



Seasonal variation in the Physico-Chemical Parameters of Mandavi Water Reservoir in Dist. Chhindwara (Madhya Pradesh).

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ABSTRACT: The present paper is the study report about the analysis of various physico-chemical parameters and their seasonal variations of the water of Mandavi water reservoir situated in Pandhurna tehsil of Dist. Chhindwara, Madhya Pradesh. In the study the Physico-chemical parameters Air Temperature, Water Temperature, Secchi Transparency, Dissolved Oxygen, Biochemical Oxygen Demand, Chemical Oxygen Demand, pH, CO₂, Total Alkalinity, Turbidity, Sulfate, Chloride and Total Nitrogen from four points of the reservoir are measured during March 2017 to February 2018. The physico-chemical parameters indicates that the reservoir is oligotrophic in nature. This study indicates that the oligotrophic nature of reservoir is responsible for the rich fish diversity. The physico-chemical factors are influence the survivability of fishes to a better level.

Key Word: physico- chemical parameters, oligotrophic, water reservoir

Introduction:

Mandavi dam is constructed in 2001, for irrigation purpose on the local river Jam by WRD, Govt. of M. P. in Pandhurna tehsil of Chhindwara Distt., located at 21° 39'53" N latitude and 78° 24' 45" E longitude with the catchment area of 10.24 km². Maximum depth of the pond was found to be 16.5 miters, whereas average depth was 16.50±1.08 miters during the period of study. Very rich agricultural activities have been situated in surround areas of water reservoir and all agricultural wastes including pesticidal residues, organic wastes and other pollutants were disposed by man and runoff water in rainy season and during irrigation in the reservoir. It is well known that water bodies have played a crucial role in the growth and development of society. Urban growth, increased industrial activities, intensive farming and over use of fertilizers in agricultural productions some identified

factors responsible for degradation of an aquatic ecosystem. Water of good quality is required for living organisms. The quality of water is described by its physical, chemical and microbial characteristics and these characteristics are also correlated to each other. The hydrological study gives the proper direction in decision making process for problems like pollution control in aquatic ecosystem. The main purpose of analysis physical and chemical characteristics of water is to determine its nutrient status. Since, the water contains dissolved and suspended materials in various proportions, its physical and chemical characteristics differ along with its biological characteristics.

Water Reservoir Data:

- I. Hydrological Data
 1. Mean Rainfall (over 24 years)
Average- 1274.60 mm/58.18”
Maximum- 1734.82 MM/68.30”
Minimum- 823.21 MM/32.41”
75% Dependable rainfall- 1041.40 MM/41.00”
 2. Flood
Maximum observed – 87.65 cum / 3096 cusec.
- II. Reservoir Data
 - a) Catchment area – 10.24 Sq. Km/4.00 Sq miles
 - b) Geology – Hilly terrain
Mean monsoon yield 90% - 4.399 M.cum/ 155.206 Mcft.
Full Tank Level – 588.40 M.
Top of bank level – 591.70 M.
Maximum water level – 589.90 M.
Lowest sill level – 579.20 M.
Water Spread Area – 49.00 Hact.

The climate of the study area is tropical monsoon with three distinct seasons. The atmospheric temperature ranged between a minimum of 10°C in December and January, and maximum of 47°C in June during the study period. The maximum rainfall (538.65mm) occurred in July, whereas the humidity ranged from 16% (April) to 99% (July and August).

Material and Methods:

The water sample is collected in the month March 2017 to February 2018. Four sites were selected viz; sampling station n. 1, stn. n. 2, stn. n. 3 and stn. n. 4 from the reservoir. Water temperature, Air temperature, Secchi transparency and pH reading were recorded in the location. Water temperature was measured by mercury filled thermometer, pH measured by pH meter, and Secchi transparency was measured by sechhi disk having a diameter of 20 cm and alternate white and black quadrates. Alkalinity, DO, BOD, COD, Turbidity, CO₂ Total Nitrogen, Chloride and Sulphate were determined in laboratory. The Alkalinity of

water sample is determined by titration against phenolphthalein and methyl orange. D.O. was fixed immediately and determined by Winkler's method. The BOD was determined by direct method with undiluted and without seeded the sample. The sample was incubated for five days at 20 degree centigrade. The COD is measured by Reflux Digestion Method (Maiti, 2004). Turbidity was measured by Nephelometer using 0.02 NTU Standard. Chloride is determined by titration the water sample against 0.02M silver nitrate solution using potassium as an indicator. Free Carbon Dioxide was analysed by titrating the water sample using 0.05 N sodium hydroxide solution as titrant, and phenolphthalein was used as an indicator. Total Nitrogen test is performed with digestion of sample and distillation of sample by using a Kjeldahl digestion apparatus. The Sulfate is estimated by Gravimetric method (Maiti, 2004).

Observation:

Table 1: shows physico-chemical parameters of water samples of twelve months. Given readings are mean values from the four stations viz. sampling site n. - 1 to sampling site n. - 4 of the reservoir.

PARAMETERS	UNIT	PRE MONSOON SEASON	MONSOON SEASON	POST MONSOON SEASON
Air Temperature	DC	36.45	26.82	24.89
Water Temperature	DC	30.12	27.62	22.64
pH	pH	7.57	7.81	7.69
Alkalinity	mg/l	160.11	169.56	168.56
Dissolve Oxygen	mg/l	6.10	7.05	7.13
B.O.D.	mg/l	2.06	0.98	1.77
C.O.D.	mg/l	2.22	0.77	1.69
Secchi Transparency	cm	39.40	35.31	42.87
Turbidity	NTU	3.60	2.68	2.41
CO ₂	mg/l	10.99	9.89	11.12
Cl	mg/l	39.00	34.12	33.87
SO ₄	mg/l	35.54	30.47	32.77
N ₂	mg/l	0.99	1.10	0.86

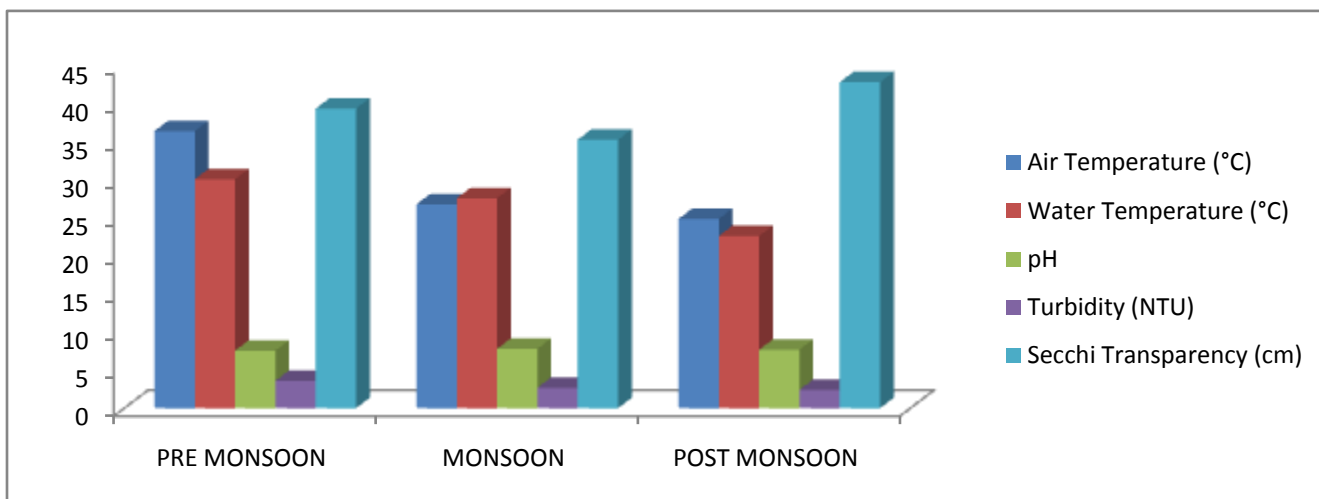


Chart: 1, showing seasonal variation in Air Temperature, Water Temperature, pH, Turbidity and Secchi Transparency in Mandavi Water Reservoir.

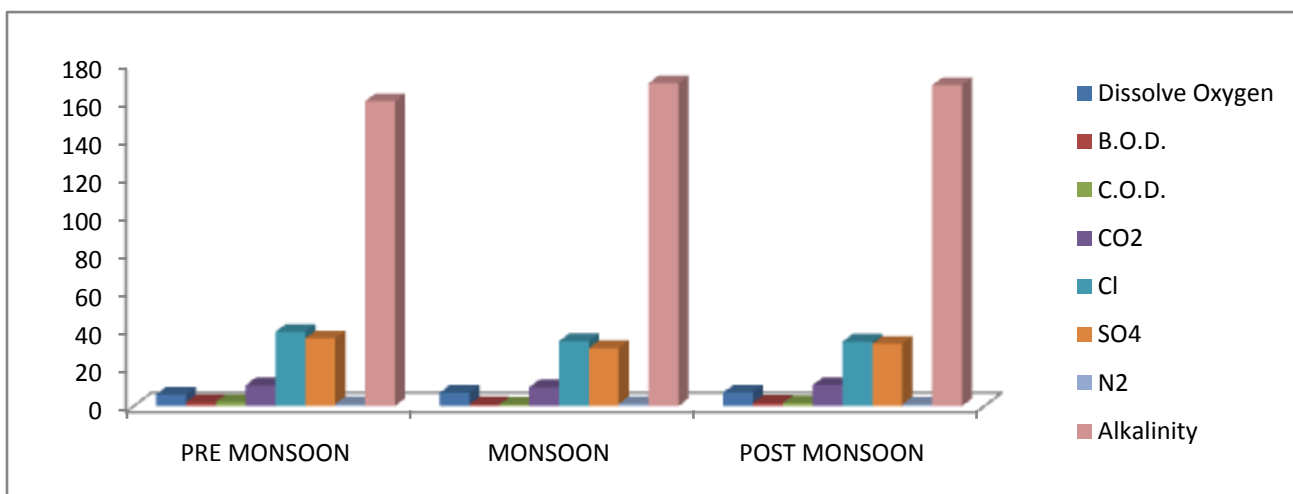


Chart: 2, showing seasonal variation in Dissolve Oxygen, B.O.D., C.O.D., CO₂, Cl, SO₄, N₂ and Alkalinity in Mandavi Water Reservoir. (unit- mg/l).

Result and Discussion:

The maximum temperatures of reservoir water were observed 30.12°C in the pre monsoon season and the minimum temperatures of reservoir water were observed 22.64°C in post monsoon season respectively on all the sites. There is a very close similarity between the temperature of atmosphere and water due to the depth of reservoir. The maximum value of pH of the water is 7.81 indicates slightly base saturation in the water. The pH value of water indicates decrease the possibility to dissolve metals or high organic contents in the water body. The maximum value of turbidity was recorded 3.60 mg/l during pre monsoon period

and minimum was recorded 2.41 mg/l during winter season attributed to the increased turbidity during summer season months was may be attributed to decrease in depth from surface water level. Transparency of water fluctuates parallel of suspended solid particles. We observed the maximum mean value of secchi transparency 42.87 cm. (max.) in the post monsoon season while the 35.31 cm. (min.) value was observed in monsoon season. Reduced transparency during rainy season may be due to erosion of soil carried by runoff from catchment areas (Singh *et al.*, 2010) and increased quantity of chemical elements and suspended ions in water.

Maximum value of alkalinity is observed 169.56 mg/l in monsoon period and minimum values of alkalinity is 160.11 mg/l in pre monsoon period. Concentration of dissolve oxygen is an important parameter to indicate water purity and to determine the distribution and abundance of various aquatic plants and autotrophic groups. Dissolve oxygen is find in an adequate concentration for the health of aquatic ecosystem, ranged 6.10 mg/l in pre monsoon season to 7.13 mg/l in post monsoon season in this year. BOD is used as the index of organic pollution of waste water that can be decomposed by bacteria under anaerobic conditions (Sladeck *et al.*, 1982). The BOD ranged between 0.98 mg/l in monsoon season to 2.06 mg/l in pre monsoons season shows medium decomposition of organic matter and less decay of vegetation. The COD level was in range of 0.77 mg/l to 2.06 mg/l that is indicating an appropriate quality of water for aquatic life. Higher concentration of COD in the pre monsoon season may be due to high temperature and higher concentration of suspended and dissolved solids.. The CO₂ value is observed in very suitable range maximum 11.12 mg/l in post monsoon season and minimum 9.89 mg/l in monsoon season. In the summer season water level goes very low, hence the density of biotic factors may increase in water resulting the increase concentration of CO₂. The value of chloride concentration in the present study was highest 39.00 mg/l in pre monsoon period and highest concentration of sulfates 35.54 mg/l is also observed during pre monsoon period, which was caused by the surface run-off bringing into the river more suspended solids along with organic matter and soluble salts from the catchment area. Total kjeldahl nitrogen (TKN) is a total of organic nitrogen and ammoniacal nitrogen. The values of total nitrogen are ranged 0.86 to 1.10 mg/l which indicated that the water has not been organic polluted. This hydrological study indicates that the hydrological condition of the water reservoir is well suitable for aquaculture. The annual

range of productivity by fish culture may effects by other physico-chemical characteristics of the water and the limited area of reservoir.

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