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## Physico-chemical seasonal analysis of Narsarha talab of Shahdol district Madhya Pradesh

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### Abstract

Narsarha talab is very old and minor reservoir. It is used for irrigation as well as fish culture by fishermen society. Physico-chemical features of the water are extremely valuable in the assessment of quality of pollution status. The present piece of research work has been carried out to investigate the limnology of Narsarha Talab one of the greatest fresh water bodies and main source of water for various purposes specially fish culture of fishermen society. The monitoring of Narsarha Talab has been seasonally completed. Therefore the aim of the present study is to have knowledge of the water quality and productivity of reservoir of Shahdol town and to explore possibilities for better management of fish culture. In the present study various physico-chemical factors such as colour, water temperature, transparency, turbidity, conductivity, pH, Total alkalinity, Dissolved oxygen, free carbon dioxide, chloride, total hardness, nitrate, nitrite, phosphate, silicate, calcium, potassium, and magnesium were found to be interrelated. These factors also indicates that the reservoir is quite suitable for fish culture and proper awareness of its culture in scientific ways should be taught to the fisherman for its proper utilization and exploitation. The present study will be beneficial not only academically but also to improve the socioeconomic importance of the water body.

**Keywords:** Narsarha talab, Physico-chemical, Seasonal analysis, Shahdol district.

### 1. Introduction

The Shahdol district lies in the north-east part of Madhya Pradesh extending from 29°39'28" and 24°16'13" North latitude and from 80°32'56" to 82°12'21" East longitude approximately. The region lies in the heart of the country. The district is surrounded by Sone river and Rewa district in North, Mandla, in South Sidhi, Anuppur in Surguja East and Umaria and Satna in West. It is situated 489 meter above of the sea surface.

The Shahdol district has undulating and hilly topography. The southern-most part of the district is hilly and form part of the Maikal range, while the portion north of it is quite undulating. In the south most portion has hills of higher elevation as compared to northern portion. There is a continuous drop in elevation from south to north and it attains its lower most elevation in the extreme north where the some forms the boundary of the district. The southernmost portion (parts of south and north Shahdol divisions) forming part of Maikal range is generally more than 900 m. above msl, while the portion north of it seldom reaches 800 m. msl.

The present aquatic body is perennial one. The area of pond is nearly 10 hectare. It is situated within municipal area of Shahdol city. The fish culturing carried out since last ten years. Hence it has been selected for the present study.

Hence, an effort has been made in this study to investigate the overall biodiversity of Narsarha talab situated in Shahdol district during the year 2014-15.

The limnological studies of this reservoir become all or more significant, not only from the biological point of view but also from the view of fish productivity. It is ancient reservoir of Shahdol district, which remain unexplored so far, which is used for fish culture by fishermen society.

### 2. Material and Methods

To study the physico-chemical changes and profit structure of Narsarha talab seasonal observation for taken for one year from July 2014 to June 2015.

The water samples were collected in the forenoon between 10 A.M. to 12 P.M. Colour, Transparency, Temperature, Dissolved oxygen, Free Carbon dioxide, pH were analysed at the

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Site. On the basis of the weather elements the year is broadly divisible into four seasons viz. Monsoon (July to Sept.), Post Monsoon (Oct. and Nov.), winter (Dec. to Mar.), summer (April to June).

About 5 Lit. of water was collected from reservoir and brought to the lab in an icebox. Immediately after collection, water samples were fixed by using a few drop of chloroform.

The samples were kept under refrigeration in plastic bottles in

the lab. Standard methods by APHA (1976) [3], Kashyap (2016) [8] were followed for analysis of various physico-chemical factors.

### 3. Results and discussion

Table 1 indicate the observations recorded of Narsarha talab for the four seasonal average value of the year July 2014 to June 2015. From the table no.1 following results are obtained:-

**Table 1:** Physico-chemical seasonal average analysis of Narsarha talab of Shahdol, M.P. India from July 2014 to June 2015

S. No.	Parameters	Units	Monsoon season	Post Monsoon season	Winter season	Summer season	P value
1.	Colour	-	Brown	Green	Greenish yellow	Yellow to green	
2.	Transparency	cm.	16.53	21.90	26.72	21.80	0.495
3.	Water temperature	°C	28.27	25.38	21.76	33.36	0.449
4.	Turbidity	mg./lit.	32.43	23.13	19.20	24.63	0.294
5.	Conductivity	µmhos	215.72	206.32	203.51	283.41	-
6.	pH	-	7.75	7.76	7.62	8.61	0.994
7.	Alkalinity	mg./lit.	77.65	77.75	79.13	64.70	0.606
8.	Dissolved oxygen	mg./lit.	9.22	9.70	11.14	5.48	0.580
9.	Free Carbon dioxide	mg./lit.	3.74	4.03	3.23	7.19	0.548
10.	Chloride	mg./lit.	10.49	6.80	9.50	14.22	0.430
11.	Total Hardness	mg./lit.	92.11	85.35	80.45	155.53	-
12.	Biological Oxygen Demand	mg./lit.	1.18	1.45	1.55	0.57	0.921
13.	Nitrate	mg./lit.	0.043	0.045	0.048	0.014	0.999
14.	Phosphate	mg./lit.	0.23	0.27	0.45	0.34	0.993
15.	Silicate	mg./lit.	11.16	10.37	7.40	18.17	0.151
16.	Calcium	mg./lit.	46.33	42.56	39.62	61.20	0.121
17.	Potassium	mg./lit.	1.92	1.64	1.30	2.45	0.943
18.	Magnesium	mg./lit.	11.24	10.38	9.2	22.24	0.041

#### i) Colour

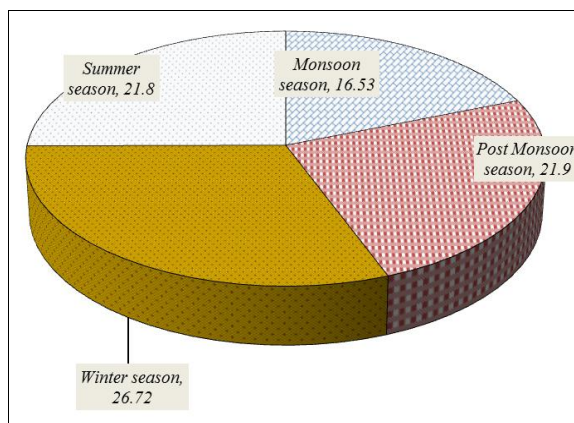
The colour of the reservoir water appeared to be influenced by turbidity as well as depth. In monsoon the water become much brown by the beginning of rains. However post monsoon soon it turned green and greenish yellow in winter but by March 2015 it become green and yellow in April and again green during summer month in the year 2015.

#### ii) Transparency

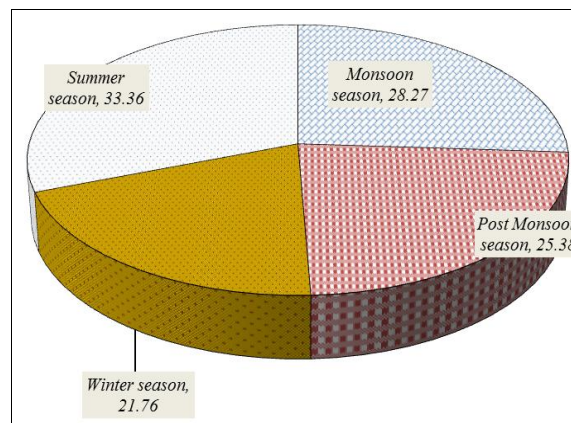
The light penetration of transparency of a water body is an

important factor on which the productivity of a water body depends. In the present study, transparency was recorded to be maximum (26.72 cms.) during winter season and minimum value (16.53 cms.) were recorded during monsoon season.

The summer low and winter high value of sacchi transparency have also being reported by Adoni (1975) [2] for Sagar Lake, Shrivastava (1993) [16] for Madan Sagar Tank and Kumar (1995) [11] in their study in other water bodies.



**Fig 1:** Graphics analysis of transparency (cm.)



**Fig 2:** Graphics analysis of water temp. (°C)

#### iii) Water Temperature

Temperature influences the Biological reaction in water. The seasonal variation in water temperature was observed in accordance with the variation of atmospheric temperature. The minimum average value (21.76 °C) of water temperature were noted in winter season. Throughout the summer season the water temperature was observed to be higher. The average value of water temperature was calculated to be 31.36 °C in summer season. Thus it is seen that variation in the water

temperature of the reservoir corresponds with the fluctuation of the temperature of air. Same results were indicated by Shanthy, *et al.* (2002) [15] for Singanallur Lake.

#### iv) Turbidity

Turbidity is measure of extend to which light is either scattered or absorbed by the suspended material in water. Table reveals that the minimum average value (19.20 mg./Lit.) of turbidity was recorded in winter season and maximum

average value (32.43 mg./Lit.) were recorded in monsoon season. Similar findings were reported by Bhatt and Negi (1985) <sup>[4]</sup> for sub-tropical pond.

#### v) Conductivity

The electrical conductivity of a water is related to the nature and concentration of ionized substances in the water and to the temperature of the water. The maximum average value of conductivity was observed in the summer season (283.41 $\mu$  Mhos) and minimum in the season of winter 203.51 $\mu$  Mhos. Similar findings were recorded by Kashyap (2016) <sup>[8]</sup> for Physico-chemical analysis of various water samples of Rewa district (M.P.) India.

#### vi) pH

pH is an important factor of fresh water bodies. Factors like, exposure to air, temperature and disposal of industrial wastes etc. bring about changes in pH. In the present study we find maximum average value 8.61 and minimum 7.62. pH shows slightly low values during winters and slightly higher values

during summer season. Though there is not very large difference throughout the year.

According to Jhingran (1975) <sup>[7]</sup> the pH range from 7 to 9 is considered good for fish culture. Thus our results indicate that the Narsarha talab having pH from 7.64 to 8.60 is suitable for fish culture. Khare (1998) <sup>[10]</sup> for Jagat Sagar Pond, Bhutiani (2004) <sup>[5]</sup> for Suswa river was also reported similar results in their study.

#### vii) Alkalinity

Total Alkalinity shows higher average value (79.13 mg./Lit.) during winter and lower average value (64.70 mg./Lit.) during summer. Similar findings were reported by Kumar (1993) <sup>[12]</sup> for Kunjwani Pond. According to Sorokin and Pavelinjeva (1978) <sup>[17]</sup> lakes with more than 60ppm. Total alkalinity was considered has nutrient rich. In Narsarha talab, since the values are more than 60ppm. On an average throughout the year, the reservoir may be considered as nutrient rich water body. The richness of nutrients also makes it good for fish culture.

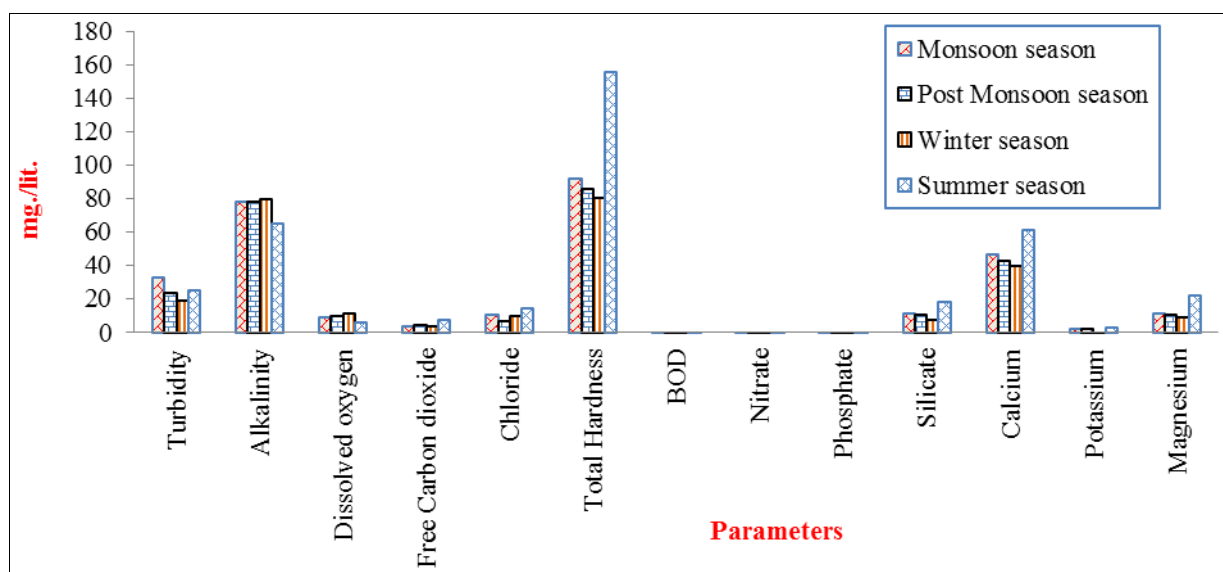


Fig 3: Graphics analysis of Physico-chemical seasonal average analysis of Narsarha talab of Shahdol, M.P. India from July 2014 to June 2015

#### viii) Dissolved Oxygen

Dissolved oxygen is very essential for metabolism of all aquatic organism that possess aerobic respiratory biochemistry<sup>25</sup>. Our results show maximum average value (11.14 mg./Lit.) of oxygen during the winter and minimum 5.48 mg./Lit. in summer. The similar seasonal behavior of dissolved oxygen was reported by Abbasi, *et al.*(1996) <sup>[11]</sup> for Kuttiadi Lake.

The higher value of oxygen during summer are associated with the rise in phytoplanktonic population (Bhatt and Negi, 1985) <sup>[4]</sup>, but according to Bohra (1977), there is no relation among dissolved oxygen, water temperature and phytoplanktons.

#### ix) Free Carbon-dioxide

The water of Narsarha talab shows well marked seasonal fluctuations of free carbon dioxide. Average value of carbon dioxide was lowest 3.23 mg./Lit. in winter and higher value 7.19 mg./Lit. in summer month. There is an inverse relationship between carbon dioxide and oxygen content of other pond water as reported by Ganpati (1943) <sup>[6]</sup> and Nayak (1980) <sup>[13]</sup>, Dharam Taal in their study, direct correlation of carbon dioxide with dissolved oxygen and in such condition the plankton can thrive as well as also found.

#### x) Chloride

Chloride occurs naturally in all type of water in variable concentration. The seasonal maximum average value 14.22 mg./Lit. were noted during summer season and minimum average value 6.80 mg./Lit. was recorded during post monsoon season. Dhanapakiam *et al.* (1999) also recorded in their study on Cauveri River i.e. lower value of chloride in rainy season.

#### xi) Total Hardness

Many Scientist consider hardness the same as total alkalinity, since when both are expressed as Calcium, their value may be approximately equal. Generally salts of calcium and magnesium contribute hardness to natural water. The seasonal Maximum (155.53mg/l) and minimum average value (80.45 mg./Lit.) were recorded in summer and winter season respectively. Similar report has been observed by Pathak and Mudgal (2005) <sup>[14]</sup> in their study on Virla Reservoir, Khargone (India).

#### xii) Biological Oxygen Demand

Biological Oxygen demand is highly important to know the amount of organic matter present in the waste treatment system and that the quantity of oxygen required for its

stabilization. It maximum 1.55 mg./Lit. and minimum 0.57 mg./Lit. potential were recorded in winter and summer season respectively. It show negative co relation with free carbon dioxide and positive with dissolved oxygen.

#### xiii) Nitrite

Minimum average value of Nitrite 0.014 mg./Lit. in summer month and maximum 0.048 mg./Lit. was recorded in winter season. Is also inversely related to temperature.

#### xiv) Phosphate

Phosphate is one of the essential nutrients present in the water in small quantity. Phosphorus shows seasonal variations in fish ponds and the mineral gets removed when the fish or the vegetation are taken out of water. The Phosphate contend of water of the Narsarha talab were recorded to the maximum average value 0.45 mg./Lit. in the winter season, while its lowest average value was 0.23 mg./Lit. in monsoon month. The Nayak (1980) <sup>[13]</sup> and Khare (1998) <sup>[10]</sup> for Dharam Taal and Jagar sagar pond also recorded similar results in their study for respectively.

#### xv) Silicate

Maximum 18.17 mg./Lit. And minimum 7.40 mg./Lit. average range of silicate content was observed to be summer and winter season respectively in our study.

#### xvi) Calcium

The average maximum concentration 61.20 mg./Lit. of Calcium ions was recorded in the reservoir water in summer season and minimum 39.62 mg./Lit. in winter season.

#### xvii) Potassium

The average maximum concentration 2.45 mg./Lit. of potassium was recorded in the reservoir water in summer month and minimum 1.30 mg./Lit. in the winter season.

#### xviii) Magnesium

Magnesium also occurs in all kind of natural waters with Calcium. The average values 22.24 mg./Lit. were recorded highest in summer and lower 9.2 mg./Lit. during winter season.

Silicate, Calcium, Potassium, Magnesium, Concentration in Suraj Kund was quite similar to that observed by Kaushik and Saxena (1991) <sup>[9]</sup> in their study.

On the basis of present findings, it is concluded that Narsarha talab suitable for fish culture. Among various chemical parameter annual variation of pH, DO, free carbon dioxide, level of nutrients appears as favourable for carp production.

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