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Studies on Physicochemical Parameters and Statastical Analysis of the Seasonal Variation Water in Hardrock of Madduvalasa Reservoir Basin, Srikakulam District, Andhra Pradesh

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***Abstract*— The present day studied on the physicochemical parameters and statistical analysis of the seasonal variations on water in hard rock of Madduvalasa reservoir in Srikakulam district. Sample of water collected various seasons and analyzed for major ions like Ca^{2+}, Mg^{2+}, Na^{+}, K^{+}, Cl^{-}, So_4^{-}, F^{-} and Po_4^{-}. And the other physicochemical parameters like pH, TDS, BOD, DO, Turbidity and TH. Statistical analysis data attempted to solve the hidden relationship between ions. This studied area was illustrated of statistical analysis to improve the groundwater system. They reveal that the studied area was not polluted and also the results are within the prescribed limits compared to the BIS and WHO. It can be used for the drinking purposes, agriculture and industrial purposes.**

Keywords*— Statistical analysis, Madduvalasa reservoir, physicochemical parameters, BIS (Bureau of Indian standards), WHO (World health organisation).

I. INTRODUCTION

The major important fact is water is the main constituent of all the living organisms. A Universe, water is the most primarily important to householders and industrial purposes [1]. Streams are the most significant regular asset for the human development however it is being dirtied by unpredictable transfer of sewage; modern wastes furthermore, plenty of human exercises which influence its physicochemical and microbial satisfactory [2]. Natural water contains specific kinds of impurities are introduced in to aquatic, gadget via distinctive methods which include weathering of rocks and leaching of soils, dissolution of aerosol particles from the climate and from a few human activities, along with mining, handling and the utilization of metallic based substances [3]. Water quality arrangements with the physical, chemical and biological traits. When it comes to all other hydrological properties. Any features of water that impacts the survival, multiplication, development and generation of aquaculture species, impacts the executive choices, causes ecological effects or diminishes item quality, what's more, security can be viewed as a water quality variable. Different elements being the identical, aquaculture species will be more advantages, generation will be increasing, ecological effects will be less also, and exceptionally higher in culture system with suitable water [7]. The water qualities have the physical, chemical and biological parameters of water [8]. The quality of water may define according to their physicochemical and biological parameters. The physicochemical properties will be helpful to identify the pollutants [9,10]. Water can be analyzed were the parameters are pH, Electrical conductivity, total suspended solids, dissolved solids, biological oxygen demand, and NO_3 –N, phosphates, chlorine, fluorine, and sulphates [5]. And river sediment contaminated Cadmium, Zinc, Arsenic, Lead, Mercury and Nickel are presented. Heavy metals in the alluvial sediment are necessary to evaluate the point of the pollution. The distribution of heavy metals is the solution has been recognizing as major factors in geochemical activity. The samples have been used to widely in heavy metal pollution in coastal areas [4,15,16]. Heavy metals are contaminated in the water. It was biggest quality issue to the many developing cities or villages as maintained quality of water and human consumption will be increased along with the population would be growth [11,12,6].

Mostly river water is excited to the anthropogenic and estrogenic sources [13] and these are polluted to the river water quality in natural resources. Anthropogenic activities like ultimate disposal of untreated effluents containing [14] and industries and also the indiscriminate use of heavy metals containing fertilizers and pesticides in agriculture rendering dangerous to environmental problems prevented to threat eco-friendly, aquaculture and biodiversity. Then, some of the metals like Cd, Pb, Zn, Hg, Ni and Fe. Where, Cd, Fe, and Zn are not necessary to the micronutrients for life process in plants and microorganisms.

Richa Bhardwaj et al 2017, says that the present-day study explored to be heavy metals pollutant in river Yamuna, at Delhi Stretch. They studied to this sites heavy metal contaminants by using environ metrics and indexing. Where, studied the water samples are in the duration of period of Dec 2013- Aug 2015. They were different locations of water samples are collected. And they are mainly concluded that the not only all site, the two different place are fully polluted to the heavy metal concentration of the in this stretch (i.e. Najafgarh and Shahdara Drain). Has done systematically correlation difference between the concentration of the different heavy metals. Their study area was polluted with

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heavy metals from different anthropogenic activities and discharge of untreated effluents from various industries and residential areas.

Tamilarasi V et al (2015) studied to investigated the groundwater quality monitoring in walajah block in palar river basin in Vellore district Tamil Nadu in India. We have to collected the water samples out of four locations in three years 2009-2011 and analyses the various parameters like pH, EC. TA, TH, Fe, Mg, Cl, F and Cr. These are analyses based on the water quality index (WQI) method. And their revealed that the parameters are TDS, TA, TH, nitrate and Chromium are present in the groundwater in walajah block in Vellore district. These are mainly polluted in this area.

Ruby Pandy et al. (2014) this paper studied the concentration of physicochemical parameters of the seasonal variations in the river of Ganga at Allahabad. Water samples are collected from the varies places are Phahamau, Dashashumedh Ghat & Sangam of Allahabad in the duration of the premonsoon and post-monsoon in the year of 2013-2014. The exhibited parameters like pH, Temperature, and Dissolved Oxygen (DO), Biological oxygen demand (BOD), Chemical oxygen demand (COD), Total alkalinity (TA), and Total hardness (TH), Total dissolved solids (TDS), Turbidity & Chloride were the pollutants are analyzed to the river Ganga. The correlation difference between the physicochemical parameters. There, the quality of water samples is calculated by the water quality index (WQI) method at all three various seasons. Were, the results are obtained the water quality was seriously polluted in monsoon and somewhat polluted in post-monsoon.

K. Ambiga et al (2013) the present day study was the assessment of ground water pollution potential in and around Ranipet area, Vellore district, Tamil Nadu. We water samples collected from the different identical dug and bore wells in duration period of the 2012. Calculated by the various physicochemical parameters subsurface water quality in ranipet. The present investigating was proved that the few parameters are TDS, TH, Cl, Mg, S, C, F and nitrates. These are in ranges within the reference of the BIS drinking water standard limits. we concluded that their needed to the take proper care to avoid to contamination of groundwater pollution through the monitoring of quality of water

Medudhula. Thirupathaiah et.al (2012) in this study, analysis of water quality by using physicochemical parameters in lower manair reservoir of Karimnagar district Andhra Pradesh. We collected water samples and analyzed to the period of the Sep 2009- Aug 20010. We calculated from the statistical parameters on seasonal variations of the water within the permissible limits of WHO. And revealed that the reservoir waters no harmful to the irrigation and drinking. So this water used for the drinking, irrigation and pisciculture.

II. METERIALS AND METHODS

Madduvalasa offshore reservoir is located in the Madduvalasa village, Vangara Mandal, Srikakulam district at India. It is constructed on Vegavathi and Suvarnamukhi Rivers, which are subsidiaries of Nagavali River. The Nagavali river was the tributary of Suvarnamukhi originates in the Eastern Ghats and it should join the Bay of Bengal at Kallepalli near the Srikakulam. The several villages are comprising about 2,240 families were adjacent to the Full Reservoir Level (FRL). This water is used for agriculture, industrial and drinking purposes. The total area of the reservoir 23000 hectares. It is lies between 83°37'20"E 18°35'30"N. The atmospheric condition of the studied area was the summer and rainy seasons.

The water sampling is situated on the three sites from the reservoir. Where sampling stations are being selected by the areas. Here, the site area was we located in relatively river low point polluted (Mishra.A.et al). The water samples are taken from the middle stream region. And were, low-level pollutants are contaminated. These all samples are collected and to transport to the laboratory. Some physicochemical is determined to the collected samples. Where, the various parameters are pH, TDS, BOD, DO, NO^3-N, PO_4^{3-} are locating to the different channel flowing through the three villages of the river basin to assure that the water pollution has not exceeded the set limit of bureau of Indian standards (BIS) and standards for irrigation sustainability and domestic usage. Here, three methods are water quality index is used to calculate the water quality parameters (Weighted Arithmetic Water Quality Index, National Sanitation Foundation Water Quality Index, and Canadian Council of Ministers of the Environment Water Quality Index).

Water samples representing various lithology's will be collected for different seasons and heterotrophic bacteria, total coli forms, Escherichia Coli and antibiotic resistant bacteria. These representing various lithology's will be collected for different seasons and analyzed for major ions like Ca^{2+}, Mg^{2+}, Na^{+}, K^{+}, HCO_3^{-}, Cl^{-}, SO_4^{2-}, NO_3^{-}, PO_4^{-}, F^{-}, H_4SiO_4, etc. Statistical analysis of the data will be attempted to bring out the hidden relationship among dissolved ions present in the water which may vary with season.

Thus, the study had revealed that the stakeholder of the reservoir basins it's suitable for irrigation, industrial purposes and also it's safe to use for human consumption. The stretch of the investigated points during the study period. However, the investigate reiterate the need for continued monitoring of the common property resources under strict water quality surveillance to ensure for the health and environmental safety for the reservoir basins.

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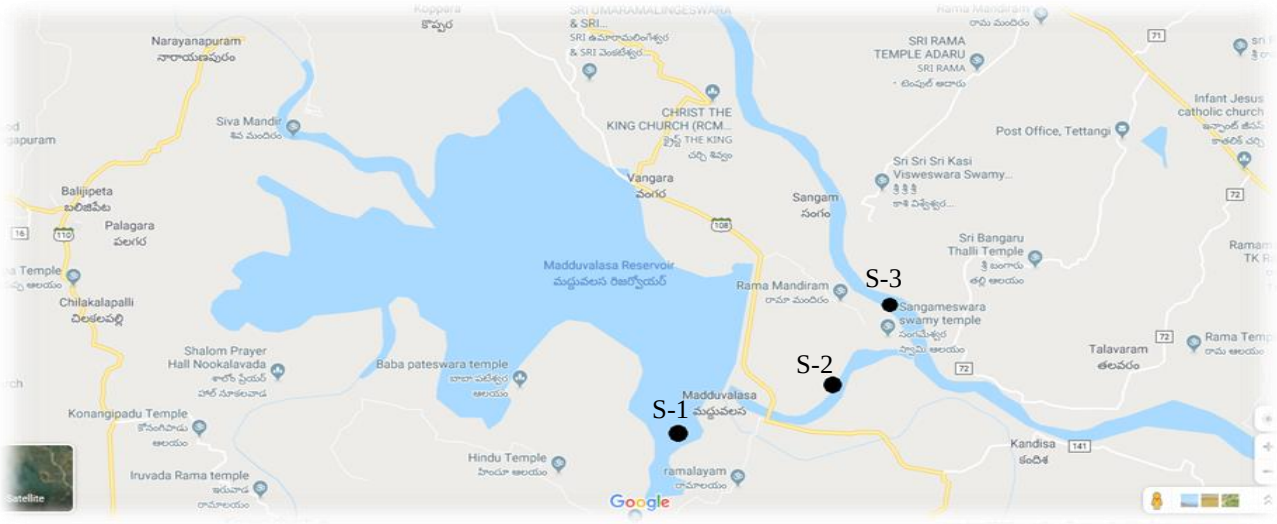

Figure: Google view of studied area showing the different sampling locations.

Statistical analysis: Statistical analysis was present to calculate the average mean, standard deviation and physicochemical values to allow the amount of river water.

III. RESULTS

A Total of fifteen parameters have been observed while this study and it has estimated while doing the experimentation, by taking the sample from three stations. In station one, which is obtained from the reservoir, the concentrations of minerals and their potentials are relatively low as compared to the other two stations. As for the station two which obtained from the tributaries of the above mentioned reservoir. From the second station, parameters are similar to the first station because, there's no presence of any industries and dumping yards nearby. As there's no presence of any parameter influenced aquatic flora and fauna. Water from the cultivated agriculture land that come from the above reservoir i.e. station one, considered as third station. Usually, agriculture lands constitute relatively higher concentrations of minerals. Because, while cultivating lands for agriculture purpose, includes usage of fertilizers and pesticides.

The results are obtained on some physicochemical parameters of the reservoir basin. And these are presented by the on fig (1 to 14). Where, the temperature is the most important factor, which influences of the physicochemical parameters of the water bodies. From table 1, it was known that the range of pH lies between the 7.5 to 8.5 standards given by the WHO, BIS and CPCB as shown the table 2. Here, the studied area variation of pH is observed to the samplings is low variation to the three stations and they are comparative studied to the physicochemical parameters of the reservoir river basin in Madduvalasa. We founded to the minimum range pH is the 6.0-7.14. in the monsoon season the character of water is acidic is increases in the concentration of the CO_2 and alkaline.

Table:1 Physicochemical parameters of the studied area.

S.NO	Parameters	Name of the stations			Avg. mean	Minimum	Maximum	S.D
		S-1	S-2	S-3				
1	pH	7.19	7.47	5.88	6.85	5.88	7.47	0.85
2	Turbidity	5.2	6.6	4.3	5.37	4.30	6.60	1.16
3	EC	410	410	570	463.33	410.00	570.00	92.38
4	TDS	321	339	375	345.00	321.00	375.00	27.50
5	TH	212	229	235	225.33	212.00	235.00	11.93
6	Cl	43	47	55	48.33	43.00	55.00	6.11
7	Ca	43	45	45	44.33	43.00	45.00	1.15
8	Mg	30	30	32	30.67	30.00	32.00	1.15
9	Na	20	17	21	19.33	17.00	21.00	2.08
10	DO	5.5	5.5	7.8	6.27	5.50	7.80	1.33
11	BOD	1.1	1.2	1.57	1.29	1.10	1.57	0.25
12	So4	87	87	79.2	84.40	79.20	87.00	4.50
13	Po4	0.31	0.35	0.75	0.47	0.31	0.75	0.24
14	TA	181.4	150.7	200.7	177.60	150.70	200.70	25.22

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Table:2 Standards of drinking water.

Characteristics	ICMR	WHO	CPCB	BIS-IS:10500-2012	CCME
pH	7.0-8.5	7.0-8.5	Class A-6.5-8.5 Class B-6.5-8.5 Class C-6.5-9.0	Class A-6.5-8.5 Class B-6.5-8.5 Class C-6.5-8.5 and Permissible-no relaxation	6.5-8.5
TDS (mg/l)	500	500	-	Class A-500 mgL^{-1} Class B-500 mgL^{-1} Class C-1500 mgL^{-1} and Permissible-2000 mgL^{-1}	500
Temperature (°c)	-	-	-	-	15
Turbidity (NTU)	5	2.5	-	Desirable-05 NTU Permissible-10 NTU	5
NO3-N ($mgNL^{-1}$)	20	45	-	Class A -20 mgL^{-1} Class B-20 mgL^{-1} Class C-50 mgL^{-1} And 45 mgL^{-1} (Permissible)	10
o-PO4-P ($mgPL^{-1}$)	-	-	-	-	0.3
BOD (mgL^{-1})	-	-	Class A-2 mgL^{-1} Class B-3 mgL^{-1} Class C-3 mgL^{-1}	Class A-2 mgL^{-1} Class B-3 mgL^{-1} Class C- mgL^{-1}	3
DO (mgL^{-1})	-	-	Class A-6 mgL^{-1} Class B-5 mgL^{-1} Class C-4 mgL^{-1}	Class A-6 mgL^{-1} Class B-5 mgL^{-1} Class C-4 mgL^{-1}	5

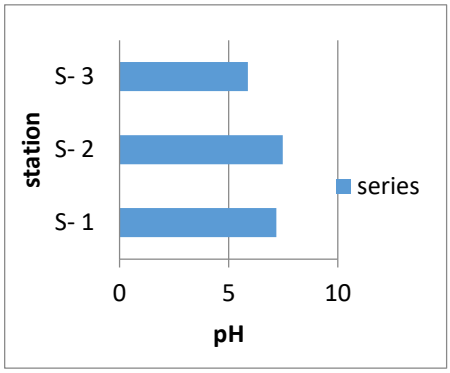

Figure: 1 Variation in pH

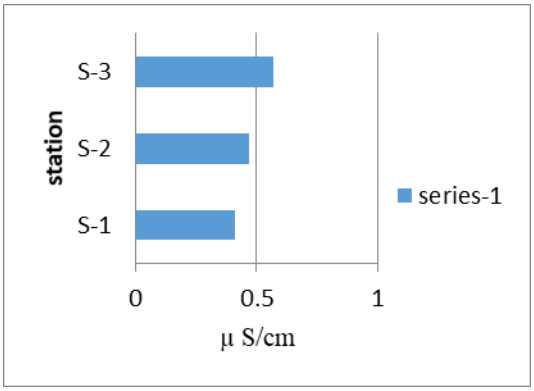

Figure-2 Variation in EC

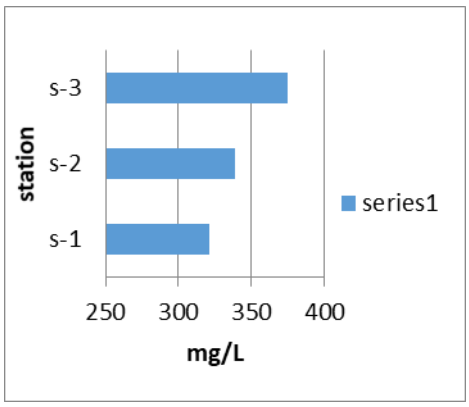

Figure: 3 Variations in TDS

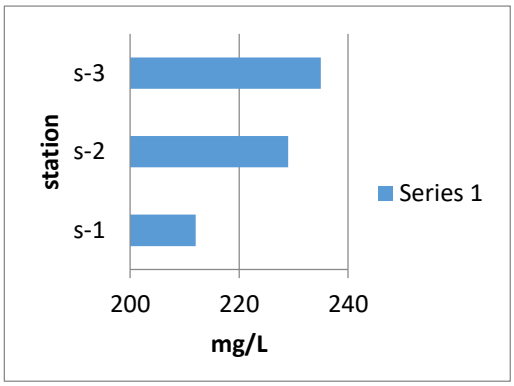

Figure: 4 Variation in Total Hardness

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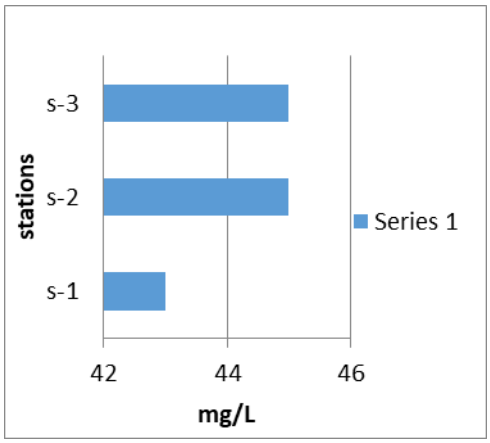

Figure: 5 Variations in Ca

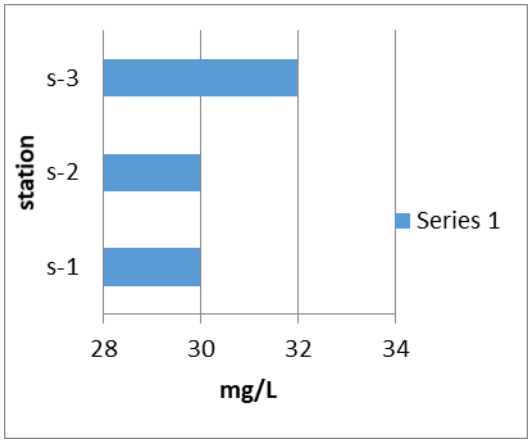

Figure: 6 Variation in Mg

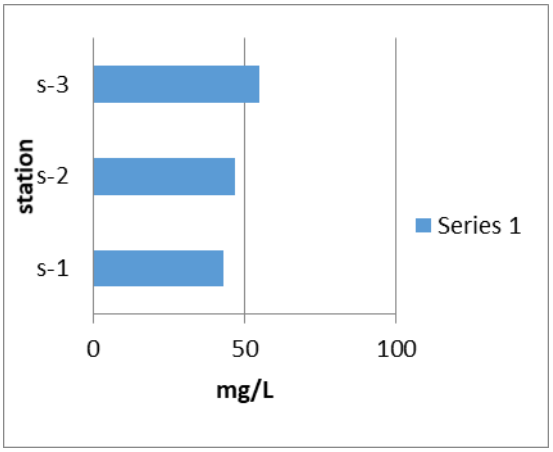

Figure: 7 Variations in Cl

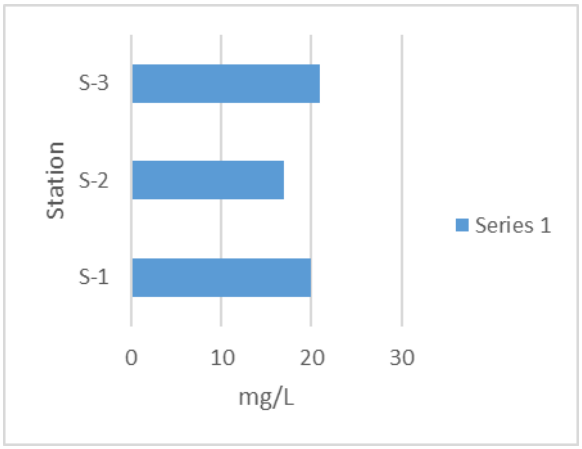

Figure: 8Variation in Na

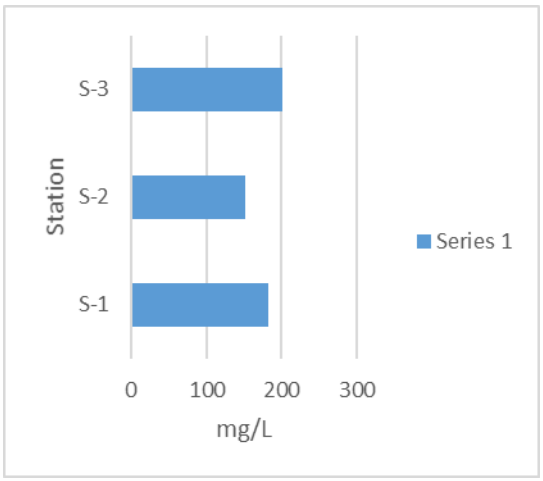

Figure: 9 Variation in TA

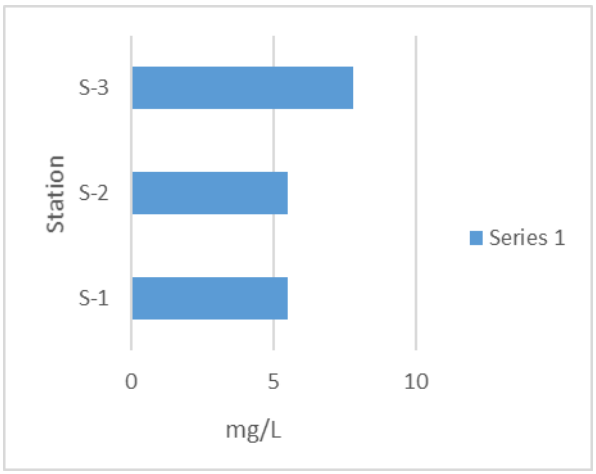

Figure: 10 Variation in DO

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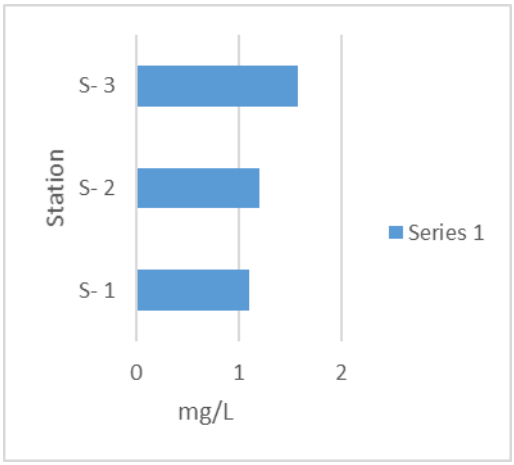

Figure: 11 Variation in BOD

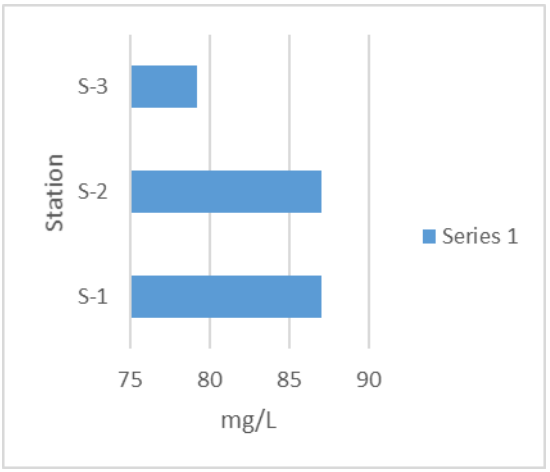

Figure: 12 Variation in So_4

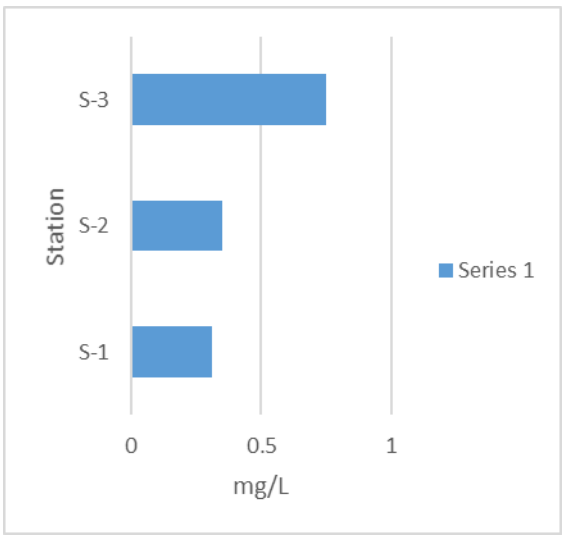

Figure: 13 Variation in Po_4

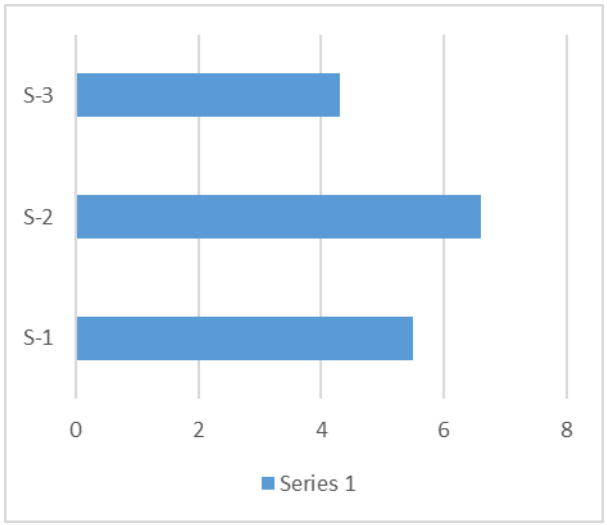

Figure: 14 Variation in Turbidity

TDS is founded in the range of the 321-375 mg/L and it was founded to be within the limit 500mg/L. this may be due to the anthropogenic activities of along with the river. DO values ranges are 5.5-7.8 mg/L values are lesser then the prescribed limits for the 5mg/L. The low DO concentration are high organic matter in the waste discharges and near by the nutrients and due to increase microbial activity occurs due to the degradation of the organic matter.

BOD values are lie in the 1.10-1.57 mg/L in the selected areas. Where, we have to observed that the values of the BOD are minimum in the monsoon season. There, the physicochemical parameters are Ca, Mg, Na, Cl, Po4 and So4 characteristics are the variations of the values are minimum to the different site locations of the river basin in Madduvalasa. And the organic pollutants are low concentration of the river.

IV. CONCLUSION

Different parameters of the physicochemical and statistical analysis are described in this reservoir river basin. Those parameters such as pH, DO, BOD, TDS, Ca, Na, Mg, Cl, Turbidity, So4 and po4 etc. the studied are reveals that, the quality of river was founded to be suitable for the human consumption, agriculture and industries as per the standard values. Their pollutants are occurring minimum pollutants and were used in water quality indices. It provides that better idea about the quality of the water.

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