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**RESEARCH ARTICLE**

**ASSESSMENT OF SEASONAL VARIATIONS IN WATER QUALITY OF GIRNA,  
RESERVOIR IN NASIK DISTRICT.(M.S.)**

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**ABSTRACT**

Seasonal variations in water quality of Girna, reservoir in Nasik district in terms of physicochemical parameters such as Temperature, pH, total alkalinity, dissolved oxygen, total hardness, salinity, chloride, electric conductivity has been studied during three seasons summer, monsoon and winter during november 2010 to october 2011. Result of physic-chemical studies revealed low values of physico-chemical parameters during monsoon season than summer and winter seasons in water of Girna reservoir in Nasik district.

**Key words:**

Girna reservoir, seasonal variations, physicochemical parameters.

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**INTRODUCTION**

Water quality is important for drinking, agriculture, aquaculture and industrial use. The aquatic resources of the country are its national wealth. Water resources need special interest for conservation, development and management for best and sustainable utilization. Aquatic ecosystems are progressively coming under permanent pressure of anthropogenic pollutants. Water constitutes the "trouble spot" of all ecosystems (Brandy and Weil, 1999). The supply of quality water remains a major challenge for humanity in the twenty-first century (Schwarzenbach *et al.* 2010). The whole human kind needs water for sustaining life; the provision of a safe drinking water supply is a high priority issue for safeguarding the health and well-being of humans (Van Leeuwen, 2000; WHO 2011) and is an important development issue at national, regional and local level (WHO, 2011).

The Girna reservoir is constructed on the Girna river. Girna river originate from the hilly ranges of Sahyadries and flows from mountain to, and weathering soil and rock have become sources of heavy metal. The Girna river is mainly polluted by

their rivulets namely Tamdi, Punand, Aram, Mosam, Masa Nadi, Baindki and markhandi etc. These rivulets are surrounded by the agricultural land, which is polluted by fertilizers and pesticides. The Girna reservoir is contaminated due to unfilthy practices of dumping waste and sewage. The modern agricultural activities and agro industrial development in the catchment area of reservoir is also contributing in pollution. Hence, the present work of monitoring water quality and physicochemical parameters has been carried out.

**Study Area:** Girna reservoir is an earthen dam constructed in 1969 on Girna river at Nandgaon in Nasik district of Maharashtra state, India. Geographically, reservoir is located at 20°29'16" N and 74°39'41" E. The total capacity of reservoir is 525,920 Km<sup>3</sup> (126,170 cu mi) and surface area is 60,040 Km<sup>2</sup> (23,180 sq mi). The height of reservoir is 54.56 m and the length is 963.17m. The volume content of reservoir is 2,042 Km<sup>3</sup> (490 cu mi) and gross storage capacity is 608,980.00 Km<sup>3</sup> (146,102.07 cu mi). The reservoir water is used for irrigation, industrial as well as for drinking purpose.

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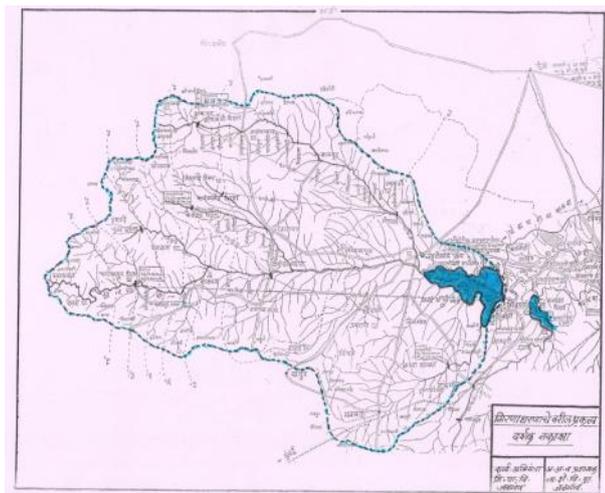


Fig. 1 Map of Girna reservoir

## MATERIALS AND METHODS

For physicochemical analysis, water samples were collected seasonally (summer, monsoon and winter seasons) from different places of Girna reservoirs of Nasik district during November 2010 to October 2011 at 8.30 am, in triplicates and mixed together for each location so as to portray the average condition in the respective area. The water samples were collected from depth of 5-10 cm below the surface water in acid washed plastic bottles. Temperature was measured directly on field by thermometer; pH measurement was carried out by a pH meter (Elico LI 120). Separate samples were collected for dissolved oxygen (DO) in 250 ml bottles and dissolved oxygen was fixed in the field by adding alkali reagent. The samples analyses were carried out immediately after return to the laboratory. Physico-chemical parameters like total alkalinity, dissolved oxygen, total hardness, salinity, chloride, electric conductivity were determined seasonally in summer, monsoon and winter seasons by standard method (APHA, 1998).

## RESULTS AND DISCUSSION

The physico-chemical parameters like temperature, pH, total alkalinity, dissolved oxygen, total hardness, chlorides, salinity and electrical conductivity were determined seasonally in water samples collected from Girna reservoir of Nasik district and obtained data are summarized in table.no. 1 and figure No. 1,2 & 3.

**Table 1** Mean values of seasonal variations of different physico-chemical parameters from Girna reservoirs of Nasik district and highest permitted value for drinking water (WHO standard, 1993 mg/L)

| Parameters                        | Summer        | Monsoon       | Winter        | Highest Permitted value for drinking water (WHO standard, 1993 mg/L) |
|-----------------------------------|---------------|---------------|---------------|--|
| Temperature °C                    | 27.12 ± 1.35  | 24.08 ± 1.26  | 20.48 ± 0.94  |  |
| pH                                | 8.31 ± 0.85   | 8.01 ± 0.82   | 7.60 ± 0.52   | 6.5 - 8.5  |
| Total alkalinity (mg/l)           | 151.29 ± 2.04 | 114.08 ± 1.64 | 81.56 ± 1.18  | 200 mg/L   |
| Dissolved oxygen (mg/l)           | 6.78 ± 0.43   | 7.38 ± 0.62   | 9.31 ± 0.82   | No guidelines  |
| Total hardness (mg/l)             | 163.27 ± 5.12 | 108.41 ± 3.47 | 134.78 ± 3.69 | 300 mg/L   |
| Salinity (mg/l)                   | 112.51 ± 2.27 | 72.46 ± 1.73  | 107.93 ± 2.16 | No guidelines  |
| Chlorides (mg/l)                  | 62.28 ± 1.42  | 40.11 ± 1.05  | 59.74 ± 1.32  | 250 mg/L   |
| Electrical conductivity (µmho/cm) | 358.09 ± 8.39 | 213.41 ± 4.28 | 241.29 ± 5.43 | 250-750 (µmho/cm)  |

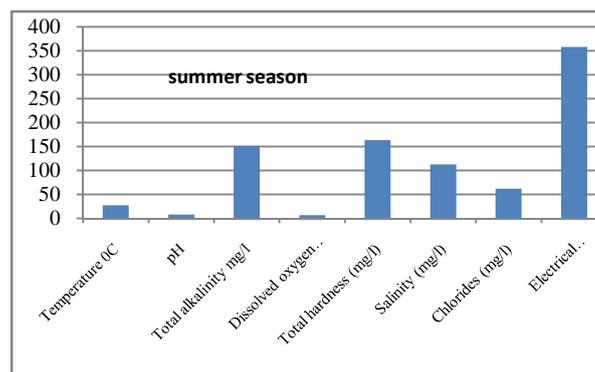


Fig.1 Graph showing seasonal variations of different physico-chemical parameters from Girna reservoir of Nasik district during summer season in November 2010 to October 2011.

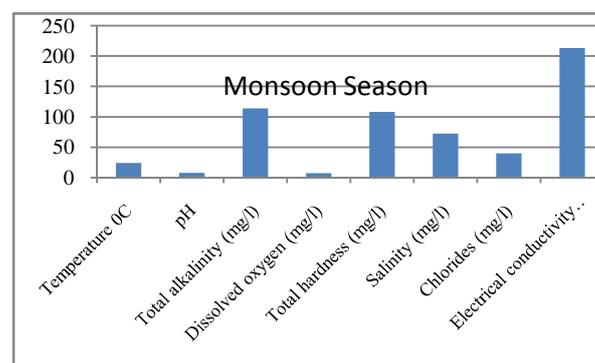


Fig. 2 Graph showing seasonal variations of different physico-chemical parameters from Girna reservoir of Nasik district during monsoon season in November 2010 to October 2011.

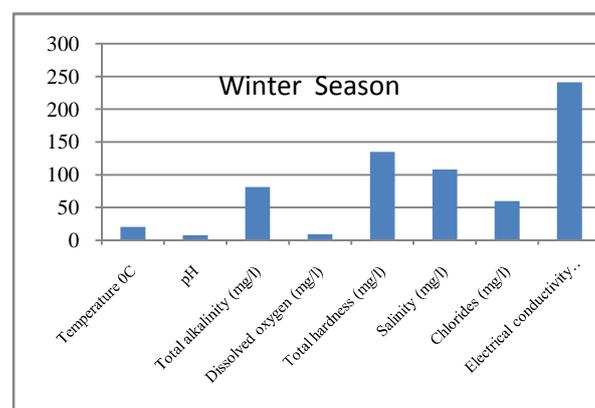


Fig. 3 Graph showing seasonal variations of different physico-chemical parameters from Girna reservoir of Nasik district during winter season in November 2010 to October 2011.

**Temperature:** Temperature is an important parameter which affects dissolved oxygen, rate of photosynthesis and distribution of biota. In summer, monsoon and winter seasons the mean temperature values were 27.12<sup>o</sup>C, 24.08<sup>o</sup>C, 20.48<sup>o</sup>C respectively at Girna reservoir. [Bhalla et.al \(2012\)](#) reported that temperature of water changes with respect to season and environmental conditions.

**pH:** In summer, monsoon and winter seasons the mean pH values were 8.31, 8.01, 7.60 respectively at Girna reservoir. In the present study higher values of pH was observed during summer season than monsoon and winter season, could be due to increased photosynthetic absorption of dissolved inorganic carbon by planktons ([Subbarao and Govind, 1967](#); [Goldman, 1972](#); [Farrell et al., 1979](#)) high pH of waters during summer season could be due to increased photosynthetic absorption of dissolved inorganic carbon by planktons.

**Total Alkalinity:** In summer, monsoon and winter seasons the mean total alkalinity values were 151.29(mg/l), 114.08(mg/l) and 81.56(mg/l) respectively at Girna reservoir. [Singh and Saha \(1987\)](#) reported higher level of alkalinity during summer months. [Jha and Barat \(2003\)](#) reported that total alkalinity had higher values in summer season followed by steep fall in monsoon due to dilution of water.

**Dissolved Oxygen:** In summer, monsoon and winter seasons the mean dissolved oxygen values were 6.78, (mg/l), 7.38 (mg/l) and 9.31 (mg/l) respectively at Girna reservoir. Higher concentration of dissolved oxygen was observed during winter season and lower during summer season, might be due to higher rate of decomposition of organic matter and limited water flow in low holding environment due to elevated temperature

**Total Hardness:** In summer, monsoon and winter seasons the mean total hardness values were 163.27 (mg/l), 108.41(mg/l) and 134.78 (mg/l) respectively at Girna reservoir. Calcium and magnesium salts are important for the formation of hardness of natural water and observed maximum during summer and winter seasons ([Munawar, 1970](#); [Chandrashekar and Jafer, 1998](#)).

**Salinity:** In summer, monsoon and winter seasons the mean salinity values were 112.51 (mg/l), 72.46 (mg/l) and 107.93 (mg/l) respectively at Girna reservoir. La Fond (1954) reported that the freshwater released from rivers causes a decline in the salinity of the surface water during the monsoon and restoration occurs as the salinity continuously increase from post-monsoon to summer.

**Chlorides:** In summer, monsoon and winter seasons the mean chloride values were 62.28 (mg/l), 40.11 (mg/l) and 59.74 (mg/l) respectively at Girna reservoir. In the present study high values of chloride was observed in summer season due to continuous input of industrial effluents, domestic waste water and low water inflow. [Jana \(1973\)](#) and [Govindan and Sundaresan \(1979\)](#) reported that higher concentration of chloride in the summer season could be due to sewage mixing, increased temperature and evaporation of water.

**Electrical Conductivity:** In summer, monsoon and winter seasons the mean electrical conductivity values were 358.09 (µmho/cm), 213.41(µmho/cm) and 241.29 (µmho/cm) respectively at Girna reservoir. During present investigation electrical conductivity was found to be significantly lower in the monsoon season than the summer season this might be due to dilutions of the reservoir during the monsoon season and perhaps the precipitation of the metallic ions during this period joined with the low water level in the dry season period ([Chapman and Krammer, 1991](#); [Akin-Oriola, 2003](#)). [Moundiotiya et.al \(2004\)](#) reported maximum electric conductivity in summer and minimum in monsoon in Jamwa Ramgarh wetland.

## CONCLUSION

Results of the present study indicated that the mean values of temperature, pH and total alkalinity were highest in summer season and lowest in winter season, mean values of dissolved oxygen was highest in winter season and lowest in summer season. The mean values of total hardness, salinity, chloride and electrical conductivity were highest during summer season and lowest during monsoon, in surfaces water sampled from Girna reservoir in Nasik district. The study indicated that physicochemical parameters undertaken to assess the water quality of Girna reservoir of Nasik district were found to be below the permissible limit set by regulating agency (WHO, 1993). Therefore this study indicates that water of Girna, reservoir is suitable for drinking, irrigation and industrial purpose. Hence it is recommended that regular monitoring is needed to maintain water quality.

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