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# Hydrobiological study of stagnant fresh water of Pahooj Dam Jhansi Uttar Pradesh

**[1] Raj Kumar Rai, [2] Hemant Kumar**

[1] Dept. of Zoology R.S.Y. Degree College Poonch, B.U. Jhansi, Uttar Pradesh, India
[2] Dept. of Zoology B. B. (P.G.) College, B.U. Jhansi, Uttar Pradesh, India

**Abstract**
Hydrobiological features of Pahooj dam Jhansi were studied at eight sampling station covering both the zone limnetic and littoral zone. Four sampling station at limnetic zone and rest of four stations at littoral zone during the period of Nov. 2007 to Oct. The values of Alkalinity, pH, COD, BOD, and TDS were found beyond the tolerance limits. Pahooj dam is situated near Indian Grassland and Fodder Research Institute in Jhansi at the distance about 9 K.M. from railway station, Jhansi at latitude of 25°-27° north and at longitude of 78°-37° eastern position with approximate height of 271 meter above mean sea level. It has an area of about 518 hectares with maximum length 4.02 km, maximum breadth1 km and maximum depth 10 meter.

**Keywords:** hydrobiology, pH, alkalinity, nitrate

## 1. Introduction
The Earth is very rich in water, which covers over 70% of the planet's surface. If this water were evenly distributed, it would cover the entire Earth to a depth of 2 miles (3.2 km). More than 97% of this is salt water, however, and is not usable by land life. About 30% of the world's renewable freshwater supplies are already being used; this is about eight times the yearly flow of the Mississippi River. Even so, enough freshwater is available to support over 20 billion people. Unfortunately, because of variable climatic and geologic conditions, freshwater is not uniformly distributed; so many areas of the world's suffer from severe water shortages.

In the present study physico-chemical analysis of the water of Pahooj dam Jhansi was studied. It is situated near Indian Grassland and Fodder Research Institute in Jhansi at the distance about 9 K.M. from railway station, Jhansi at latitude of 25°-27° north and at longitude of 78°-37° eastern position with approximate height of 271 meter above mean sea level. It has an area of about 518 hectares with maximum length 4.02 km, maximum breadth1 km and maximum depth 10 meter.

The research is therefore oriented to investigate physico chemical data of the Pahooj Reservoir with an aim to determine the extent of changes in the physico – chemical characteristics of water.

## 2. Material and Methods
In the present investigation internationally accepted standard methodology prescribed in limnological literature was adopted as far as possible. Initially, all the relevant historical, geological and topographical details of the water bodies were collected from the different specialized sources. Thereafter, the field trials and standardization of analytical procedures were made. A regular uninterrupted monthly sampling was carried out for twelve months falling between November 2007 and October 2008 covering all the three prevailing seasons of this region. Monthly sampling was done in the first week of every month. Sampling was done between 07.00 hrs and 10.00 hrs. A field kit containing standard glass wares, reagents, water sampler, secchi disc, century water analyzer kit (ck 710) manufactured by "century instruments pvt. Ltd. Chandigarh". It is a unique instrument for the measurement of physico-chemical characteristics of the aqueous solutions such as pH, Temperature, Dissolved oxygen and TDS etc. Water samples were collected using Ruttner's water sampler. For laboratory analysis, the water samples were preserved with 2-4 drops of chloroform solution. Temperature, secchi transparency, pH, conductivity, Redox potential, alkalinity, dissolved oxygen etc. were analyzed on the spot. Other physico chemical parameters from samples determined in laboratory using the method suggested by APHA [1985] [3] and Trivedy and Goel [1986] [16].

## 3. Results and Discussion
Hydrobiological feature of fresh stagnant water of the water body were determined monthly from eight sight covering both the zone limnetic and littoral zone. Four sampling station at limnetic zone and rest of four stations at littoral zone during the period of Nov. 2007 to Oct. 2008 and result were summarized in Table No. -1 and Table No. -2 including seasonal variation of the parameters.

**Table 1:** Physico-Chemical parameters of pahooj reservoir average values of eight sites

| Parameters | units | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Temperature | 0°C | 21.3 | 16 | 15.3 | 19.5 | 21.5 | 24.4 | 25.4 | 27.7 | 28 | 27.3 | 28.4 | 25.1 |
| pH | --- | 8.31 | 7.74 | 8.32 | 8.53 | 8.62 | 8.53 | 8.32 | 8.3 | 7.52 | 7.91 | 7.88 | 8.09 |
| Transperancy | CM | 73.5 | 106.6 | 112 | 64.9 | 46.8 | 36.3 | 23 | 18.9 | 25.1 | 34.6 | 47.2 | 69.8 |
| Tds | Mg/l | 173.74 | 167.2 | 152 | 176.83 | 210 | 238 | 239.1 | 244.8 | 228.9 | 195 | 195.31 | 204 |
| Conductivity | Micro/mohr | 294.79 | 283.6 | 285 | 294.38 | 338 | 361 | 353 | 330.7 | 328.7 | 281.4 | 290.25 | 293.2 |
| Alkalinity | Mg/l | 130.75 | 117.1 | 175 | 138.06 | 146 | 169 | 212.6 | 140.9 | 113.1 | 92.94 | 127.19 | 147.9 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Do | Mg/l | 8.05 | 8.04 | 8.63 | 9.38 | 8.36 | 7.85 | 7.59 | 7.28 | 7.03 | 6.11 | 6.87 | 7.09 |
| Bod | Mg/l | 2.04 | 2.99 | 2.58 | 1.42 | 2.26 | 1.44 | 0.99 | 2.35 | 1.71 | 1.69 | 2.01 | 1.34 |
| Cod | Mg/l | 2.79 | 2.55 | 3.03 | 3.43 | 4.78 | 5.87 | 6.95 | 7.85 | 3.99 | 5.88 | 3.83 | 4.29 |
| Nitrate | Mg/l | 0.41 | 0.32 | 0.34 | 0.55 | 0.36 | 0.3 | 0.35 | 0.38 | 0.26 | 0.17 | 0.16 | 0.27 |

**Table 2:** Seasonal variation of physico-chemical parameters of pahooj reservoir district Jhansi

| Parameters | Unit | Winter season | Summer season | Rainy season | Min | Max | Ave |
|---|---|---|---|---|---|---|---|
| Temperature | 0°C | 18.02 | 24.75 | 27.2 | 15.3 | 28.4 | 23.3 |
| pH | --- | 8.22 | 8.44 | 7.85 | 7.52 | 8.62 | 8.2 |
| Transperancy | CM | 89.25 | 31.25 | 44.17 | 18.9 | 111.8 | 54.9 |
| Tds | Mg/l | 167.44 | 232.97 | 205.8 | 152 | 244.82 | 202.1 |
| Conductivity | Micro/mohr | 289.44 | 345.67 | 298.3 | 281 | 361.35 | 311.2 |
| Alkalinity | Mg/l | 140.22 | 167.12 | 120.28 | 92.9 | 212.56 | 142.5 |
| Do | Mg/l | 8.52 | 7.77 | 6.77 | 6.11 | 9.38 | 7.7 |
| Bod | Mg/l | 2.25 | 1.76 | 1.68 | 0.99 | 2.99 | 1.9 |
| Cod | Mg/l | 2.95 | 6.36 | 4.49 | 2.55 | 7.85 | 4.6 |
| Nitrate | Mg/l | 0.4 | 0.34 | 0.86 | 0.16 | 0.55 | 0.3 |

The temperature is one of the most important physical parameter which is directly related to chemical reactions in aquatic ecosystem. In present investigation the water temperature is ranging in between 15.31 to 28.4 C. Seasonal variation ranged between 18.02 to 27.2 C it was found higher in rainy season and lowest in winter season. The similar result were reported by Goel *et al.* (1986) [16].

The water transparency or light penetration is highly variable parameter and help in determining productive zone of water body Golterman *et al.* (1978) it ranged between 18.9 to 111.8 cm. it was observed highest 89.25 in during winter and lowest 31.25 during summer season.

The measurement of ph gives the intensity of acidic or basic character of water. The ph of water is alkaline and value ranged from 7.52 to 8.62. The value of seasonal variation was observed higher during summer and lower during rainy season. It is in accordance with Mathur (1978), Raiyani *et al.* (1994) [12], Kumar *et al.* (2005) [8], Kumar *et al.* (2007) [9], Singh *et al.* (2009) [14] and Kumar *et al.* (2016) [7].

Total dissolved solids is a useful parameter in the analysis of the chemical density and contributes to the productivity of water Jhingran (1977). The seasonal variation was observed highest 232.97 Mg/l during summer and lowest167.44 Mg/l during winter season.

Alkalinity ranged between 92.94 Mg/l to 212.56 Mg/l. the seasonal variation was calculated highest 167.12 Mg/l during summer season and lowest 120.28 Mg/l during rainy season. It is in accordance with Agarwal N. C. *et al.* (1995) [1] and Kumar sanjeev *et al.* (2003).

The specific conductivity of water of water body is a measure of resistance of a solution to electric flow. It ranged between 281.41 to 361.35 micro/mohr $cm^{-1}$. The seasonal variation was calculated high in summer and low in winter season.

Dissolved oxygen is the important parameter which supports the aquatic life. D. o. is equally essential for decomposition of deal matter and chemical waste. It ranged between 6.11 to 9.38 Mg/l. the seasonal variation was observed maximum during winter and minimum during rainy season similar variation in oxygen was reported by Bhosale *et al.* (1994) [4] and Kumar *et al.* (2016) [7].

Bod is the direct measure of the extent of pollution in the water body. Bod is the amount of oxygen required by living aquatic organisms for their physiological process. It ranged between0.99 to 2.99 Mg/l. the seasonal variation of bod was observed maximum 2.25 Mg/l during winter season and minimum 1.68 Mg/l during rainy season.

Cod is the amount of oxygen required for the oxidation of chemical wastes. A high value of cod shows the presence of higher amount of organic waste in the water body. Cod ranged between 2.55 to 7.85 Mg/l. it was found higher during summer season and lower during winter season. It was in accordance with the observations made by Reddy *et al.* (1995), Kumar *et al.* (2005) [8] and Singh *et al.* (2007) [15].

Nitrate is highly oxidized form of nitrogen and it a very important plant nutrient. A high concentration of nitrate is useful in irrigation but in water bodies it is triggers of eutrophication. Nitrate was observed minimum 0.16Mg/l and maximum 0.55 Mg/l. the seasonal variation was calculated maximum value .86 Mg/l during rainy season and minimum value .34 Mg/l during summer season. Similar results were reported by Agarwal *et al.* (1995) [1], Pandey *et al.* (1999) [11], Angadi *et al.* (2005), Singh *et al.* (2007) [15] and Kumar *et al.* (2016) [7].

On the basis of present investigation it can be concluded that Pahooj dam is grossly polluted. Remedial measures are required to sustain the good quality of water and to save the life of livestock.

**Table 3:** Morphometric and ecologilcal profile of pahooj reservoir

| | | |
|---|---|---|
| 1. | Name of reservoir | Pahooj |
| 2. | Name of reservoir | Pahooj |
| 3. | Location | Near I.G.F.R.I. Jhansi |
| 4. | Source of water | Pahooj river |
| 5. | Catchment area | 310.80 sq km |
| 6. | Average rain fall | 859 mm |
| 7. | Maximum flood discharge | 1528.20 cu, meter |
| 8. | Year of start | 1907 |
| 9. | Year of completion | 1909 |
| 10. | Type of dam | Weir |
| 11. | Area of the reservoir | 518 ctares |

| | | |
|---|---|---|
| 12. | Maximum depth | 10.67 meter |
| 13. | Length | 4.02 km or 2.50 miles |
| 14. | Breadth | 1 km or .620 miles |
| 15. | Designed flood discharge | 1528.20 cu, meter |
| 16. | Submerged are at FRL | 543.90 hectares |
| 17. | Gross storage capacity | 18.25 m. cum |
| 18. | Live storage | 18.21 . cum |
| 19. | Power house | Nil |
| 20. | Length of main canal | 2440 km |
| 21. | No. distribution system | 6 nos. |
| 22. | Length of distribution system | 90 km |
| 23. | Irrigation command area | 6475 hectares |
| 24. | Prime objectives | Irrigation and water supply |
| 25. | Annual irrigation | 2117 hectares |
| 26. | Provisions for water supply | 5.0 m. cum. |
| 27. | Benefited district | Jhansi |
| 28. | Nature of fisheries | Capture and culture |
| 29. | Species stocked | *Catla catla, Cirrhinus mrigala, Labeo rohita, C. idella, Cyprinus carpio, H. molitrix etc.* |
| 30. | Nature breeding | Reported |
| 31. | Yield kg $ha^{-1}yr^{-1}$ | 89.66 g |
| 32. | Total production | 464.48 kg |
| 33. | Managed by | Fisheries department |

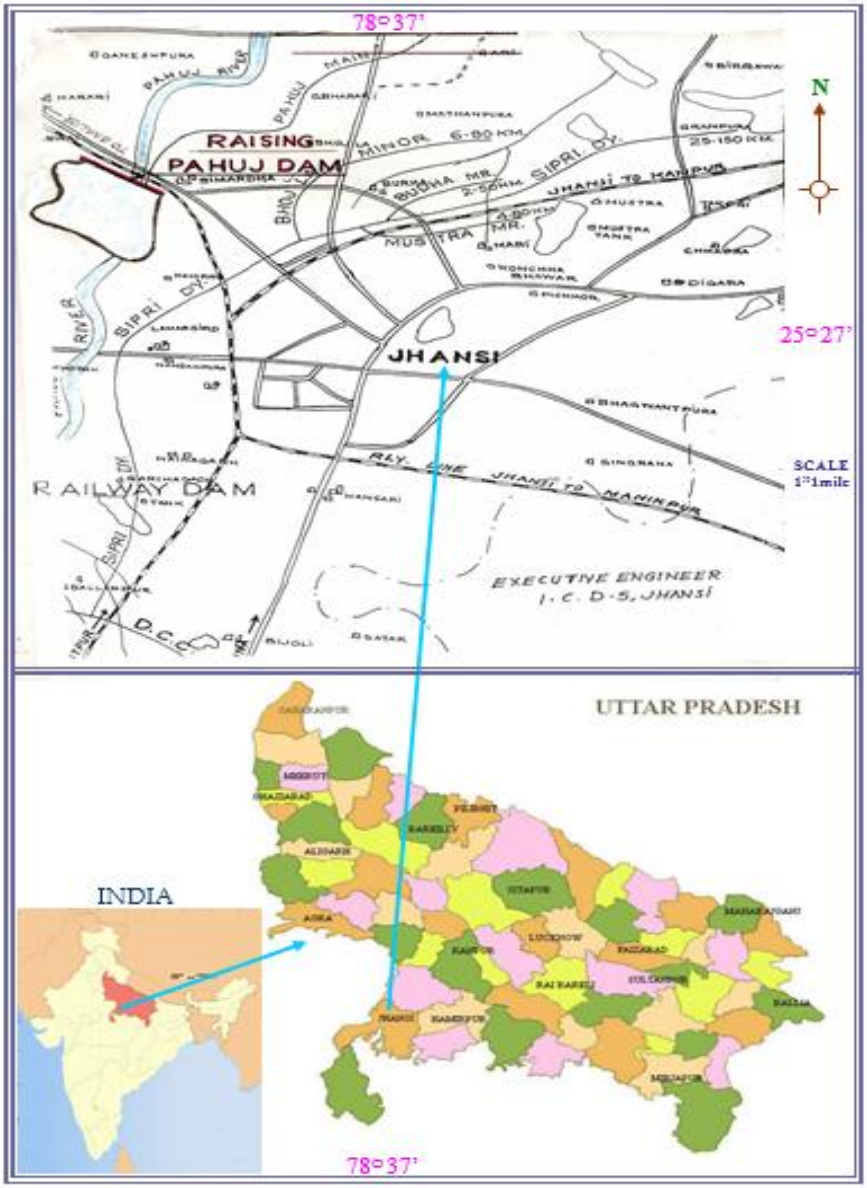


**Fig 1:** Index map of Pahooj reservoir Jhansi

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