



# An experiment on seasonal variations of water quality parameters in Chandrawal reservoir and Arjunsagar reservoir, UP, India

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## ABSTRACT

The present study conducted on Arjunsagar and Chandwal reservoir situated in Mahoba district, Uttar Pradesh, India to assess the significant variation in different seasons like Pre-monsoon, post-monsoon and winter. The experiment was carried out from April 2018 to January 2019. After 8 months of monitoring, physico-chemical parameters of both of the waterbody shows a haphazardly variations. Mainly Temperature, pH, alkalinity, hardness DO and Free CO<sub>2</sub> and all these parameters are done by standard APHA (1995) methods. After observation the water quality proved that it is totally suitable for fish culture and irrigation purpose. After monsoon the quality of the water was much healthier for all aquatic animals.

**Keywords:** Chandrawal Reservoir, Arjunsagar Reservoirs, Water quality, Physico-chemical parameters.

## INTRODUCTION

Water is an essential commodity for the development of agriculture sector, especially in aquaculture. Water is responsible not only for human survival but also for the all living creature in the world. Water is crucial for the quality of life. The Oceans, the rivers, lakes creeks together with the bland constitute the canvas on which life grows and interacts. The ecological balance maintained by the quality and quantity of water determines the way of life of a people. On other hand polluted water is the greatest source of disease and besides debasing the land also become unfit to sustain life (Francis 1994). Today the problem is not only of water availability but of environments quality and ecological balance. With increasing industrialization, urbanization and technological advances in all the fields' source of water are getting more and more seriously polluted (Uddin, 2012). The cause of pollution in reservoir and also in other water body is industrial waste, sewage of households, anthropogenic activities and some by natural condition. All these wastes having a hard complex mixture which contain organic and inorganic compound are which directly affect water quality and productivity of reservoir.

Reservoirs are artificial water bodies that have economic and ecological importance (Wetzel 2001). They play a pivotal role in freshwater resource accessibility in many regions throughout the world. Although many reservoirs were initially constructed with a single purpose (e.g., production of hydroelectric power), they commonly evolve towards provision of a multitude of services (Jorgensen et al. 2005). Reservoirs provide important ecological services (Atobatele and Ugwumba 2008), serving as rich ecological habitats (Menetrey et al. 2005) and hot spots of biodiversity, supporting abundant as well as unique and rare species (Williams 2003). Furthermore, reservoirs have diverse social and economic values like water management and serve as a source or sink for heat, sediments, and solutes that can cause severe effects far downstream from the dam (Wetzel 2001). Similarly, in Ethiopia, reservoirs often provide rural communities with an important source of dietary protein, consumable water for people and domesticated animals, irrigation water for horticulture, and income from fishing and eco-tourism (FAO 2008; Ndebele-Murisa et al. 2010 (Bizuneh et al. 2018)).

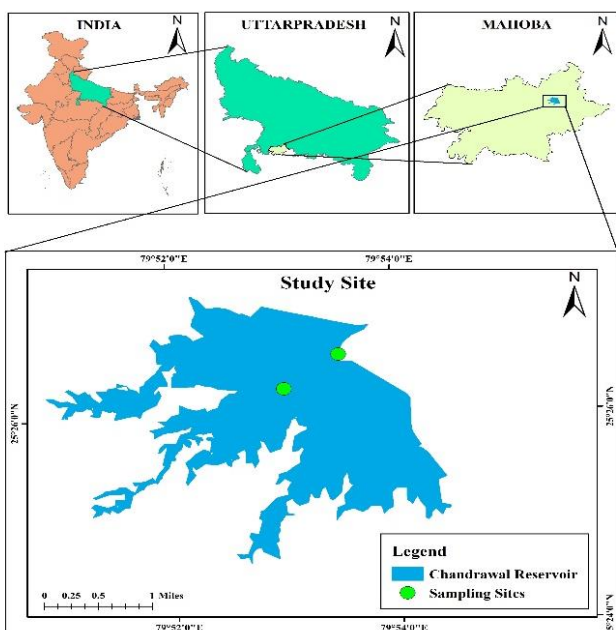
**MATERIAL AND METHODS**

Uttar Pradesh is India's most populous state, as well as the world's most populous sub-national entity state. It is located in the northern part of India between 24° to

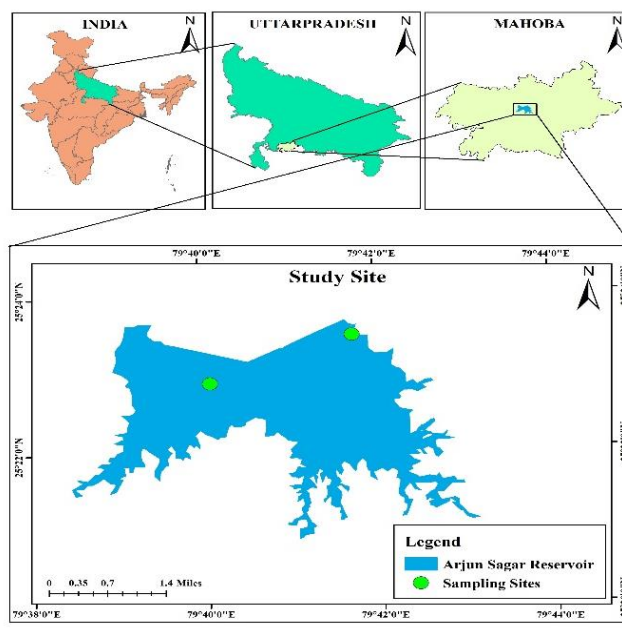
31°N and 77°E to 84°E. The state has an area of 240,928 km<sup>2</sup>. Uttar Pradesh covers a large part of the highly fertile and densely populated upper Gangetic plain. The larger Gangetic plain in the north includes the Ganga- Yamuna Doabs; the Ghaghra plains; the Ganga plains and the Terai. Main rivers of Uttar Pradesh are the Ganga and its tributaries viz., the Yamuna, Ramganga, Gomti and Ghagra. In recent years, some of the northern and southern tributaries of Ganga and their minor feeder streams have been tamed, creating a few reservoirs. The total number of reservoirs in the state is 150. They have total average area of 159850 ha.

Chandrawal and Arjunsagar reservoir are located in North-eastern and middle UP at nearby Bundelkhand region. Physico-chemical parameters of the water body of these two reservoirs was measured bi-monthly in the duration of 2018-2019, following APHA (1995). Samples were collected from the different part of the whole reservoir which is covering all the zones such as lentic and lotic. Most of the water-parameter was done by Standard titration methods.

Where temperature measured by using a Celsius thermometer, pH of the water was measured directly by dipping litmus paper and transparency of the water body was measured by using a metal Secchi disc of 20 cm diameter. Water samples were collected in twice at surface from the center and outlet of the Arjun and Chandrawal reservoir.



**Figure 1:** Map of UP state showing Chandrawal reservoir in Mahoba district



**Figure 2:** Map of UP state showing Arjunsagar reservoir in Mahoba district

The center was located at a midpoint of the reservoir, at the deepest part of the reservoir. The outlet was located near the dam wall. Water samples were collected in every month from February, 2018 to January, 2019 to cover 3 different seasons per year i.e., Pre-monsoon (April-May-June), Post monsoon (September-October) and Winter (November-December- January). All the water quality parameters for eight months of experiment were introduced by using some statistical method (mean  $\pm$  standard error). All the parameters presented by using bar diagram to show the comparison between that two reservoir.

## RESULTS AND DISCUSSION

The analytical seasonal data of physico-chemical characteristics of the waterbody of Arjun reservoir is presented in Table 1 and Table 2 is for Chandrawal reservoir. pH is the most important factor in case of

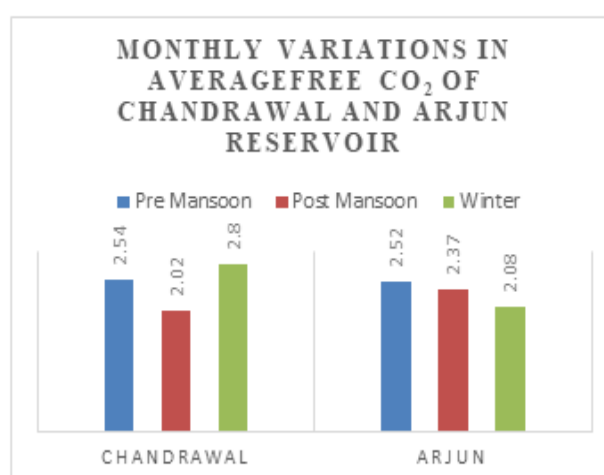
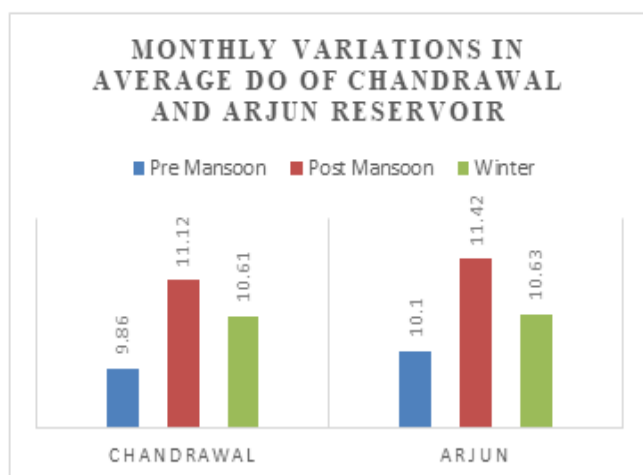
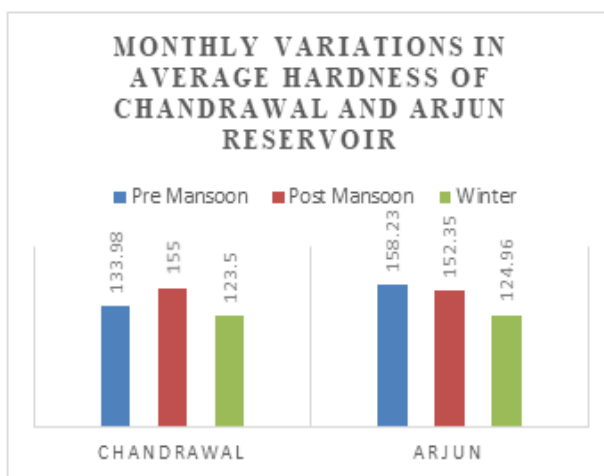
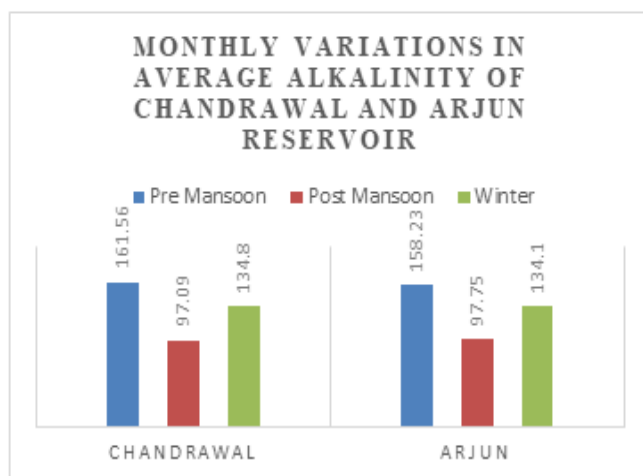
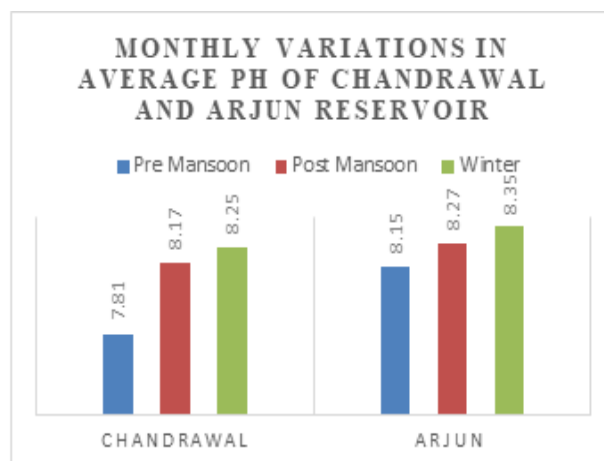
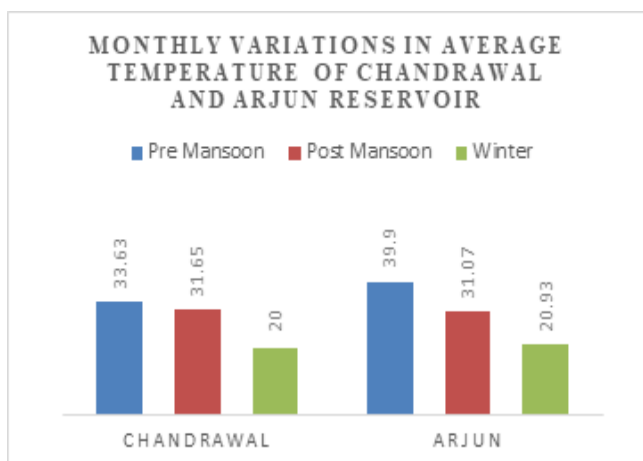
fish survival. The highest and lowest value of pH was noted from 8.7 to 7.3 which indicates that the nature of the waterbody was very productive. The temperature variation was significant towards the seasons, in Chandrawal reservoir temperature maximum recorded as 46.9°C and in Arjun Reservoir it was 47.8 °C. Season wise variations showed the similarity among Chandrawal and Arjun Reservoir. Except in the month of April, temperature increased slightly from the middle of September to 37.8 °C and it declined to 13.7 in the month end of January. Alkalinity also showed the seasonal variations in between arjun and chandrawal reservoir, in arjun maximum alkalinity noted as 173.4 mg/l (Figure 2) and 174.5 mg/l was in chandrawal, in the month of October the lowest alkalinity recorded form Chandrawal reservoir was 78.5 mg/l. and 74.2 mg/l was the lowest temperature of the arjun reservoir. In both reservoir the value of total hardness rose from month end of May and the least value was 97.68 mg/l and 99.7 mg/l for Chandrawal and Arjunsagar reservoir respectively.

**Table 1: Average with standard error values of physico-chemical parameters of water samples collected at Chandrawal Reservoir.**

Parameters	Pre-monsoon (April-May-June)			Post-Monsoon (Sept-Oct)			Winter (Nov-Dec-Jan)		
	Max.	Min.	Mean $\pm$ SE	Max	Min	Mean $\pm$ SE	Max	Min	Mean $\pm$ SE
Temperature (°C)	46.3	32.5	33.63 $\pm$ 4.51	37.8	26.8	31.65 $\pm$ 4.16	25.9	13.9	20 $\pm$ 3.67
pH	8.2	7.3	7.81 $\pm$ 0.31	8.9	7.3	8.17 $\pm$ 0.51	9.3	7.1	8.25 $\pm$ 0.62
Alkalinity (mg/L)	174.5	146.5	161.56 $\pm$ 10.04	110.5	78.5	97.09 $\pm$ 11.1	156.5	110.8	134.8 $\pm$ 14.57
Total Hardness (mg/L)	184.2	138.9	133.98 $\pm$ 16.12	173.8	129.6	155 $\pm$ 14.76	134.4	97.68	123.5 $\pm$ 13.61
DO (mg/L)	11.3	8.3	9.86 $\pm$ 0.97	12.58	9.6	11.12 $\pm$ 0.98	13.5	9.2	10.61 $\pm$ 1.36
Free CO <sub>2</sub> (mg/L)	3.4	1.8	2.54 $\pm$ 0.56	3.1	1.2	2.02 $\pm$ 0.68	4.1	1.9	2.8 $\pm$ 0.6

**Table 2: Average with standard error values of physico-chemical parameters of water samples collected at Arjunsagar Reservoir.**

Parameters	Pre-monsoon (April-May-June)			Post-Monsoon (Sept-Oct)			Winter (Nov-Dec-Jan)		
	Max.	Min.	Mean $\pm$ SE	Max	Min	Mean $\pm$ SE	Max	Min	Mean $\pm$ SE
Temperature (°C)	45.4	35.4	39.9 $\pm$ 3.31	36.8	24.5	31.07 $\pm$ 4.69	28.7	14.8	20.93 $\pm$ 4.4
pH	9.2	7.4	8.15 $\pm$ 0.62	8.5	7.9	8.27 $\pm$ 0.20	9.4	7.6	8.35 $\pm$ 0.58
Alkalinity (mg/L)	173.4	144.2	158.23 $\pm$ 10.81	115.5	74.2	97.75 $\pm$ 13.43	148.9	120.8	134.1 $\pm$ 9.72
Total Hardness (mg/L)	164.4	126.8	159.1 $\pm$ 20.5	171.5	124.8	152.35 $\pm$ 15.74	147.9	99.7	124.96 $\pm$ 14.89
DO (mg/L)	11.8	8.6	10.1 $\pm$ 1.06	13.7	9.7	11.425 $\pm$ 1.29	12.7	8.6	10.63 $\pm$ 1.31
Free Co <sub>2</sub> (mg/L)	3.5	1.4	2.525 $\pm$ 0.77	3.1	1.3	2.37 $\pm$ 0.63	2.8	1.6	2.08 $\pm$ 0.45



In the case of dissolved oxygen, it shows haphazardly variations all over the study period. The maximum value of DO in Chandrawal reservoir was 13.5mg/l at the start of winter whereas in Arjun reservoir it was 13.7mg/l in the post monsoon season. Average DO slightly rose in the post monsoon season than other seasons because of maximum rainfall and heavy wind flow in both reservoirs. In these two reservoirs the maximum free CO<sub>2</sub> reading was noted as 41.1 mg/l in

the winter season. But except this, the value of free CO<sub>2</sub> significantly varies in both pre-monsoon and post monsoon season. All the experimented data were presented by following bar diagrams.

**Conflict of Interest:** None of the authors have any conflicts of interest to disclose. All the authors approved the final version of the manuscript.

## REFERENCES

- APHA (American Public Health Association), 1998. Standard Methods for the Examination of Water and Wastewater, 22nd ed. American Public Health Association, Washington, DC
- APHA, 1992. Standard methods for the Examination of water and waste water, 18th edition American Public Health Association, Washington, DC
- Biswas, A.K. and Tortajada, C. (2001). Development of large dams: A global perspective. *Int. J. Water Resour. Devel.*, 17: 9-21.
- Boyd, C.E. (1979). Water quality in warm water fish ponds. Craftmaster, Printers Inc. Auburn, Alabama, USA, 353 pp.
- Chavan, *et al.* (2004). Studies on water quality of Manjara Project Reservoir in dist. Beed, Maharashtra. *J. Aqua. Biol.* 19: 73-76.
- Fisheries Department, Government of Uttar Pradesh, India.
- Krishna Ram H., (2007). Limnological studies on Koloramma lake, Kolar, Karnataka. *Envi. Ecol.*, 25:364-367.
- Lawal *et al.* (2014) Physico-chemical parameters in relation to fish abundance in Daberam Reservoir, Katsina State, Nigeria. *Entomology and Applied Science Letters*, 2014,1,3:43-48 ISSN No: 2349-2864.
- Lianthumliaia *et al.* (2013) Assessment of seasonal variations of water quality parameters of Savitri reservoir, Poldpur, Raigad, district, Maharashtra. *The Bioscan* 8(4): 1337-1342, 2013
- Ranjeetha Choudary, (2011). Comparative study of Drinking water quality parameters of three manmade reservoirs i.e., Kolar, Kaliasote and Kerwa dam. *Current World Environment*. 6(1):145-149, 2011.
- Sadauki, *et al.* (2022). Assessment of water quality parameters of Zobe and Ajiwa Reservoirs, Katsina State, Nigeria. *African Scientist Vol. 23, No. 1.*
- Sahib S. and Sunudeen (2011) Physico-chemical parameters and phytoplankton in the Parappan reservoirs of Kerala. *J. Ecobiology*, 28 (1 & 2): 187-190.
- Simeonov, V., *et al.* (2022). "Environmetric Modeling and Interpretation of River Water Monitoring Data," *Analytical and Bioanalytical Chemistry*, Vol. 374, No. 5, pp. 898-905
- Verma PU, (2010). Study of water quality of Hamirsar lake – Bhuj. *International Journal of Bioscience Reporter* 8: 145-153
- Verma S.R., (2022). Physico-chemical and biological characteristics of Kadrabed in U.P. *Indian J. of Environmental Health*, 20: 1-3.
- W.H.O. 1993. Guidelines for drinking water quality (vol.2): Recommendations. World Health Organization, Geneva

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