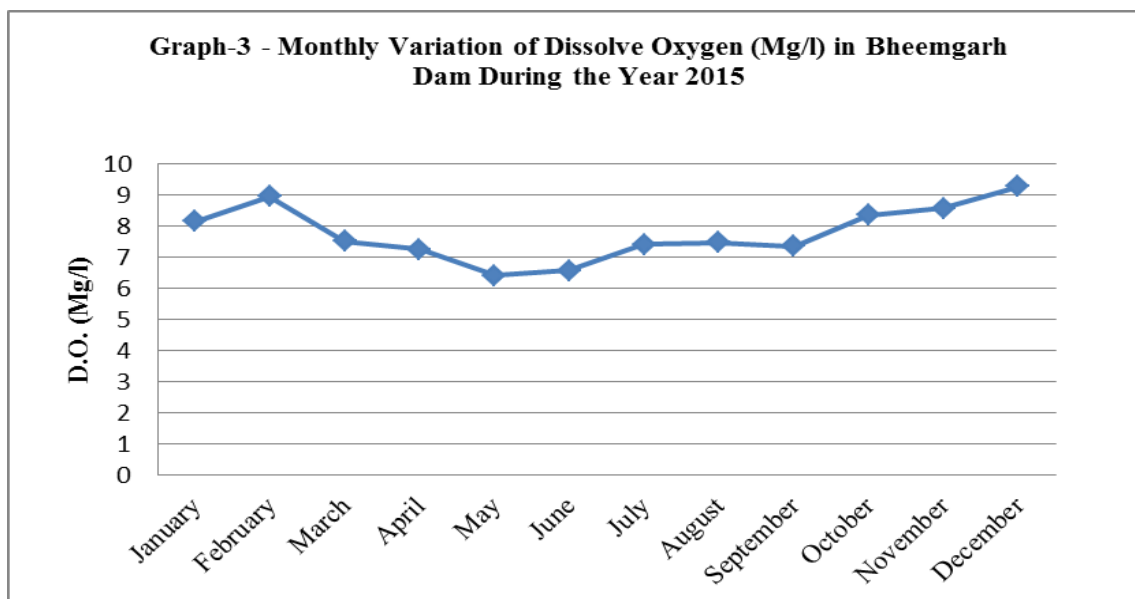
**pH –**

The pH values ranges reported during the study period was between  $7.25 \pm 0.10$  to  $8.15 \pm 0.08$ . The maximum pH value was recorded in the month of June and minimum pH value was in the month of January. The pH value was found to be alkaline throughout the study period as shown (Table 1 and Graph 2). Similar pH values were also reported by Kumari *et al.* (2013) in Narmada dam; Kar *et al.* (2010) in Hirakund dam and Bhatt *et al.* (2014) in Sukhnag water body.



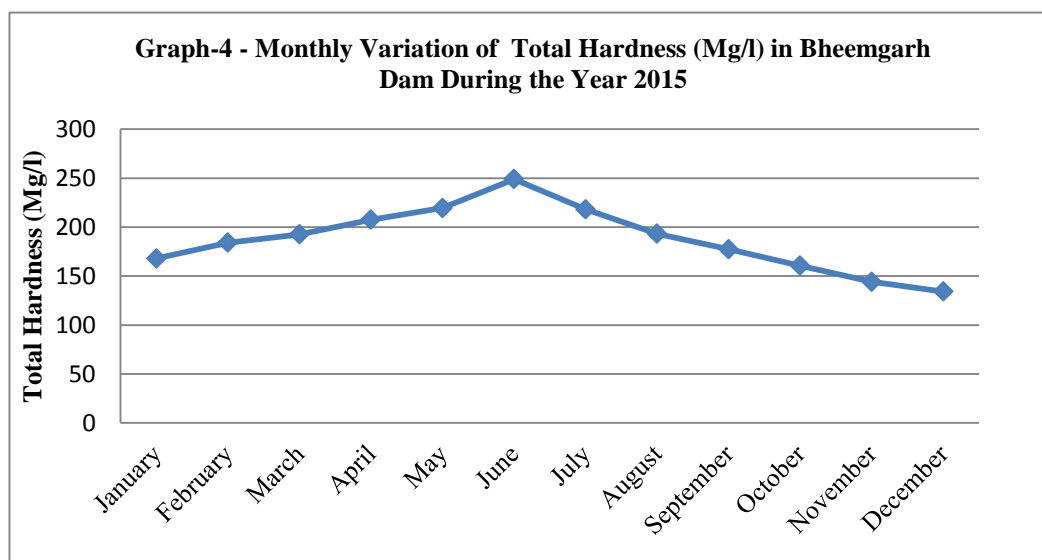
**Dissolved Oxygen (Mg/l) –**

The value of dissolved oxygen (DO) of the water of this dam fluctuates from  $6.42 \pm 0.19$  mg/l to  $9.28 \pm 0.19$  mg/l in the study period (Jan, 2015 to December, 2015). The maximum DO values were recorded in the month of December (Winter season) and minimum value in the month of May (Summer season). The sun light intensity increases during summer seems to accelerate photosynthesis by phytoplanktons for utilizing  $CO_2$  and giving off oxygen. This accounts for the greater quality of  $O_2$  recorded during summer. The quantity of DO was reported to be slightly lesser during winter season (Table 1 and Graph 3). Almost similar observations were reported by Ahmed and Krishnamurthy (1990).



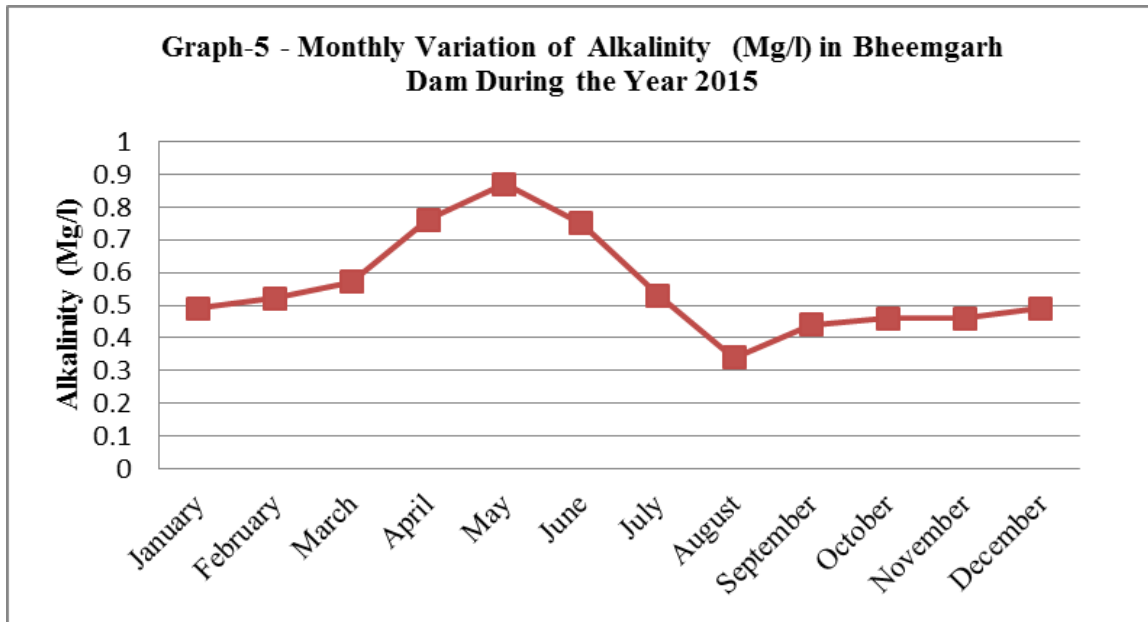
**Total Hardness (Mg/l) –**

The hardness of water of this dam fluctuates between  $134.20 \pm 5.81$ mg/l to  $249.00 \pm 6.86$ mg/l and maximum value was recorded in the month of June (summer season) and minimum in the month of December (winter season) as shown in Table (1) and Graph (4). Similar findings were also reported by Gupta *et al.* (2013); Agarwal *et al.* (2010) and Matta *et al.* (2017).



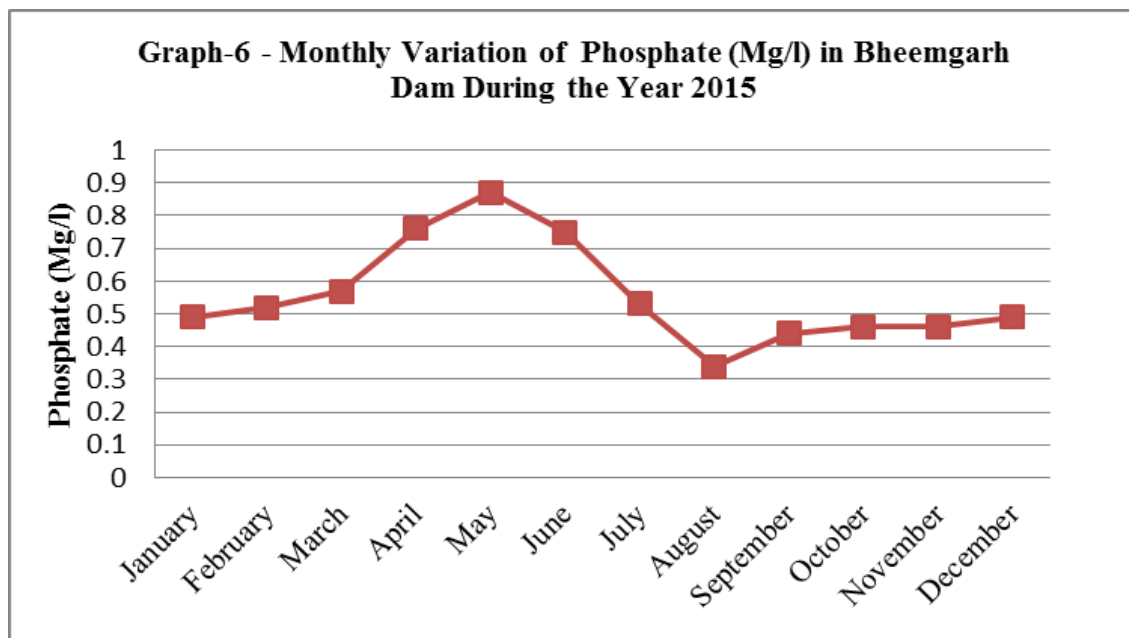
**Alkalinity (Mg/l) -**

Total alkalinity of this water was reported between the ranges  $162 \pm 4.95$  mg/l to  $211.2 \pm 2.59$  mg/l. The maximum value was recorded in the month of February and minimum value was in the month of August (rainy season) as shown in Table (1) and Graph (5). Similar observations were also reported in water bodies by number of authors including Narayana *et al.* (2008) in Anjanapura reservoir; Garg *et al.* (2009) in Ramsagar reservoir; Laad *et al.* (2016) in Omkareshwar reservoir; Kumara *et al.* (2010) in TB dam, Kumari *et al.* (2013) in Narmada river and its dam; Shinde *et al.* (2010) in Harsool dam, Virha *et al.* (2011) in Bhopal lake and Sinha *et al.* (2011) in Kalyani lake.



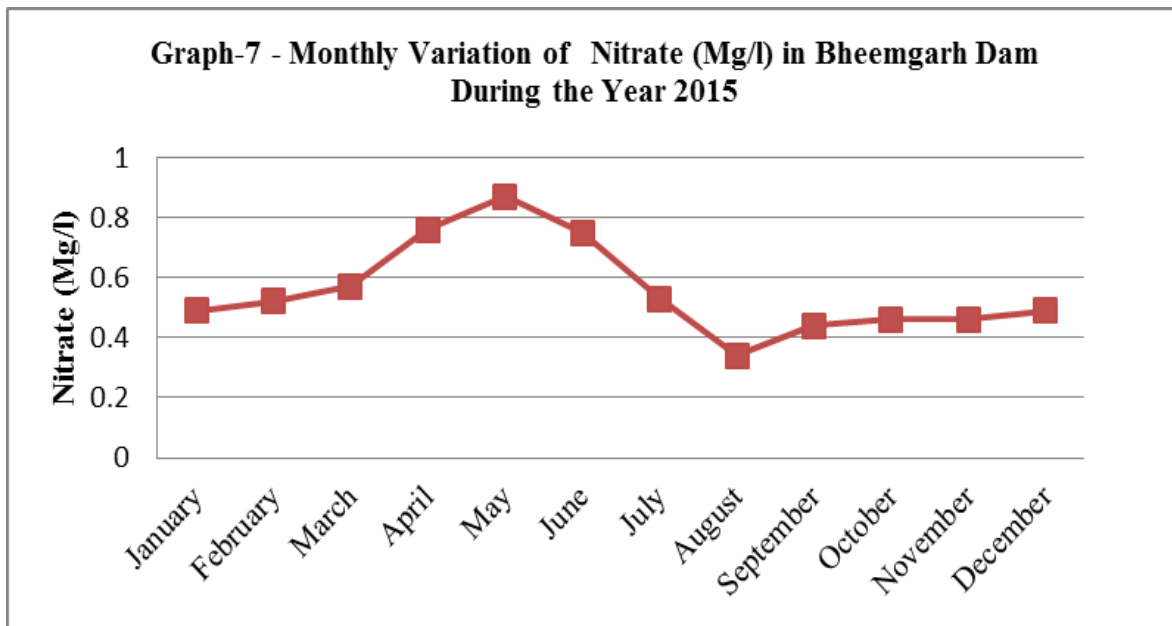
**Phosphate (Mg/l) -**

The value of phosphate in the water was in the range from  $0.19 \pm 0.03$  mg/l up to  $0.45 \pm 0.02$  mg/l. The maximum value was recorded in the month of June and minimum value was in the month of November (Table 1 and Graph 5). Similar results were reported by Arvind Kumar (1995).



**Nitrate (Mg/l) –**

The value of nitrate in the water of this dam ranges from  $0.034 \pm 0.03$  mg/l to  $0.87 \pm 0.03$  mg/l. The maximum value was recorded in the month of May and minimum in the month of August (Table 1 and Graph 7). Similar results were reported by Swaranlatha and Narsingrao (1998).



**Table 1-** Monthly variation of physicochemical parameters of water samples of Bheemgarh dam of Chhapara district Seoni (M.P.).

Months 2015	Temp °C	Ph	Dissolved Oxygen(Mg/l)	Hardness (Mg/l)	Alkalinity (Mg/l)	Phosphate (Mg/l)	Nitrate (Mg/l)	
January	18.16±0.14	7.25±0.10	8.16±0.30	168.00±5.15	203.60±2.61	0.29±0.03	0.49±0.02	
February	20.12±0.12	7.34±0.16	8.96±0.23	184.00±4.95	211.20±2.59	0.30±0.04	0.52±0.02	
March	27.18±0.13	7.88±0.21	7.52±0.34	192.60±3.97	199.00±2.92	0.36±0.02	0.57±0.02	
April	28.64±0.11	7.92±0.2	7.26±0.21	207.60±3.85	182.60±2.79	0.41±0.03	0.76±0.04	
May	30.16±0.18	7.98±0.2	6.42±0.19	219.40±4.88	189.60±6.88	0.42±0.02	0.87±0.03	
June	32.14±0.18	8.15±0.08	6.58±0.29	249.00±6.86	187.60±3.85	0.45±0.02	0.75±0.04	
July	28.25±0.11	7.82±0.11	7.42±0.19	218.20±5.81	173.20±3.03	0.40±0.02	0.53±0.04	
August	27.18±0.16	7.68±0.17	7.48±0.24	193.20±2.17	162.00±4.95	0.30±0.02	0.34±0.03	
September	26.36±0.11	7.54±0.08	7.36±0.21	177.40±3.97	178.80±3.96	0.32±0.02	0.44±0.02	
October	26.14±0.16	7.44±0.12	8.36±0.21	160.60±4.88	192.00±4.95	0.25±0.03	0.46±0.03	
November	23.15±0.16	7.28±0.11	8.58±0.19	144.20±3.19	200.00±2.74	0.19±0.03	0.46±0.03	
December	19.84±0.11	7.26±0.06	9.28±0.19	134.20±5.81	207.40±2.41	0.23±0.02	0.49±0.03	
Range	Min	18.16±0.14	7.25±0.10	6.42±0.19	134.20±5.81	162.00±4.95	0.19±0.03	0.34±0.03
	Max	32.14±0.18	8.15±0.08	9.28±0.19	249.00±6.86	211.20±2.59	0.45±0.02	0.87±0.03



**CONCLUSION:-**

The present study indicates that the water of Bheemgarh dam is not quite satisfactory for conserving the aquatic plant and animal diversity and for utilizing it for drinking purpose. The unmanaged and unwanted anthropogenic activities of surrounding population of the area are deteriorating the water quality of this dam continuously. The increase in environmental temperature reduces the level of water due to evaporation and accumulation of domestic sewage in the water bodies were reported to be the main factors responsible for deteriorating the quality of water and eutrophication in the dam.

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