



RESEARCH ARTICLE

ANALYSIS OF WATER QUALITY (CHANGES IN PHYSICO-CHEMICAL PARAMETERS)

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ABSTRACT

The present study dealt with assessment of the physico –chemical parameters and correlation coefficient of vedadri reservoir, Krishna district, AP, India. The physico-chemical characteristics and correlation coefficient were studied and analyzed during January-december 2014. Seasonal variation in water samples of Vedadri in different seasons were observed. The results stated that there was significant seasonal changes in some physico- chemical parameters and most of the parameters were in normal limits and indicated for better quality of lake water. Correlation co-efficient indicates showed high significant positive and negative relationship ($p < 0.01$) and also show significant positive and negative relationship ($p < 0.05$).

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INTRODUCTION

Water the most abundant and wonderful natural resource, has become a precious commodity today and its quality is threatened by numerous sources of pollution. Water is an essential requirement of human and industrial development. Water naturally contains minerals and microorganisms from the rocks, soil and air with which it comes in contact. Human activities can add many more substances to water. The demand for freshwater is due to the rapid growth of population and industrialization. Monitoring of water quality leads to the management and conservation of aquatic ecosystem. Water quality is defined as the chemical, physical and biological characteristics of water. It's also a function of geology of the watershed. The healthy ecosystem depends on the physical and biological characteristics of water. To assess these parameters is essential to identify the magnitude and source of pollution load in the aquatic system. Many researches are being carried out to suggest appropriate conservation and management strategies based on the physical and chemical characteristics of water. Due to increased pollution, urbanization rapid growth of industrialization and disposal of sewage, domestic waste, industrial effluents and other human

being activities. Pollution of water majorly shows effect on physico-chemical quality and then systematically destroys microbial and plankton communities thus it leads ecological imbalance of food chain in aquatic ecosystem. The surface water and ground water resources of the country play a major role in agriculture, hydropower generation, live stock production, industrial activities, forestry, fisheries, navigation, recreations activities. Etc., Due to unplanned management, tremendous development of industry and agricultural runoff and disposal of untreated public sewage water, agricultural runoff and other human and animal wastes to rivers, lakes, reservoirs and water bodies are continuously deteriorating their water quality and biotic resources (Venkateshan, 2007). To evaluate the water quality an effort was made to investigate the Vedadri reservoir water at Jaggaihpeta in Krishna district, Andhrapradesh, India. The Objective of the study is to suggest measures based on the physico chemical parameters of Vedadri reservoir water for its better management and conservation.

MATERIALS AND METHODS

Study area

To evaluate the water quality an effort was made to investigate the water in Jaggaihpeta lake located in Krishna and Nalgonda

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Table 1. Vedadri munner water analysis Jan-Deceember2014

	PH	AT	WT	DO	ALK	HARD	EC	TDS	FLOU	NO2	CA	CL	TUR
14-Jan	7.25	25.6	21.4	4.4	130	220	620	400	0.5	0.03	120	130	1.2
14-Feb	7.35	27.3	21.1	4.6	100	220	642	433	0.4	0.04	130	145	0.9
14-Mar	7.58	28.9	26.2	4.7	90	220	620	405	0.7	0.03	80	130	1.7
14-Apr	7.58	32.2	29.2	6.1	80	190	510	338	0.6	0.05	50	140	1.2
14-May	7.70	36.2	34.2	5.3	110	190	510	334	0.4	0.06	40	110	1.0
14-Jun	7.54	35.3	33.8	5.9	70	250	620	381	0.5	0.03	60	180	2.4
14-Jul	7.50	29.4	28.2	6.4	130	210	540	358	0.5	0.04	80	170	1.4
14-Aug	7.57	29.4	28.2	6.7	110	230	585	255	0.5	0.05	110	170	0.9
14-Sep	7.29	32.3	29.4	6.8	90	180	496	367	0.7	0.08	110	130	0.9
14-Oct	7.60	28.2	27.4	5.9	70	230	540	352	0.5	0.04	100	140	0.7
14-Nov	7.65	27.2	28.2	6.8	120	210	590	384	0.8	0.03	95	130	1.5
14-Dec	7.76	25.3	25.3	5.8	130	190	590	390	0.8	0.02	80	150	1.4
SUM	88.17	359.3	335.6	65.7	1020	2540	6882	4399	5.9	0.39	1040	1640	15
AVE	8.43083333	30.10833	28.13333	6.391667	97.33333	213.3333	575.1667	368.25	0.493333	0.025167	88.83333	145	2.083333
MIN	8.15	25.3	23.1	5.1	70	190	576	255	0.5	0.02	50	110	0.7
MAX	7.8	37.2	36.2	7.5	130	250	649	417	0.7	0.08	120	190	2.4
STDEV	0.18865448	3.59895	5.351036	0.945801	22.56173	21.69715	52.79092	47.0121	0.202986	0.114434	24.91589	24.86361	0.59734

Table 2. Water analysis correlations Jan-Deceember2014

	PH	AT	WT	DO	ALK	HARD	EC	TDS	FLOU	NO2	CA	CL	TUR
PH	1												
AT	0.675602	1											
WT	0.7488	0.875052	1										
DO	0.173692	0.587837	0.68714	1									
ALK	-0.33552	-0.64881	-0.62116	-0.37378	1								
HARD	0.083056	0.039854	0.033993	0.013176	-0.53873	1							
EC	-0.18877	-0.67028	-0.68269	-0.70683	0.314912	0.715955	1						
TDS	-0.42096	-0.38196	-0.44156	-0.71734	0.018412	0.242927	0.626818	1					
FLOU	-0.29188	-0.33421	-0.27718	-0.0748	-0.05484	-0.68571	-0.28373	0.179378	1				
NO2	-0.41523	0.412463	0.3567	0.843513	-0.23695	-0.21212	-0.59945	-0.49868	-0.01019	1			
CA	-0.86508	-0.74595	-0.76775	-0.21536	0.188923	0.452218	0.419466	0.19939	-0.07767	0.344556	1		
CL	0.3264893	0.071336	0.221157	0.465932	-0.14886	0.759232	0.428185	-0.08591	-0.43656	0.134509	0.135239	1	
TUR	0.539477	0.376706	0.444249	-0.17078	-0.2061	0.58508	0.474442	0.374622	0.038027	-0.36822	-0.5289	0.442188	1

districts in Andhra Pradesh. The lake exclusively used for irrigation, domestic, fish culture and recreation and also useful for electricity (hydropower) generation.

Collection of sample

In order to determine the water quality, samples of water collected from the paler reservoir during January –December 2014 in the first week of every month. The samples were collected in acid washed five liter plastic container from a depth of

5-10 cm below the surface of water. The physico-chemical water temperature, turbidity, pH, Conductivity, total dissolved solids, chloride, phosphate, and nitrate were determined in different seasons according to standard methods (APHA, 2005, Trivedy and Goel, 1986).

Statistical analysis

All the Statistical analyses were carried out using SPSS for windows release 10.0.

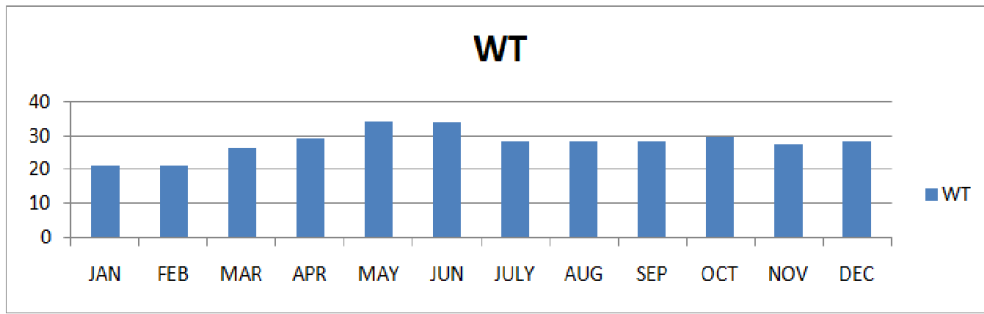


Fig. 1. Changes in water temperature

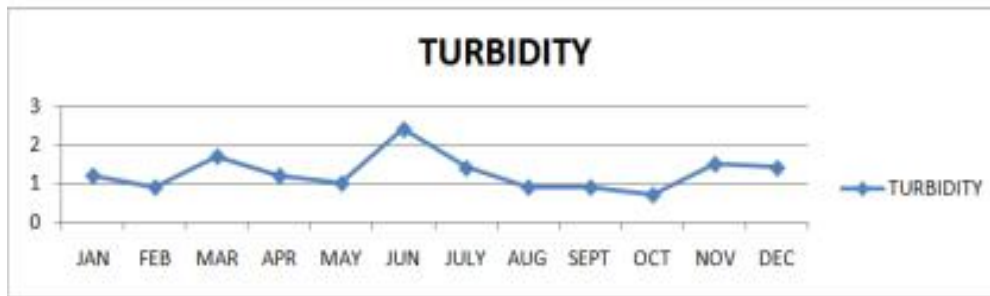


Fig. 2. Changes in Turbidity

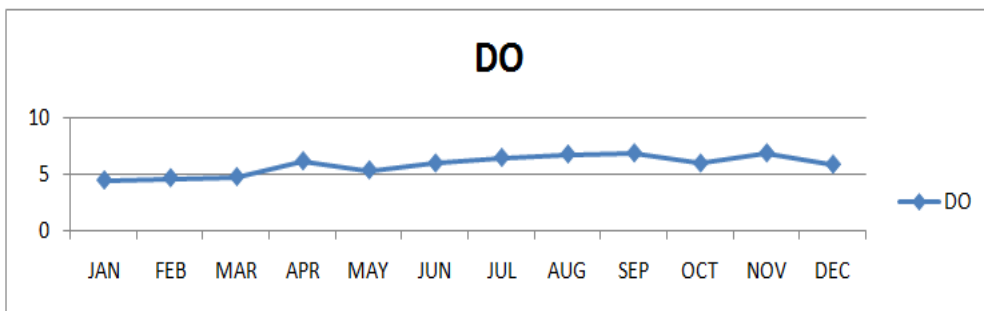


Fig. 3. Changes in Dissolved oxygen

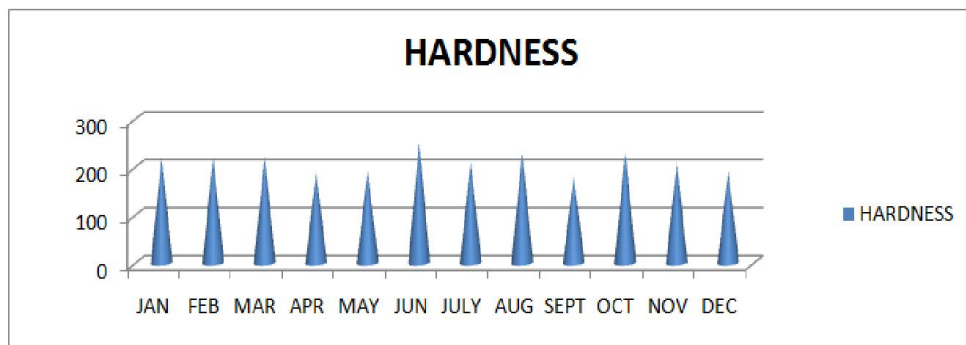


Fig. 4. Changes in Hardness

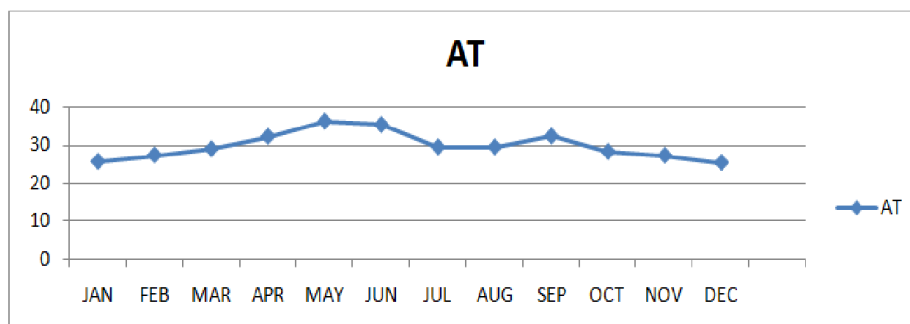


Fig. 5. Changes in Atmospheric temperature

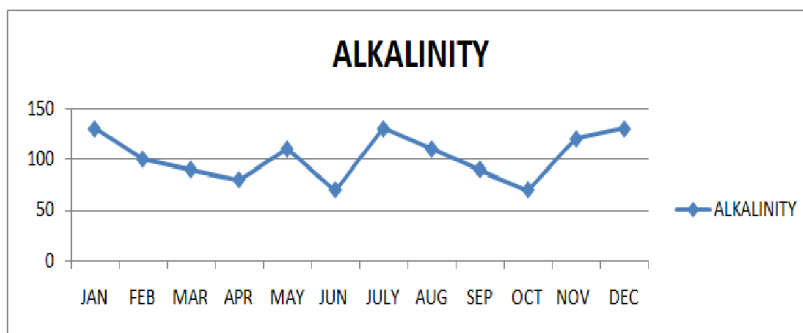


Fig. 6. Changes in Alkalinity

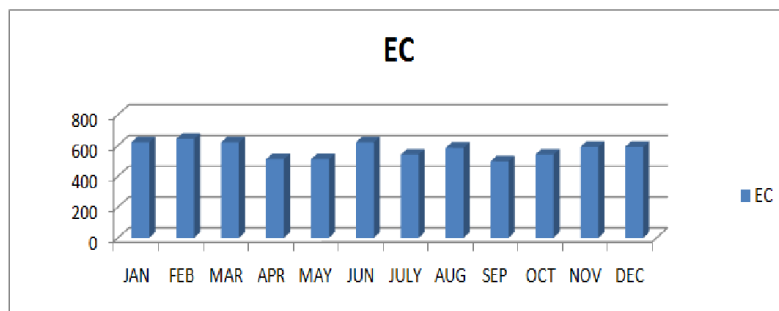


Fig. 7. Changes in Electro conductivity

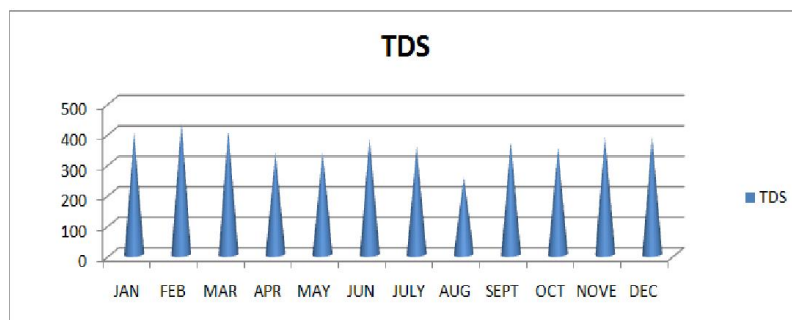


Fig. 8. Changes in Total dissolved solids

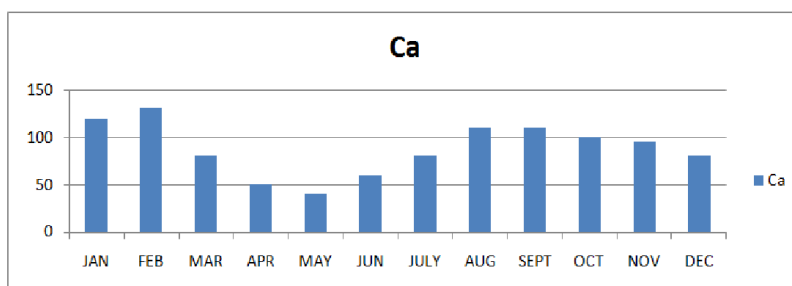


Fig. 9. Changes in Calcium levels

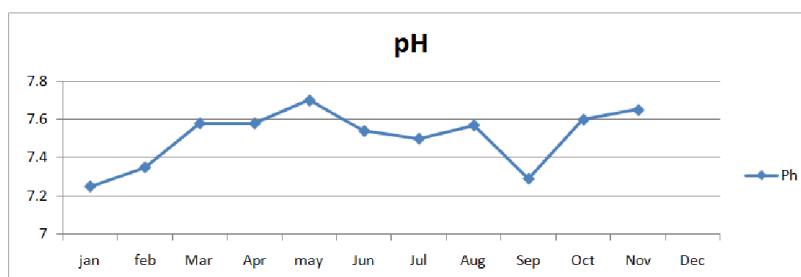


Fig. 10. Changes in pH

The season wise grouped data were used to calculate Student-Newmen-Keuls test (this is the one way ANOVA post hoc non parametric test, for making comparison among the means of three different seasons).

RESULTS AND DISCUSSION

The monthly variation in physico-chemical parameters was presented in Table -1. There are some variations in different physico-chemical parameters have been observed during the study period. The Atmospheric temperature was recorded between 25.3°C to 28. 2°C. The reason for the exceptional lower temperature (air) of 26 can be attributed to the unseasonal rain during the period at the spot. The Atmospheric temperature is also one of the important factors in aquatic environment. Water temperature is very important parameter, because it influence the biota in a water body by affecting activities such as behavior, respiration and metabolism. The temperature of surface water is also influenced by latitude, altitude, season, air circulation, cloud cover, flow and depth of water body. In present study, the water temperature was ranged from 22.1°C to 35.2°C. Water temperature fluctuations shows impact on aquatic animals. The pH is defined as the intensity of the acidic or basic character of solution at a given temperature. P^H is a most important chemical factor of water. It is considered as important ecological factor of aquatic ecosystem. During the present study, P^H is ranged from 7.15 to 7.7 with mean value of 7.430. Alkaline waters harbor more plants than acidic waters. pH between 8.7 to 9.7 is unfavorable for the growth of aquatic organisms, but in the Jaggaiahpet lake, the pH values around below these limits, supporting its growth. Dissolved oxygen (DO) plays a major important role in water quality determination by the entering of either organic and inorganic materials causes depletion of DO levels of water bodies. It is also essential for all forms of aquatic life especially for those organisms responsible for self purification process in natural water. Dissolved oxygen concentration was 5 mg/l throughout the year the reservoir is productive for fish culture. During the present study, DO level are in between 4.8 mg/l to 6.7 mg/l with mean value 5.39 mg/l.

Alkalinity of water is significant for biological activity. Alkalinity in natural water bodies is generally due to the presence of CO_2 in water or HCO_3 produced by the action of ground water on lime stone or chalk. In the present investigation, alkalinity 70 mg/l to 130 mg/l. Hardness of water is due to the presence of major cations like calcium and magnesium that are imparting hardness along with anions like Sulphate, Chloride, Bicarbonates and Carbonate. The increase in hardness can be attributed to the decrease in water volume and increase in the rate of evaporation at high temperature. In the present study, Hardness range in between 190 mg/l to 250 mg/l. In the present investigation, the maximum hardness recorded in monsoon and minimum in summer season.

Electro conductivity reflects the nutrient status of the water and the distribution of macrophytes. It is a good method to estimate the total dissolved solids present in water. In the present study, electro conductivity ranged from 486 to 649 $\mu S/cm$. Solids refer to suspended and dissolved matter in water. In nature water dissolved solids are composed mainly of

carbonates, bicarbonates of calcium, magnesium, sodium, potassium etc. Total dissolved solids are determined as the residue left after evaporation. In the present study Total Dissolved solids ranged from 255 mg/l to 442 mg/l with mean value 358.25 TDS analysis has great implications in the control of biological and physical waste water treatment process. In the present study, fluoride values ranged from 0.4 mg/l to 0.6 mg/l with the mean value 0.5 mg/l. Fluorides concentrations fluctuate due to seasonal variations. High fluoride concentration in water causes fluorosis. Its concentration varied in different seasons is mainly due discharge of sewage waste and industrial effluent into the water. Nitrates is the most highly oxidized form of nitrogen compounds commonly present in natural waters, because it is a product of aerobic decomposition of organic nitrogenous matter. Significant source of nitrates are fertilizers, decayed vegetable and animal matter domestic and industrial effluents and atmospheric washouts. Nitrates plays major role in controlling and occurrence of phytoplankton in water bodies. The results revealed that Nitrates ranged from 0.11 mg/l to 0.16 mg/l with mean value 0.0241 mg/l. Nitrates levels in surface water often show marked seasonal fluctuations with higher concentrations being found during monsoon months compared to summer and winter months. Calcium is found in all the natural waters and its main source is weathering of rocks from which it leaches out. The element is an important component of the carbonic system and also cycles through biotic and a biotic component of the ecosystem. In the present study, Calcium ranged from 45 mg/l to 115 mg/l. Chloride anion is generally present in natural waters. In the present study, chlorides are ranged from 110 mg/l to 190 mg/l, our results were in permissible limit of 200 $mg\ l^{-1}$ (WHO, 1993). Turbidity is an expression of light scattering and light absorbing property of water and is caused by the presence of suspended particle such as clay, silt, colloidal organic particles. In the present study, turbidity ranged from 0.6 NTU to 2.1 NTU.

Correlation (r) between different parameters of water samples of Vedadri reservoir

In the present study the correlation coefficient (r) between every parameter pair is computed by taking the average values as shown in table-3. Correlation coefficient (r) between any two parameters, x & y is calculated for parameter such as PH, atmospheric temperature, water temperature, dissolved oxygen, alkalinity, hardness, electro conductivity, total dissolved solids, fluorides, nitrates, calcium of the Paler reservoir. The degree of line association between any of the water quality parameters measured by the simple correlation coefficient (r) is presented in table-3 as correlation matrix.

Conclusion

The present study shows detailed physico-chemical characteristics and quality of water in Vedadri reservoir. The summer, monsoon and winter seasons shows seasonal fluctuations in various physico-chemical parameters. The water of present reservoir is useful for irrigation as well as fish culture. The water parameters indicate that the reservoir is rich in nutrients. To improve quality of water there should be continuous monitoring of pollution level and maintain the

favorable conditions essential for the fish culture, growth and reproduction.

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