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A STUDY OF SEASONAL VARIATIONS IN PHYSICO-CHEMICAL PARAMETERS OF TEMPERATURE IN PALAIR RESERVOIR, KHAMMAM, TELANGANA, INDIA

*Ravi Shankar V and *Bhanu Prakash. K*

Dept. of Zoology, Government Degree College Nelakondapally, Khammam District, Telangana

**Dept. of Zoology, K R K Government Degree & PG College, ADDANKI, Prakasam DT., AP*

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Abstract: *The present study carried out in Palair reservoir, Khammam district of Andhra Pradesh. India, during two years starting from August 2004 to July 2006. In the present study various parameters like physico-chemical parameters of water and biological parameters like zooplankton were studied. In view of the scanty approach to investigate physico-chemical and biological parameters water has been analyzed. Standard methods have been followed for physicochemical analysis as suggested by APHA (1989), Trivedy and Goel (1986), M. M. Saxena(1989).*

Keywords: *Seasonal Variations, Physico Chemical, Temperature, Palair Reservior, Water sampler.*

Review of Literature:

Clean water is one of the nature's greatest gifts to mankind. Water is one of the most important and precious natural resources. Unfortunately, the clear water resources are not only shrinking in size but are also getting more and more polluted becoming less suitable for its various uses. In fresh water bodies nutrients play a major role. The performance of tropic status depends on the locality and topography of the water body (Hosetti et al., 1984). Oligotrophic water bodies are relatively un productive and receive comparatively small amounts of nutrients and support aquatic plants and animals while eutrophic water bodies experience high influx of aquatic nutrients and are highly productive in term of plants and animals. It is generally found that eutrophic water bodies tend to experience water quality problems. Kant & Vohra (1989) have rightly suggested that the management of any aquatic ecosystem is the conservation of habitat with an aim to maintain its physico-chemical quality of water. The monitoring of water quality is the first step to be taken before taking up any management and conservation plan of any aquatic system. (Garg et al.,2006).

All human civilizations have evolved in close promixity to natural sources of water, especially rivers. An increasing tendency of these fresh water resourcesgetting degraded due to the dumping of industrial and agricultural effluents, domestic sewage etc. in an uncontrolled manner creates potential health hazards and renders them unsuitable for various purposes such as drinking, irrigation, pisciculture and recreation. This is a matter of serious concern among environmentalists, public health authorities, administrators and policy makers as well as a favourite topic for investigation among researchers. Interdisciplinary approach in this field has helped to evolve strategies for the remediation of contamination of these fresh water ecosystems. Looking at the scarcity of water, such natural water bodies and reservoirs should be judiciously and hygienically handled so that water existing in such reservoir could be used for domestic purposes. Hence limnological studies of the existing reservoirs are of utmost importance. Similar studies have been made by various workers like Ganapathi 1995, Krishnamurthy et al., 1965, Unni 1984.Saran and Adoni 1985.

The fresh water system of this region are characterized by the seasonal fluctuations in a water levels, seasonal fluctuations in water temperature variation between surface and bottom waters and wide seasonal fluctuations in the density and diversity

of flora and fauna. Lakes and rivers have important multi-usage components, such as sources of drinking water, irrigation, fishery and energy production. These considerably depend on water quality and thus water quality should be kept at a certain level. The pollution of surface water with toxic chemicals and the eutrophication of rivers and lakes with excess nutrients are areas of great environmental concern worldwide. Agricultural, industrial and urban activities are considered to be major sources of the addition of chemicals and nutrients to aquatic ecosystems. Concentrations of toxic chemicals and biologically available nutrients in excess can lead to such diverse problems as toxic algal blooms, loss of oxygen, fish kills, loss of biodiversity, and loss of aquatic plants beds and coral reefs (Ouyang et al., 2006, CansuFilikIscen et al.2008).

The quality and quantity of surface water bodies such as lakes depend upon the climate, catchments, geography of the area and the inputs and outputs both natural and manmade (Gray 1994). The water quality of lakes can be degraded due to microbiological and chemicals contaminants. Among the latter, trace metals are most important because many of these metals are essential nutrients when in lower concentrations; however, they become toxic if their concentrations surpass certain limits (O'Dell and Sunde 1997; Goldhaber 2003; WHO 2004). Constant exposure to these metals can result in bioaccumulation (Nessim and Riad 2003; Papagiannis et al., 2004; Maffucci et al., 2005; Nguyen et al., 2005) and cause endocrine disruption (Brian 2005). In higher concentration, copper causes metabolic and gastrointestinal disorders (WHO 2004), affects the liver and brain of sufferers of Wilson's disease (Brewer 2000; Roberts and Schilsky 2003) and becomes toxic to aquatic life (Paris-Palacios et al., 2000). Cobalt is alsotoxic in higher concentration (Norberg and Molin 1983; Marr et al., 1998). Cadmium is toxic to humans, aquatic life and wildlife (Canton and Slooff 1982; Leffel et al., 2003; Barbier et al., 2005). In higher concentration, nickel is toxic and carcinogenic to humans (Denkhaus and Salnikow 2002; Kasprzak et al., 2003; WHO 2004). Lead is cytotoxic, neurotoxic and a possible human carcinogen Group B2 (Mameli et al., 2001; WHO 2004). It also affects mental development in infants and young children (WHO 2004). Nevertheless, the investigation of trace metals in lake water is difficult because of their low concentrations and separation of trace metals from the key cations that are in higher concentrations in natural waters is important. Therefore, analytical methods those are sensitive enough are required. Nevertheless, the investigation of trace metals in lake water is difficult because of their low concentrations and separation of trace metals from the key cations that are in higher concentrations in natural waters is important. (Ghulam Murtaza Mastoi et al., 2008).

Objectives:

Reservoirs are the most important and effective water storage facilities in modifying uneven distribution of water both in space and time. They not only provide water, hydroelectric energy and irrigation, but also smooth out extreme inflows to mitigate floods or droughts. To make the best use of the available water, the optimal operation of reservoirs in a system is undoubtedly very important. Reservoir operation requires a series of decisions that determine the accumulation and release of water over time. In the face of natural uncertainty, forecasts of future reservoir inflow can be helpful in making efficient operating decisions.

Collection water samples:

Water samples for physico-chemical analysis were collected from four stations of sampling were identified based on representative stations of the water body so that, by and large the water samples should represent the totality of its water chemistry. Sampling was done once in the first week of each month from August 2004 to July 2006 between 10 A.M. to 11.30 A.M. the samples were taken from 5-8 cm in acid polyethylene bottle of two liter capacity and brought to the laboratory.

In view of the scanty approach to investigate physico-chemical and biological parameters water has been analyzed. Standard methods have been followed for physicochemical analysis as suggested

by APHA (1989), Trivedy and Goel (1986), M.M. Saxena(1989).

Material and methods:

The present study carried out in Palair reservoir, Khammam district of Andhra Pradesh. India, during two years starting from August 2004 to July 2006. In the present study various parameters like physico-chemical parameters of water and biological parameters like zooplankton were studied.

The following physico-chemical parameters of Palair reservoir analysed once in a month to know the chemical and biological status of reservoir. The parameters analysed were Temperature, Hydrogen ion concentration (P^H), dissolved oxygen (DO), Biological oxygen demand (BOD), Total hardness (T.H), nitrates (NO_3-N), Total solids (TS), Calcium, Magnesium, Chlorides, Nitrites(No_2-N), Sodium(Na), Potassium (K), Sulphates(So_4), Carbonates(Co_3), Bi-Carbonates (HCO_3), Cadmium(Cd) , Cobalt(Co), Copper(Cu), Zinc(Zn).

TEMPERATURE:

Monthly water temperature ^{0}C was taken with the help of thermometer.

Result and Discussion:

Temperature is one of the important parameters indicating the quality of water. It influences the aquatic life both flora and fauna. Water temperature is of enormous significant, andit regulates various abiotic as well as biotic activities of an aquatic ecosystem. Surface waters exhibited a seasonal trend in temperature with an increase during pre-monsoon; a decrease during post monsoon. The variation in the water temperature may be due to different timing of collection and the influence of season.

Temperature has the greatest effect on the solubility of Oxygen in winter. The dissolved oxygen might fluctuate due to the alteration in water temperature. Temperature of reservoir water showed seasonal variation as well as variations of four stations shown in Fig3.1.1.

The reservoir water temperature had an influence of local climatic conditions hence, recorded in pre monsoon season is minimum and maximum temperatures were recorded in months of February 2006(30.2^{0}C) and April 2006 (32.8^{0}C) respectively in station I; in station-II May 2006(30.4^{0}C), and April-05 (32.8V); in station-III February 2006(30.3^{0}C) and April 2006(32.3^{0}C) and in station-IV the minimum temperature recorded in the month of May 2006 (29.8^{0}C) and maximum temperature recorded in April 2006(32.1^{0}C).Mean temperature values are 30.9 ^{0}C at station-I, 31.3 ^{0}C at station-II, 30.9 ^{0}C at station-III and 30.8 ^{0}C at station-IV.

In monsoon season, minimum and maximum temperatures were recorded in months of August 2004(27.3^{0}C) and June 2006(30.1^{0}C) respectively in station I; in station-II August 2004(27.6^{0}C), and June 2006(31.1^{0}C); in station-III August 2004(27.2^{0}C) and June 2006(30.2^{0}C) and in station-IV the minimum temperature recorded in the month of August 2004(27.5^{0}C) and maximum temperature recorded in June 2006(30.4^{0}C). Mean temperature values are 28.9 ^{0}C at station-I, 29.3 ^{0}C at Station-II, 29 ^{0}C at station-III and 28.9 ^{0}C at station-IV.

In Post monsoon season, minimum and maximum temperatures were recorded in months of November 2005(23.3^{0}C) and October 2004(30.1^{0}C) respectively in station I; in station-II November 2005(23.8^{0}C), and October 2004(30.4^{0}C); in station-III November 2005(23.9^{0}C) and October 2004(30.2^{0}C) and in station-IV the minimum temperature recorded in the month of November 2005 (23.3^{0}C) and maximum temperature recorded in October 2004(30^{0}C). Mean temperature values are 27.5 ^{0}C at station-I, 27.8 ^{0}C at station-II, 27.6 ^{0}C at station-III and27.4 ^{0}C at station-IV.

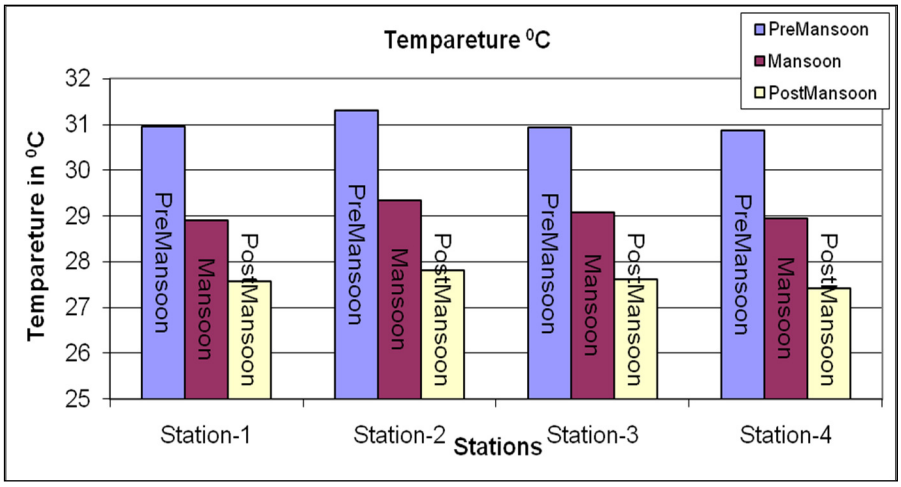

Fig: 1: shows the Seasonal variations in temperature ^{O}C of Palair reservoir

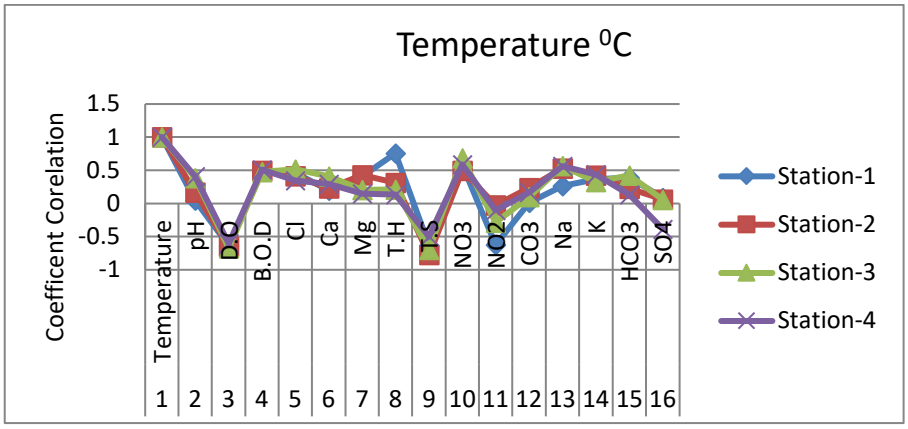

Fig. 2 showing the Temperature Vs remaining Physico chemical Parameters Correlation Coefficient for the Year of 2004-2006 in different Stations

In the present study except Dissolved Oxygen, Total Solids, Nitrites and all other water quality parameters are positively correlated with the Temperature as shown in Fig 3.

Temperature is inversely proportional to Dissolved oxygen in this Palair reservoir, the same results have been reported by Solanki.et.al., 2009, 2006 in Bellal and Pandu of Bodhan.

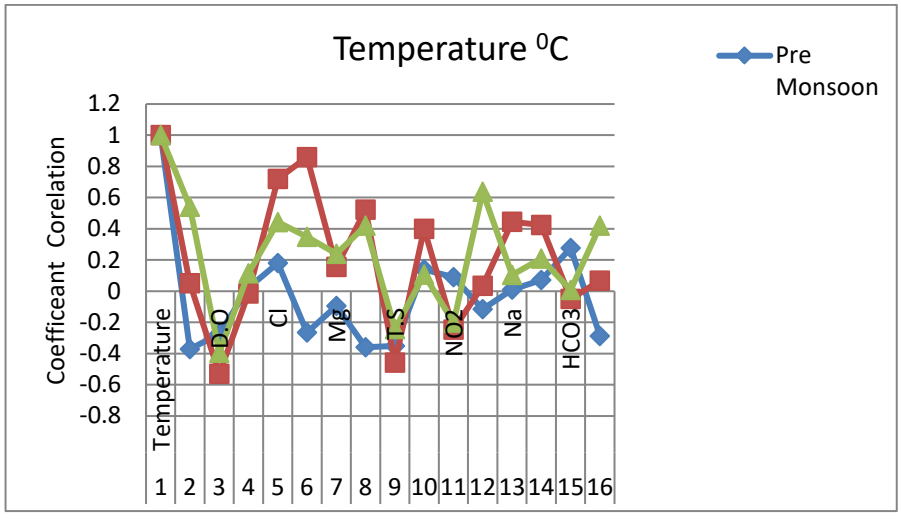

Fig. 3 showing the Temperature Vs remaining Parameters Correlation Coefficient for the Year of 2004-2006 in different Seasons

Bio Chemical Oxygen Demand, Chlorides, Nitrates, Nitrites, Sodium, Potassium & Bicarbonates are positively correlated with temperature in different seasons.P^H, Dissolved Oxygen, Calcium, Magnesium, Total Hardness, Total Solids &Carbonates are negatively correlated with temperature in different seasons as shown in fig .3.

Discussion:

The surface temperature of the reservoir ranged between 23ºC and 33 ºC. High temperature was marked in pre monsoon months while low in post monsoon months. This was mostly because of seasonal changes. As the water samples were collected from the edges of water body, where water was shallow, it responded quickly to the atmospheric fluctuation in temperature. Welch (1952) had also reported that shallow water reacts more quickly to atmospheric temperature. This range of variation was found to be higher than those reported by Ganapati (1960), Zafar (1966), and Prakash (1994). The same range of temperature (23ºC to 33ºC) variation was reported by Usha Avasthi and Tiwari (2004), Kemdrim (2005), Solanki et al (2006) and Veeresha Kumar et al (2006).

Conclusion:

Reservoirs are the most important and effective water storage facilities in modifying uneven distribution of water both in space and time. They not only provide water, hydroelectric energy and irrigation, but also smooth out extreme inflows to mitigate floods or droughts. To make the best use of the available water, the optimal operation of reservoirs in a system is undoubtedly very important. Reservoir operation requires a series of decisions that determine the accumulation and release of water over time. In the face of natural uncertainty, forecasts of future reservoir inflow can be helpful in making efficient operating decisions. A particular problem in the case of water quality monitoring is the complexity associated with analysing the large number of measured variables. Each factor does play its individual role but at the same time the final effect is really the result of interaction of all the factors. The data sets contain rich information about the behaviour of the water resources. Classification, modelling and interpretation of monitored data are the most important steps in the assessment of water quality among the pollutants heavy metals are regarded as serious pollutants of the aquatic ecosystem because of their environmental persistence, toxicity even at low concentration ability to be incorporated into the food web and the organism's capacity for accumulation.

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