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Research Article

ANALYSIS OF KARUKONDA RAMAVARAM LAKE FOR DETERMINING WATER QUALITY INDEX (WQI) AND TROPHIC STATUS

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A B S T R A C T

Water is liquid gold and very significant sustaining material for existence. The primary life originates in the water and first organisms were also aquatic where water was principle external as well as internal milieus for organisms. The water quality usually refers to the constituent of aquatic ecosystem present at the optimal level for appropriate development of flora and fauna. Water quality can be evaluated by various physical and chemical parameters. The present study was undertaken to study the water quality of Karukonda Ramavaram Lake, Kothagudem area (T.S.), for a period of one year from January to December 2018. During the study period water samples were collected from four sampling sites for the analysis of physical characteristics such as Color, Odor Temperature, Total Suspended Solids and Total Dissolved Solids and chemical characteristics such as Hydrogen Concentration, Dissolved Oxygen, Biological Oxygen Demand, Chemical Oxygen Demand, Chloride Content, Total Alkalinity, Phosphate content, Ammonia content and Total hardness. Analysis of water samples by using globally accepted 'Water Quality Index' (WQI), which is one of the most successful ways to describe the quality of water. The present study expresses the variations of physical and chemical characteristics with seasonal diversity.

INTRODUCTION

Water is natural renewable resource which plays a vital role in sustaining all life on the earth planet and is in incessant circulatory movement as hydro biological cycle. Human being depends on water for the purpose of drinking, domestic needs and irrigation. Usually water in nature is not at all pure in chemical sense. It contains impurities of different kinds such as dissolved gases, minerals and suspended particles. These normal impurities are in very low amount. But due to human activities and urban residency many unnecessary chemical substances are thrown into water and it is contaminated. Polluted water is turbid with bad odor, unpleasant and unhealthy for drinking as well as domestic purpose and cause many diseases and is harmful to human beings. In India villages do not have a source of drinking water. In additional millions of people are yearly affected by low quality of water, around 80% of the total diseases are water borne. Every lake has a unique environment. The majority of lakes on Earth are of fresh water and most of lakes serve the needs of people such as for bathing, fishing, irrigation and livestock watering. Irresponsible practice and improper management of water years the water quality of most Indian water ecosystems such as rivers, Lake and ponds have been subjected to critical anthropogenic actions leading to enormous dwindling of the water quality (Gholami *et.al.,* 2010; Rajamanickam and Nagan, 2016). Further, the improvement of aquatic diversity in fresh water bodies depends directly upon the physico-chemical factors, in addition sun shine and temperature also play an important role (Annalakshmi and Amsath, 2012). The nutrient availability plays an important role in aquatic productivity. *Ramesh* and *Aruna* (2018), *Srinivas* and *Aruna (2018)* and *Aruna et.al* (2018).

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MATERIALS AND METHODS

Analysis of lake water is a part of monitoring environment. While water quality is poor, it affects not only aquatic bionetwork but surrounding ecosystem also. Karukonda Ramavaram Lake is shallow lake largely affected by environmental conditions and anthropogenic activity. It is located between the latitude of $17^{0}19^{1}$ and $18^{0}36^{1}$ North and longitude of $78^{0}48^{1}$ and $80^{0}43^{1}$ East in Bhadradri Kothagudem District of T.S. The study site is the medium fresh water lake in Karukonda Ramavaram. It is main source for drinking, fish cultivation and also irrigation purpose for surrounding crop lands. The present work was undertaken to find out the physico chemical seasonal variation and also aimed on water quality. Four sampling stations selected were labeled as SS_1,

SS_2, SS_3 and SS_4 established in the study area covering all sides for the collection of water samples. Sampling site code, their specification and characters are shown in Table-1.

Table 1 Showing Specification and Characteristic features of Sampling Site

Sampling site code	Specification of Area	Depth (meters	Characteristic features
SS1	Littoral area	2.0	Organic nutrients are added by surface run off
SS2	Limnetic area	1.0	Upper layer of the lake with intensive light penetration where Photosynthesis occurs
SS3	Profundal area	3.5	Bottom area with effective light penetration
SS4	Benthic	4.5	This include bottom region it consist of sediment and soil.

Water samples were collected seasonally throughout the Year 2018 in a 5 liter capacity cans. All the sampling and field observations were conducted very carefully at forenoon hours and analyzed in the laboratory for physico chemical qualities such as Color, Odor Temperature, Total Suspended Solids and Total Dissolved Solids and chemical characteristics such as Hydrogen Concentration, Dissolved Oxygen, Biological Oxygen Demand, Chemical Oxygen Demand, Chloride Content, Total Hardness, Phosphate content, Ammonia content and Total hardness To estimate the content of all these parameters following methods were followed. pH was measured by digital pH meter, DO BOD and COD were measured by Winkler's method, Total hardness was measured by Using EDTA – titration method and Chlorides were measured by Volumetric method, Ammonia by Calorimetric method, TSS and TDS by gravimetric method (Trivedi and Goel, 1986 and APHA 2005).

The present study evaluates water quality assessment based on the Water quality index (WQI) by using following index.

$$WQI = \sum^{n}_{i=1} QiWi$$

Where,

Qi = sub- index for *i* th water quality parameter.
Wi = weight associated with *i* th water quality parameter.
n = number of water quality parameters.

The WQI was prepared using the mean values of the water parameters. In the present study sixteen water parameters were selected based on their significance in water quality.

Table 2 shows WQI range and Water quality status and Table - 3 shows Annual Mean and ranges of water quality parameters at each station during one year of study period (2018)

Table 2 WQI legend (House and Ellis, 1987)

WQI range	Water quality status
91-100	Excellent
71-100	Good
51-70	Medium
26-50	Fair
0-25	Poor

Table 3 Annual Mean and ranges of water quality parameters at each station during one year of study period (2018)

S.No	Water parameter	Mean and ranges of water quality			
		SS1	SS2	SS3	SS4
1	Temperature	26(10-25)	20(9.5-24.5)	24(5-35)	*28(10-40)
2	Colour	Light brown	Color less	Color less	Light brown
3	Odor	Slightly odored	Odorless	Odorless	badly odored
4	pH	6.5(4.3-6.4)	7.5(3.4-8.5)	7.9(2.8-9.5)	*8.4(4.6-12.8)
5	BOD mg/l	0.8(0.3-0.9)	1.5(1.0-1.8)	*3.5(2.5-4.0)	0.5(0.3-0.7)
6	COD mg/l	5	3	2	*10
		(2-7)	(1-5)	(1-4)	(2-12)
7	DO	5.4(2.4-10.5)	6.5(3.5-12)	*7.8(2.5-14.5)	5.5(2-10)
8	TDS mg/l	380(90-480)	*400(200-800)	350(150-350)	300(200-350)
9	TSS mg/l	60(30-80)	40(25-90)	50(60-120)	*68(20-80)
10	Ammonia content mg/l	0.4(0.2-0.7)	0.6(0.4-0.8)	0.5(0.3-0.6)	*0.8(0.4-0.9)
11	Chlorides mg/l	35(20-45)	40(20-45)	30(25-50)	*70(30-90)
12	Phosphate content mg/l	1.4(1.0-1.8)	1.2(1.0-1.5)	1.4(0.8-1.6)	*1.7(1.0-1.8)
13	Sodium mg/l	12.5(1.9-5.8)	8.1(5.2-10.0)	6.5(6.0-9.0)	*12.8(5.8-15.5)
14	Sulphates mg/l	5.4(2.4-6.5)	6.5(1.5-8.5)	8.1(7.8-9.0)	*12.5(8.5-14.5)
15	Total Hardness Total	*65(10-56)	50(20-60)	48(35-45)	45(10-60)
16	Coliform MPN/100ml	900(400-2000)	1200(800-1500)	1300(800-1600)	*2400(800-3500)
	Overall Water Quality Index (WQI)	42	44	40	39

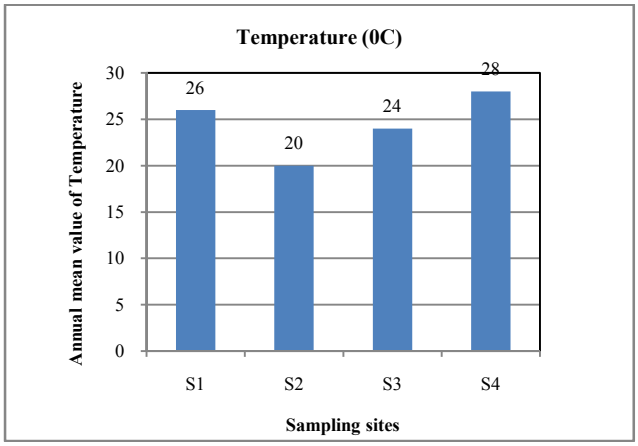
*maximum value

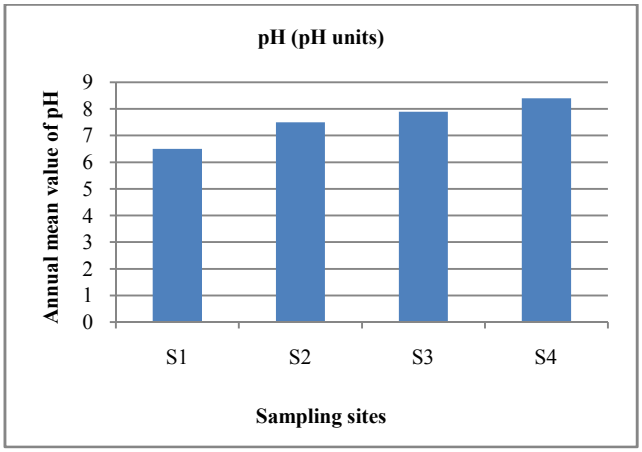
RESULTS AND DISCUSSION

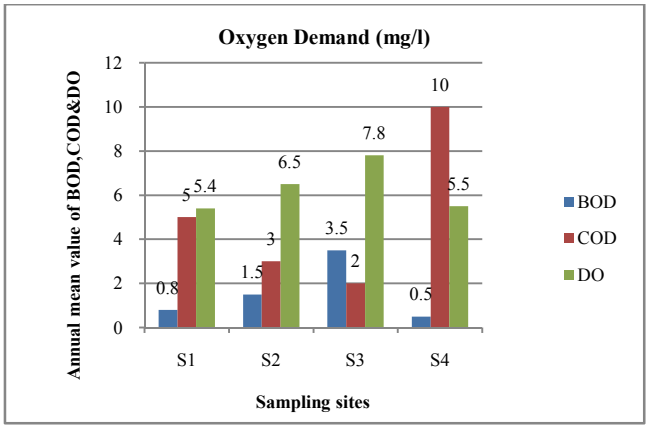
During the study period results obtained of various physico – chemical characteristics of Karukonda Ramavaram Lake water were presented in Table -2. While evident from the table, the four sites temperature varied from 20-28^{0}C, minimum noticed in SS2 and maximum at SS4 pH value varied from 6.5-8.4, minimum noticed in SS1 and maximum at SS4. DO values from 5.4-7.8 mg/l, minimum were noticed in SS1 and maximum at SS3. BOD values vary from 0.5 to 3.5 mg/l, minimum noticed in SS4 and maximum at SS3. COD from 2-10 mg/l, minimum noticed in SS3 and maximum at SS4. Total hardness varied from 45-65 mg/l, minimum noticed in SS4 and maximum at SS1. Ammonia content values from 0.4-0.8mg/l, minimum noticed in SS1 and maximum at SS4. Phosphate content varied from 1.2-1.7mg/l, minimum noticed in SS2 and maximum at SS4. Sodium content varied from 6.5-12.5mg/l, minimum in SS3 and maximum at SS4. Sulphates from 5.4-12.4mg/l, minimum noticed in SS1 and maximum at SS4. TDS varied from 300-400mg/l, minimum noticed in SS4 and maximum at SS2. TSS varied from 40-68mg/l, minimum noticed in SS2 and maximum at SS4. Total coliform MPN/100ml varied from 900-2400, minimum noticed in SS1 and maximum at SS4. Physico chemical parameters of the water body reflect the basic conditions of water sample. Color, odor and taste of the water are indicative of good water quality supported by values of physico-chemical parameters. The average pH values show a condition almost, nearer to neutrality. DO values indicate Oxygen rich conditions. BOD values show unpolluted condition with organic matter. (Fig 1 and Fig 2).

The waste and poisonous substances are frequently discharged into the wetlands through surface run of that degrades the water purity (Lawson *et.al*.2011). This aquatic environmental abnormality can induce changes in biological activities and it was reflecting the occurrence, distribution and diversity of biotic communities (Radha Krishna & Sugunmaran, 2010).

The water sample from four sampling sites of Karukonda Ramavaram Lake has highest WQI value at SS2 with 44 followed by SS1 with 42, SS3 with 40 and SS4 with 39, an average of 41.25 being classified as a water body with fair water quality.







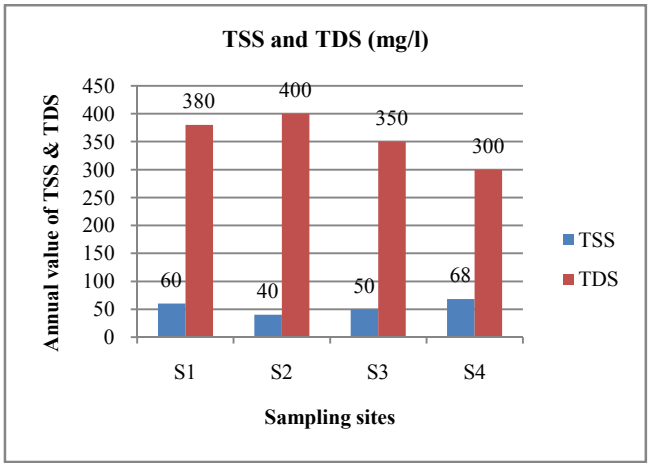
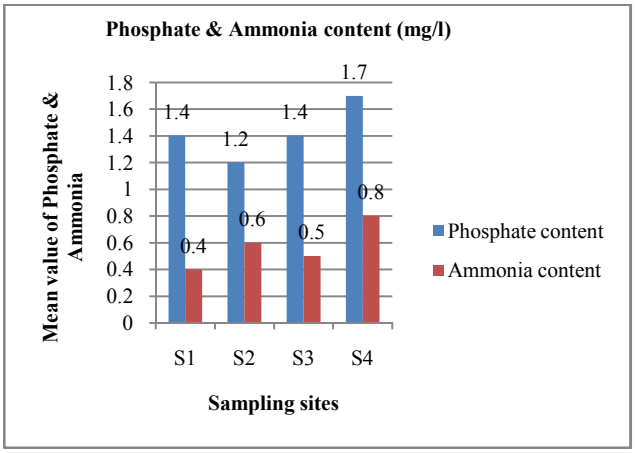
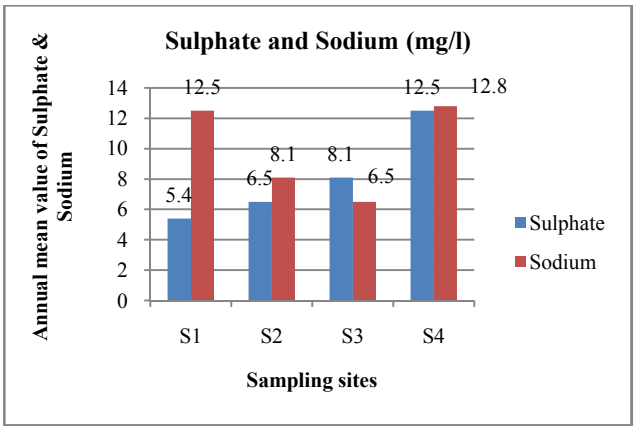
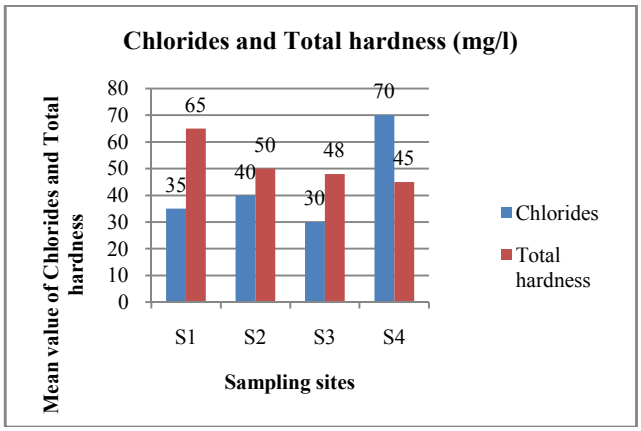


Fig 1 Showing variation in physical characters of lake water







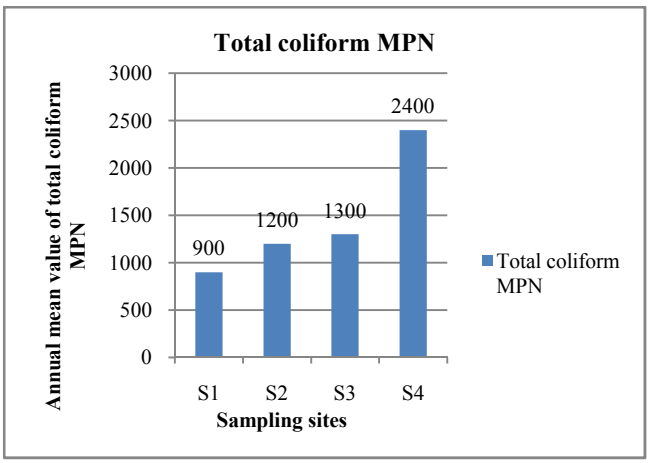


Fig 2 Showing variation in chemical characters and Total coliform MPN in lake water.

CONCLUSION

Water quality factors of the lake were carried out, those parameters showed variation with in sampling sites. Peak values were recorded at the sampling site SS4. According to the results the lake constitutes high nutrient concentration and resulting proliferated growth of algae. Based on the values of water quality index (WQI) and ranges of water parameters, the trophical status of Karukonda Ramavaram lake is classified as 'Eutrophic lake' (Nutrient -rich lake).

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