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SEASONAL VARIATIONS OF *Ca*, *Mg*, *Na*, *K* OF PALAIR RESERVOIR, KHAMMAM, TELANGANA, INDIA

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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.*

Keywords: *Seasonal Variations, Palair Reservoir, Physicochemical, water sample.*

Review of Literature:

Water is most vital resource for the living organism to survive it possess a number of physical and chemical properties that help the molecule to act as best for the life activities. Most of the bio-chemical reactions that occur in the metabolism and growth of the living cells involve water, hence it has been referred to as a universal solvent. Water is essential for the existence of life on this planet. Today good quality water has become precious commodity. The quality of water is getting vastly deteriorated due to unscientific waste disposal, improper water management and negligence towards environment. This has lead to scarcity of potable water affecting the human health. (Devidas Kamath et al., 2006).

In recent years with unprecedented population growth and intensive agriculture, ground and surface water are being exploited on increasing scale all over the country and water quality and safety have become major issues in public health. In India, canal water is mainly used for drinking and irrigation. Number of studies on physico – chemical quality of water have being extensively carried out (Prasad and Ramachandra, 1997, Bandela 1998 and Chavan 2000, Khatavkar and Trivedi 1992 and Rajput et al., 2004).

Water is one of the basic needs of the mankind and is vital to all forms of life, which exist in lentic and lotic habitats. All lentic habitats such as reservoirs, ponds, and lakes are extremely important because they are endowed with abundance of natural resource. Reservoirs are important to surface water run off for the requirement of drinking, domestic, agricultural and industrial uses. The consideration of the physico-chemical factors in the study of limnology is basic in understanding the tropic dynamics of that water body. 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. In a broad sense, planktons are considered as an index of fertility and the landings of fish are directly proportional to the quantity of plankton (Chidambaram and Menon 1945). Of these, zooplanktons provide the main food item of fishes and can be used as indicators of the tropic phase of a water body (Verma and Munshi 1987). The density and diversity of the zooplanktons are controlled by the several physico-chemical factors of water (Bais and Agarwal 1995 and Hulyal et al., 2008).

The expansion of agriculture and industrial development has not only increased water consumption considerably but has also affected water quality. Water is easily polluted because of its great ability to dissolve substances. Even before raindrops touch the earth, they stand picking up pollutants. Once on the ground, water picks up things rapidly, and becomes contaminated. The various human activities and industries not only require water in large amounts, they also pollute it while using it. Apart from industries, water is

polluted by agricultural and domestic or municipal sources. The water pollutants vary in nature; they include biological agents, chemicals that make water rich in nutrients, chemicals that poison water sediments, heat and radioactive waste. Nearly all water bodies are affected by pollution, including ground water. In many developed countries, water pollution is a major problem and many river basins have been found to show high organic matter concentration. Polluted water loses its economic and aesthetic value. Over the years, water pollution has emerged as an important issue in India as most of the rivers are polluted, which are having substantial negative impact on human health and aquatic life. (UNEP/GEMS1995).

Water pollution is a major problem related to the economic/industrial growth of any country. The number of industries in India, during the last decade, has grown more than ten times and accordingly the problems related to environmental degradation have increased many folds. There is a need for sustainable development of economic growth and industries. Some of the industries release their effluents either on the open land or in surrounding surface water bodies contaminating the soil, surface water and ultimately groundwater. Government of India is aware of these problems and have started looking into the remedial measures to clean some of the highly contaminated surface water bodies. Involvement of very high costs of remediation will make this process slow and therefore, it is essential that the contamination of water bodies is controlled rather than remediation. Human activities are threatening the sustainable use of lakes and reservoirs, which provide pristine water resources for the substances of life or land environments. Many studies revealed that these sources are at risk from over enrichment, over exploitation, contamination by toxins and water diversion for unsustainable agriculture uses (Dinar et.al., 1995). In order to process the developing of a region, in a way, that appropriately considers the precious natural resources like lakes, reservoirs and watersheds, and should be protected for generations to use and enjoy their needs and benefits. (Krishnakumar et al.,2005).

Most developing countries have been blessed with large quantities of water but it is not available in sufficient for human consumption as well as for industrial and agricultural development because of the pollution of the water sources. Pollution of environment is one of the most crucial ecological crises. Environmental pollution is the result of urban-industrial technological revolution and speedy exploitation of every bit of natural resources Sharma et al., 1997. Different activities of man have created adverse effects on all living organisms. Today the environment has become foul, contaminated, undesirable and therefore harmful for the health of the living organisms including the man. The enrichment of water bodies by nutrients and metal ions occurs due to a variety of factors, mostly due to the activities of man directly or indirectly. (Sumana Dutta et al., 2004).

We largely depend on the surface water for domestic, irrigational and industrial and industrial requirements; therefore, it should be good quality along with its aesthetic value in the scenic environment. Water is supplied related to human beings. Another source of the pollution through pesticide residues from the crop fields after rains (Mohan, 1990 and Premlata Vikal et al., 2007).

Water quality is a major factor in determining the welfare of the society. The presence of water born toxic substances in the water bodies cause health hazard. The quality of water is further affected by the human activities, such as usage of detergents, petroleum waste and pesticides, run-off from the agricultural fields has added to the inventory of pollutants. Some Industrial operations which include chemical production, metal plating operations etc, further add up pollutants. (Anil Kumar Gupta et al., 2005).

The quality of water is being continuously by multifold developmental activities. There should be monitoring of our development and industrial skill in such a way that our environment is to be restored

and saved. One of the ways is regular monitoring of water quality to know the status. (Ugale et al., 2005).

Increasing industrialization and urbanization in general has resulted in a drastic increase in both volume and diversity of waste categories being discharged into the aquatic environment including the marine one. Now days the concentrations of the heavy metals are increased in the lotic and lentic water bodies due to discharge of waste water and agricultural run-off (Sahu 1991, Israli 1992; Ouseph, 1995 and Jain and Salmon, 1995 and Anil Kumar Gupta et al., 2005).

Methodology

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.

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.

Physico chemical analysis of water samples:

CALCIUM:

Principle:

Many indicators such as Murexide, calcon, etc. form a complex with only calcium but not with magnesium at higher PH. As EDTA is having a higher affinity towards calcium, the former complex is broken down and magnesium is precipitated out as magnesium hydroxide. Now calcium reacts EDTA to form the colour complex.

Procedure:

To 50 ml of sample, 2 ml of 1N NaOHsolution and 100 mg of Murexide indicator were added. It was titrated with 0.01 M EDTA solution till pink colour changes to dark purple. Calcium was calculated as follows

$$\text{Calcium in ppm} = \frac{\text{ml of titrant EDTA used} \times 0.01 \times 1 \times 400.8}{\text{ml of sample}}$$

MAGNESIUM: COLORIMETRIC METHOD (Brilliant yellow):

Principle:

When magnesium hydroxide is precipitated in the presence of brilliant yellow, the dye is adsorbed on the precipitate and its colour changes from orange to red. A stabilizer is added to maintain the $Mg(OH)_2$ in colloidal suspension.

Procedure:

In the 100 ml measured volumetric flack 50 ml of sample is taken and 1 ml sodium sulfite solution is added. In order 1 ml of sulphuric acid solution, 20 ml of calcium sulphate solution and 5 ml of aluminium sulphate reagent were added. Volume was brought to about 80 ml with distilled water. 5 ml stabilizer, 2.0 ml brilliant yellow solution and 3.5 ml NaOH were added and diluted to the mark, shaken well and was left for five minutes for full colour development. Sufficiently diluted solution was measured photometrically within one hour, against a blank prepared from distilled water and all of the reagents. Use a light path of 2 cm or longer. Prepare standard curve, from 0, 100, 200, 400 and 600μg/Mg.check the least two points with each set of determinations.

$$\text{Calculations: mg/L Mg} = \frac{\mu g\ Mg}{\text{ml sample}}$$

SODIUM:

This cation occurs generally in lower concentration than calcium and magnesium in fresh waters, and makes its way in water through weathering of rocks. In saline and brackish water its concentration is remarkably high and limits the biological diversity due to osmotic stress. Its salts are highly soluble in water and impart softness (in contrast to hardness).

Method:

Filter the sample through filter paper and feed it in flame photometer. Note the reading for

ample and deduce Sodium content of the sample in mg/l by comparing the value with standard curve.

POTASSIUM:

These cations occurs in natural waters in far lesser concentration than Calcium, Magnesium and Sodium. It behaves in the water as does Sodium. Though found in small amounts its plays a vital role, in the metabolism of fresh water environments and considered to be an important macronutrient.

Method:

Set the filter of flame photometer for reading at 769 nm and proceed for determination of potassium in sample following the method described for the determination of Sodium. Use standard Potassium solutions for preparation of standard curve. Express the result of Potassium content in mg/l.

CARBONATES: (Wilcox and Halcher ,1950)

50 ml of sample was titrated with N/20 H_2So_4 using phenolphthalein as indicater.

BICARBONATES: (Wilcox and Halcher ,1950)

50 ml of sample was titrated againest N/20 H_2So_4 using methyl Orenge as indicater.

Result and Discussion:

CALCIUM

Calcium is essential for all organisms and regulates various physiological functions. The Calcium ion contributes to the hardness of the water. Calcium is an important element influencing biota of ecosystem, which plays important role in metabolism and growth. The average Ca^+ value I Palair reservoir of it varied from 17.6 to 66.4 mg/L. The maximum concentration of 66.4 mg/L was noticed in the Pre monsoon and minimum of 17.6 mg/L in the monsoon season as shown in fig:1. Normally these ions are not problematic but at higher concentration increases total hardness of water (Ravi Kumar *et al.* 2005). Calcium is one of the alkaline earth metals and it is not known to indicate or produce any hazardous effect on human health (Pawar and Pulle, 2005 in Pathwadaj Dam Nanded.)

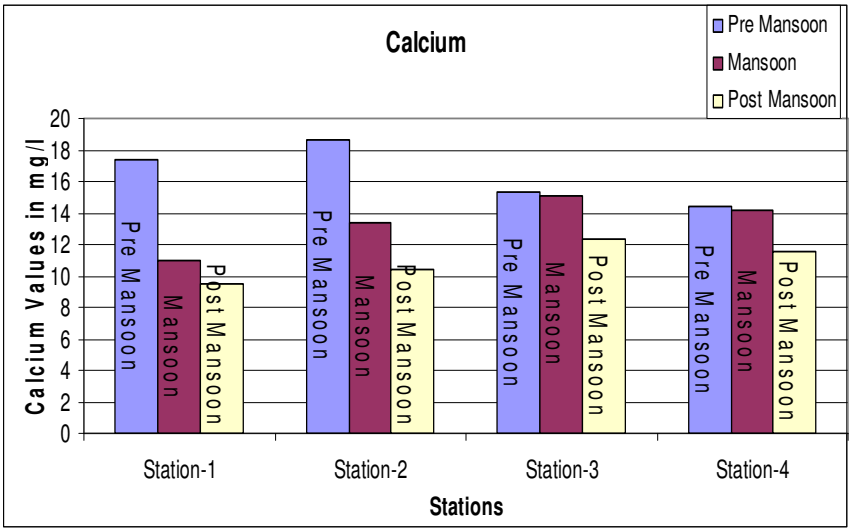


Fig: 1: Average Calcium in Different Stations in Different Seasons.

In pre monsoon season similar Ca values observed in in Karanja reservoir, Bidar by Shashikanth.H.et.al., 2007.

MAGNESIUM

In present study the level of Magnesium varied from 0.97 to 33.58 mg/L- The maximum value (33.58 mg/L) during pre-monsoon while minimum value (0.97 mg/L) was during post monsoon. Mohanta and Patra (2000) observed the values of magnesium maximum during summer and minimum in the winter. Similar results are observed in the present study. Magnesium has ten times the solubility of calcium and being bivalent, it too produces hardness.

Magnesium enters into the drinking water system from natural geological sources, Mg^{2+} causes nausea, muscular weakness and paralysis in human body when it reaches up to the level of about 400

mg/L. (Mahuyadas Gupta Adak, 2001) Maximum permissible limit of mg in drinking water is 150 mg/L. as prescribed by the W.H.O). (Joshi.J.D.et.al., 2004)

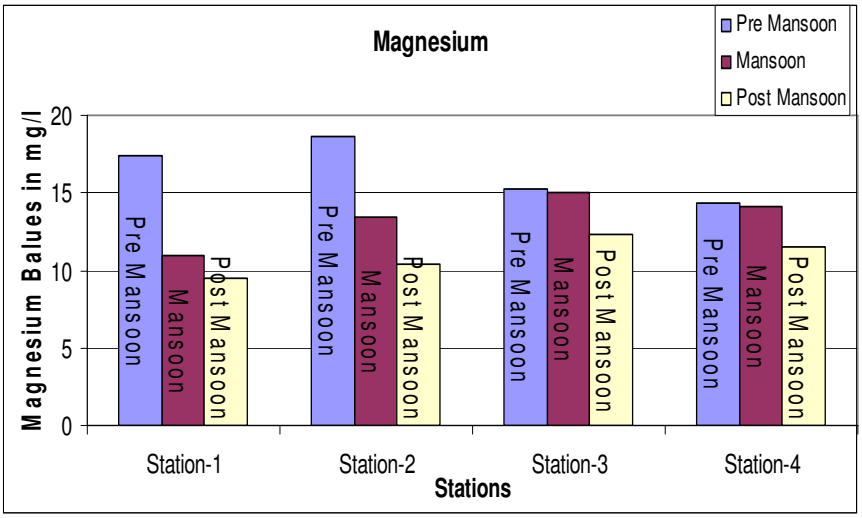


Fig: 2: Average Magnesium in Different Stations in Different Seasons.

SODIUM

Sodium controls intercellular and intra cellular osmosis maintains p^H balance of blood within the body and controls normal activities of muscles and nerves. (Joshi.J.D.et. al., 2004)

The Sodium values in Pre-Monsoon season was recorded maximum 121 mg/l,120 mg/l,96 mg/l and 120 mg/l and minimum values were recorded 42 mg/l,105 mg/l,93 mg/l and 104 mg/l at Station I, II, III&IV respectively. The maximum values were recorded during May 2006 at stations-I, II&III and April 2005 at station-IV in the pre monsoon season, but the minimum values were recorded in February 2005 at all four stations.

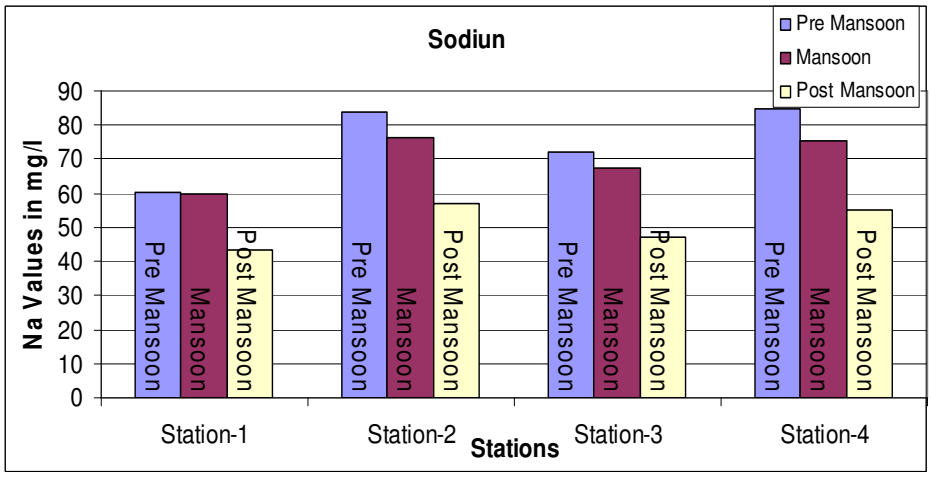


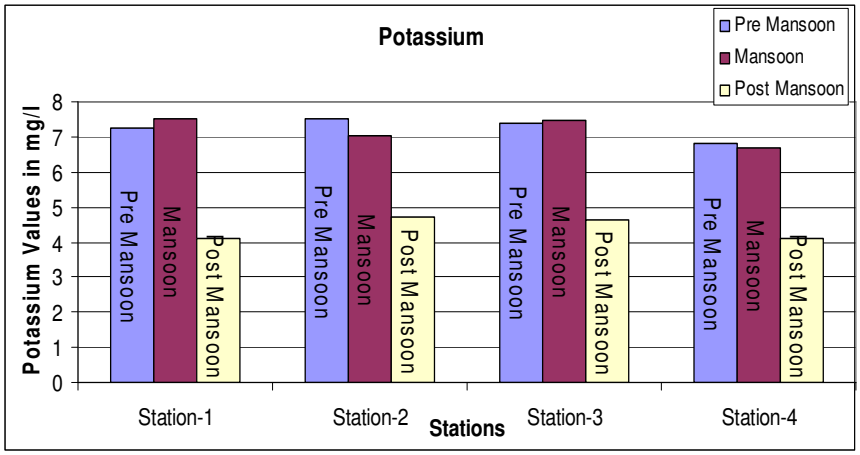
Fig: 3: Average Sodium in Different Stations in Different Seasons.

POTASSIUM

The Potassium values in Pre monsoon season was recorded maximum 8 mg/l,8.3 mg/l,8 mg/l and 8 mg/l and minimum values were recorded 6 mg/l,6.2 mg/l,6.8 mg/land 6 mg/l at Station I, II, III&IV respectively. The maximum values were recorded during May 2006at stations-I and May 2005 at remaining stations-II, III&IV in the pre monsoon

season, but the minimum values were recorded in February 2005 at station I, II&IV and in February 2006 at station III.

The Potassium levels in the present investigation of Palair reservoir during 2004 to 2006 are ranged in between 11 mg/l to 3 mg/l at station-I, 10.8 mg/l to 3.1 mg/l at station-II ,11 mg/l to 4 mg/l at station-III and 11 mg/l to 3 mg/l in Monsoon season.



In the Palair reservoir water composition at all the four stations is in the order Mg>Ca>Na>K>. The dominance of Hco3 in the present study indicates that the hardness of the reservoir water is temporary.

In the pre monsoon season the Calcium level recorded was high in Palair reservoir and similar Ca values were observed in in Karanja reservoir, Bidar by Shashikanth.et.al., 2007.

Water with calcium values above 25ppm is classified as calcium rich. In the present study, the values of calcium content were above this limit for a major period of the year. Slight rise in calcium content in Pre monsoon season at all the stations could be attributed to the rapid oxidation of organic matter, while it decreased during rainy months, might be on account of dilution due to the rain water into the water body. This is in line with Ramana.et.al., 2006.

In the present study of Palair reservoir the Magnesium levels varied from 0.97 to 33.58 mg/l. The maximum value (33.58 mg/L) during the pre-monsoon season while a minimum value (0.97 mg/L) was during the post monsoon season. Mohanta and Patra (2000), observed that the values of Magnesium were maximum during the pre-monsoon season and minimum in the post monsoon season as in the present study. Magnesium has 10 times the solubility of calcium and being bivalent, it too produces hardness.

The hardness ranged from 228 mg/l and92mg/l during the study period. The hardness was found to be maximum (228 mg/l) in the pre monsoon season and minimum (92mg/l) in the monsoon season in the Palair reservoir. Hiware and Jadhar (2001) observed that the high value of Hardness was during pre-monsoon season and minimum during monsoon season.

In the palair reservoir Sodium showed maximum values in July indicating influx of a rain water containing fertilizers from the surrounding agricultural fields. Similar findings were observed by Devidaskamath et.al., 2006 in Ayanur tank near Shimoga.

Potassium was the least abundant cation in the Palair reservoir. It is known that potassium is essential for all algae and higher plants and under low concentration of potassium their growth and photosynthesis are poor (Jhingran, 1970; Hutchinson, 1967 &1975). The monsoon averages at most of the stations were relatively higher than those of winter and summer. Higher potassium contents were recorded in monsoon season. Similar findings were observed by Krishna ram.et.al., 2007 in Byramangala lake Bangalore.

Conclusion:

Present study embodies results on physico-chemical and biological characteristics of Palair reservoir of Palair Village of Khammam district situated in Southern part of telangana in Andhra Pradesh. The reservoir is facing problems of agricultural residues, domestic runoff. The level of dissolved oxygen in the Palair reservoir is considered to be within permissible limits.

Calcium is very important micronutrient influencing both flora and fauna of ecosystem which plays potential role in metabolism and development. In the present investigations calcium is found higher than magnesium. Sodium and Potassium are within permissible limits in Palair reservoir.

References:

1. Devidas Kamath, Puttaiah,E.T.Kiran,B.R.and Vijaya Kumara, 2005.Status Of Water Quality In Ayanur Tank Near Shimoga District, Karnataka, Nature Environment and Pollution Technology,5(2):257-260.
2. Prasad, B.V. and Rameshchandra, P. I 997. Ground water quality in an industrial zone. A case study. Poll Res. 16(2): 105-107.
3. Chidambaram, K., & Menon, M. D. (1945). The correlation of the west coast (Malabar and Canara) fisheries with plankton and certain oceanographical factors. Proceedings of the Indiana Academy of Science, B22, 355—3
4. Krishnakumar, A. Sobha, V. and Padmalal, D.2005. Status of Nutrients and Heavy Metals in the Recently Deposited Sediments of Vellayani Freshwater Lake, Kerala, South West Coast of India.Eco.Env. & Cons. 11 (2): (235-240).
5. Sumana Dutta and ShriparnaSaxena .2004.Spatial Distribution and Level of Occurrence Of Nutrients and Heavy Metals in the Sediments of Hooghly River.Poll Res. 23 (4): 833-835.
6. Anil Kumar Gupta and Priti Pandey, 2005.Monitoring and Assessment of Heavy Metal Contents in the Pond Water and Sediments at Varanasi.Eco.Env& Cons. 11 (3-4): (433-436).
7. Pawar, S. K.and J.S.Pulle.2005.Studies on physico-chemical parameters in Pathwadaj Dam, Nanded District in Maharashtra. India.j.Aqua. Biol. 20 (2): 123-128.
8. J.D.Joshi(2004) "Drinking water quality of Patan region ,Gujarat,India.Poll Res 23(4):817-820.