THE QUALITY OF CAUVERY AT DELTA

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ABSTRACT-Water quality analysis is one of the most important aspects in surface water studies. We have decided to collect water sample and analysis the characteristics of Cauvery river from the station kumbakonam to poombuhar. 25 samples are collected at 4 km interval distance. The analysis was carried out by taking certain physical parameter like pH, total dissolved solids (TDS), total hardness (TH), colour, taste, odour and chemical parameters like dissolved oxygen (DO), sodium, potassium, calcium, chemical oxygen demand (COD), biological oxygen demand (BOD), chloride, sulphur, electrical conductivity (EC). By using Analysed results, the point of change in character of surface water were found and compared with the permissible limits as per IS 10500-2012, BIS and WHO Standards.

KEYWORDS:*parameters, water sample, contamination, comparison, standards.*

INTRODUCTION

Water is the valuable resource for every life and also used for various activities. About 71% of the earth's surface is covered by water. A river is a natural flowing water course, usually fresh water flowing towards on ocean, sea, lake or another river. In some cases,a river flows into ground and becomes dry at the end of its course without reaching another body of water. The river water is used for domestic, agriculture and industrial purpose. The water is one the most abundant compounds of the ecosystem. The healthy aquatic ecosystem is depended on the physico-chemical and biological characteristics.

The Cauvery river covers a distance of about 805km (500mile) and flows through the state of Karnataka and Tamil Nadu.The average discharge of Cauvery river is 677m^3/sec (23,900cu.ft/sec) the samples have been collected after the river crossing the village. Cauvery riverhas long been used for discharging the wastes. Unfortunately, the natural sources are being contaminated by other factors, which the case sensitive discharge of untreated effluents and organic wastes to the stream. Pollution of theriver first affect its physico-chemical parameters like pH, DO, BOD, COD, Chloride, TDS, Sulphates, TH, electrical conductivity (EC). Sometimes river water compares the flow, doesn't cause any problems if the stream is turbulent, but if it is a normal flow, the natural self-cleaning process won't be done properly. By selecting a random stream, the all characteristics of the samples were done and results of various water samples are compared and the quality of water is found.

MATERIALS AND METHODS

STUDY AREA

The present study was carried out along the different station. The selected locations are Kumbakonam to Poombuhar. The Kumbakonam town is located at the north east of Tanjore district. The Cauvery river passes through the northern part of the town and is flowing from west to east. The Tanjore district is situated at eastern coast of the state of TamilNadu in south India. Geographically, the ancient city of Tanjore in TamilNadu is placed in between 9°50' and 11°25' north latitude and 78°45' and 70°25' east longitude. The Poombuhar is located at the Nagapattinam district. The Nagapattinam district lies to the south of Karaikal and Tiruvarur district. The samples collected at the station in between the Kumbakonam to Poombuhar from Cauvery River, over the distance of60km.

LOCATION DETAILS FOR SAMPLES

SI.NO	STATION	DISTANCE(km)	NAME OF VILLAGE
1	SAMPLE-1	4.5	Darasuram Bypass
2	SAMPLE-2	4	Kumbakonam Melacauvery
3	SAMPLE-3	3	Old Market Kumbakonam
4	SAMPLE-4	4	Chettimandapam Bypass
5	SAMPLE-5	5	Mannanchery
6	SAMPLE-6	3.5	Veppathur near Kalyanapuram
7	SAMPLE-7	4	Thirumangalakudi
8	SAMPLE-8	3.9	Narasingam Pettai
9	SAMPLE-9	4.4	Madhiri Mangalam
10	SAMPLE-10	4.8	Kuttalam
11	SAMPLE-11	4	Moovalur Sutress
12	SAMPLE-12	3	Palakarai
13	SAMPLE-13	5	Shankara Vidhyalaya school
14	SAMPLE-14	4	Dharmapuram to Manakkudi connection
15	SAMPLE-15	5.5	A.V.C. back side Keelurup
16	SAMPLE-16	4	Melaiyur
17	SAMPLE-17	4	Sembanarkovil
18	SAMPLE-18	4	Kelayur
19	SAMPLE-19	4	Pallakollai
20	SAMPLE-20	3.6	Karuvi
21	SAMPLE-21	5	Meelayur Sutress
22	SAMPLE-22	4	Kannagi
23	SAMPLE-23	5.5	Cauvery Poompattinam
24	SAMPLE-24	4.6	Vanagirey
25	SAMPLE-25	4	Poompuhar Estuary

ANALYSIS OF SAMPLES

The water samples were collected by using 1 litre plastic bottles. The different stationsare identified by thelabel over the bottle. All the sample collections were immediately preserved in a refrigerator and brought to the laboratory for determining the specific water quality parameters as per IS10500. The parameters like pH, DO, BOD, COD, Chloride, TDS, Sulphates, TH, electrical conductivity (EC) etc. The result of the analysis is shown by the graphical representation.

RESULT AND DISCUSSION

pH (Hydrogen Potential)

pH or the "Potential of Hydrogen" is the negative log of concentration of hydrogen ions in the water.

$$pH = -$$

As per BIS, the pH for water should be of the range 6.5 to 8.5. The pH of pure water is 7. In general, water with a pH levellower than 7 is considered as acidic and with a pHlevel greater than 7 is considered as basic or alkaline. The PH is important because it affects the solubility and availability of nutrients. Highest PH value of sample was recorded as 8.065 at sample-9 (MadhiriMangalam) and minimum of 6.715 at sample-11 (Moovalur Sutress). PH value of all the samples between 6 to 8. So, the water samples are not affected. For Graph refer figure.1

Electrical conductivity

It is the ability to conduct theelectrons. Salts or other chemicals that dissolve in water can breakdown into positive and negatively charged ions.The conductivity value ranges from 0-25µs/cm at different station of the Cauvery river. The minimum value obtained as 0.26µs/cm and maximum value is 19.40µs/cm. It can be the presence of a large quantity of ions in the surface water starting from S-22 to S-25 due to the decomposition of organic matter. For graph refer figure.2

TDS (total dissolved solids)

It is the measure of the total dissolved compound of all inorganic and organic substances present in the substances. As per BIS, the TDS for water should be the range of 500mg/l. The TDS for water sample varied from 200mg/l to 6000mg/l. The station22,23,24,25 is the higher value of TDS. The organic and inorganic solids should be discharged into s-23 to s-25. Water with a high TDS indicated more ionic concentration. They increase in value of TDS indicated pollution by extraneous sources. For graph refer figure.3

Table1a. Variation in physio-chemical parameters of Cauvery River

Different sampling stations

PARAMETER	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10	S-11	S-12	S-13	S-14	S-15	S-16	S-17	S-18
pH	7.14	6.71	8.05	8.06	8.02	7.97	7.87	7.75	7.79	7.72	7.64	7.45	7.15	7.28	7.52	7.76	7.76	7.93
Dissolved oxygen (mg/l)	7.81	8.79	6.86	7.54	7.48	8.79	8.39	8.05	7.95	6.84	6.95	5.46	6.65	8.95	9.76	9.58	8.99	8.74
TDS (mg/l)	214	215	215	216	211	210	208	207	206	214	231	208	240	222	220	216	242	219
Total hardness (mg/l)	0.4	0.5	0.5	0.9	0.8	0.6	0.4	0.7	0.6	0.5	0.8	0.7	0.7	0.7	0.7	0.6	0.7	0.5
Calcium (mg/l)	04	03	04	04	02	04	04	04	06	05	05	05	04	02	02	03	02	02
Sodium (mg/l)	10	16	13	15	10	12	15	14	15	19	30	15	09	13	15	14	12	11
Potassium (mg/l)	01	01	02	02	01	01	02	01	00	01	01	05	02	01	02	02	02	01
EC (µs/cm)	0.27	0.27	0.27	0.28	0.27	0.27	0.25	0.26	0.26	0.31	0.33	0.26	0.30	0.30	0.28	0.27	0.31	0.31
COD (mg/l)	0.13	0.15	0.11	0.05	0.03	0.12	0.11	0.10	0.12	0.12	0.12	0.09	0.17	0.19	0.2	0.21	0.19	0.16

TOTAL HARDNESS

Total hardness is the parameter of water quality used to measure the amount of calcium (ca) and magnesium (mg) salts in water. Water containing calcium carbonate at concentration below 60mg/l is generally considered as soft; 60-120mg/l moderately hard, 120-180mg/l hard and more than 180mg/l very hard (McGrown,2000). The total hardness varies from 0 to 20mg/l for all selected sampling sites. The maximum total hardness value at s-25. But the value is below the concentration of 60mg/l. so they will be considered as soft. For graph refer figure.4

DISSOLVED OXYGEN

The DO is the major constituent of aquatic life and wealth of a surface water. oxygen enter into a surface water body by photosynthesis, diffusion from atmosphere and wing cycling. These will happen naturally if the stream has good flow. It can be done manually by aerators and hand turned water wheels. Thus, the oxygen is recharged by dissolved oxygen. Inside the surface water body, when the decomposition takes place the level of do is decreased to 60%. But in stable body with no stratification the do remains 100%.The level of do when it is too high or too low it can harm aquatic life and affect water quality. Hence the permissible limit for DO is 4-10 mg/l and the tested report shows that all samples are in between the limit. For graph refer figure.5

Table1b. variation in physio-chemical parameters of Cauvery river at different sampling stations

PARAMETER	S-19	S-20	S-21	S-22	S-23	S-24	S-25
pH	7.84	7.68	7.70	7.36	7.13	7.14	6.95
Dissolved oxygen (mg/l)	8.34	8.21	9.85	9.58	9.45	9.85	9.68
TDS (mg/l)	220	224	228	1078	4764	5451	5781
Total hardness (mg/l)	0.7	0.6	0.6	1.2	5.2	7.9	19.9
Calcium (mg/l)	04	02	02	06	30	25	67
Sodium (mg/l)	15	13	09	68	145	139	179
Potassium (mg/l)	02	01	02	08	40	44	92
EC (µs/cm)	0.28	0.29	0.29	1.40	7.19	8.86	19.40
COD (mg/l)	0.16	0.14	0.17	0.14	0.18	0.20	0.22

CALCIUM

Calcium is a naturally mineral content in water. It is the largely responsible for water hardness. One of the main reasons for the abundance of calcium in water is its natural occurrence in the earth crustand also constituent of coral. The calcium for water should be range of 75mg/l to 200mg/l. Lack of calcium from Cauvery river. The calcium gradually forms starting point to end point the level of presence of calcium from s-1 to s-25 is 0 to 70mg/l. For graph refer figure.6

SODIUM

Sodium is a common mineral present in river water. As was mentioned earlier, sodium stems from rocks and soils. Not only seas, but also river and lakes contain significant amount of sodium. As per IS10500-2012, in water the range of sodium content in 30mg/l to 60mg/l. Although the presence of sodium at s-1 to s-25 is 9 to 180mg/l. Naturally the sodium content is rich in s-22 to s-25 because of sea water intrusions. For graph refer figure.7

COD

The amount of oxygen required for the chemical oxidation of organic matter by storing oxidising agents under acidic condition is called COD. In surface water due to the character of self-purification of Cauvery river. There is a present of low COD. Although from s-1 to s-25 the presence of COD at 0.033mg/l to 0.28mg/l. hence the conclusion is neglecting the COD due to its low demand of chemical oxidation. For graph refer figure.8

POTASSIUM

Potassium is one of the major constituents for health and the permissible limits for the content of K in river water is 2-3mg/l but for sea water it ranges up to 400 mg/l. Such potassium minerals are used for the manufacturing of glass which are strong and solid. Excess of potassium can be removed by reverse osmosis process, by which it can be used for both industrial and domestic purposes. From our samples the traces of potassium are found nearby 1-8 mg/l in zones away from sea, and the samples nearby seawater contains up to 90 mg/l. For graph refer figure.9

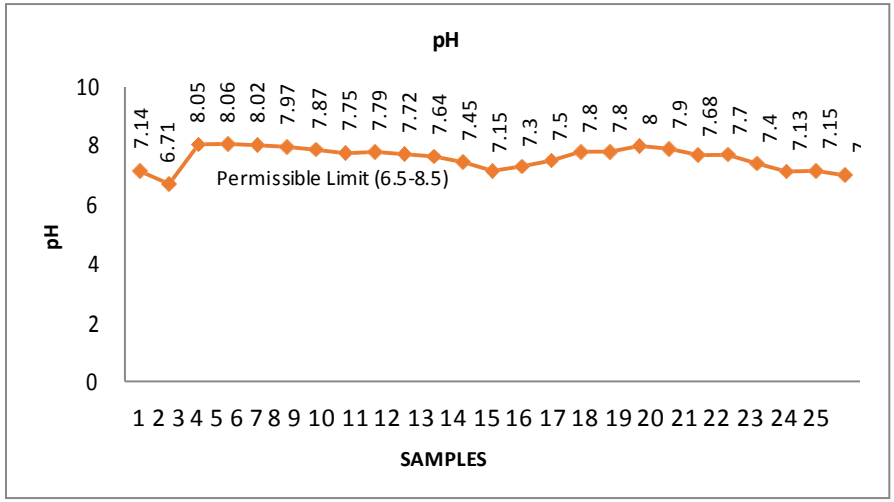
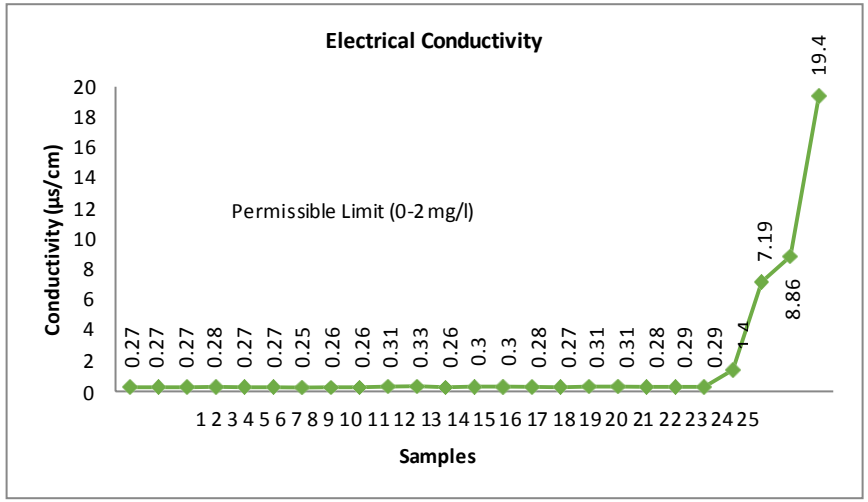


Figure.1



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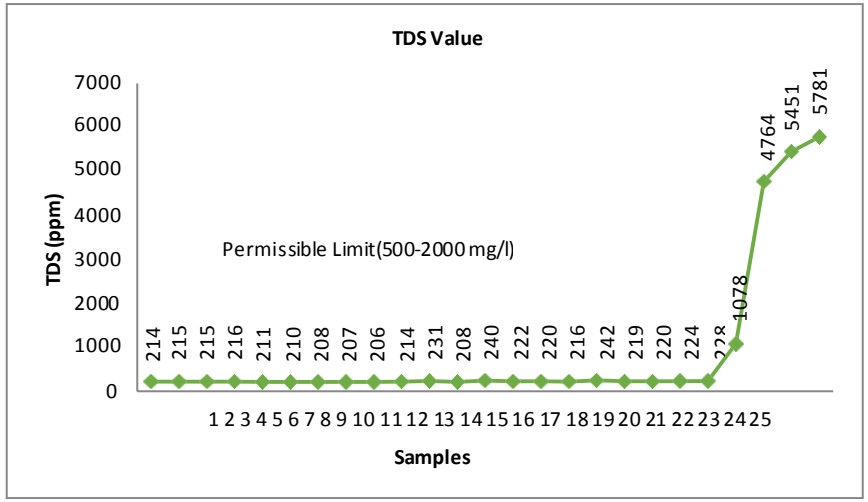

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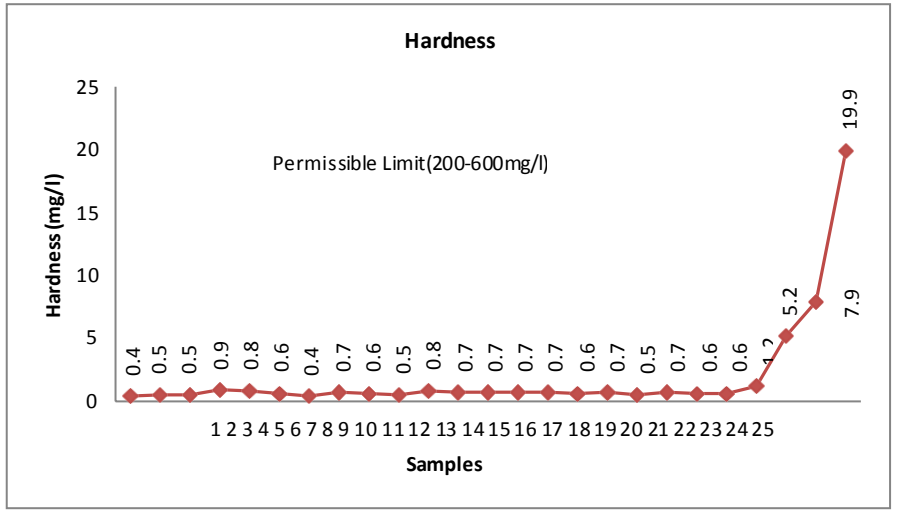

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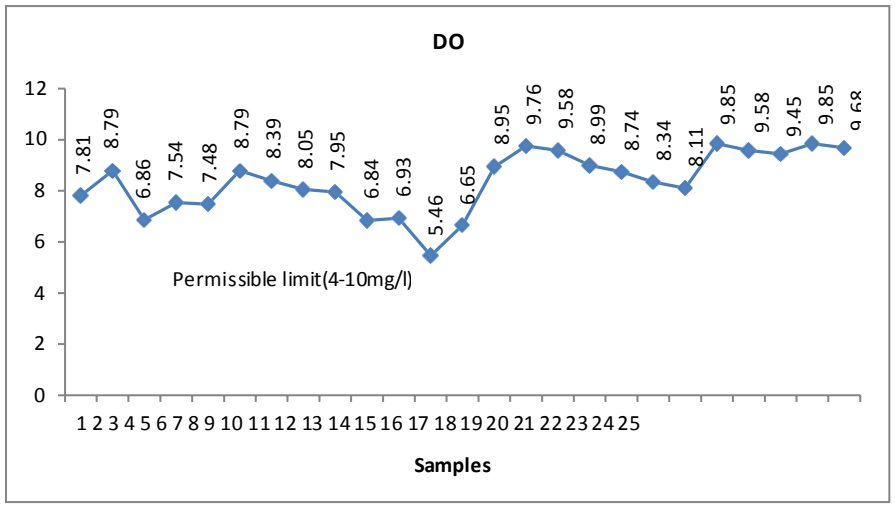

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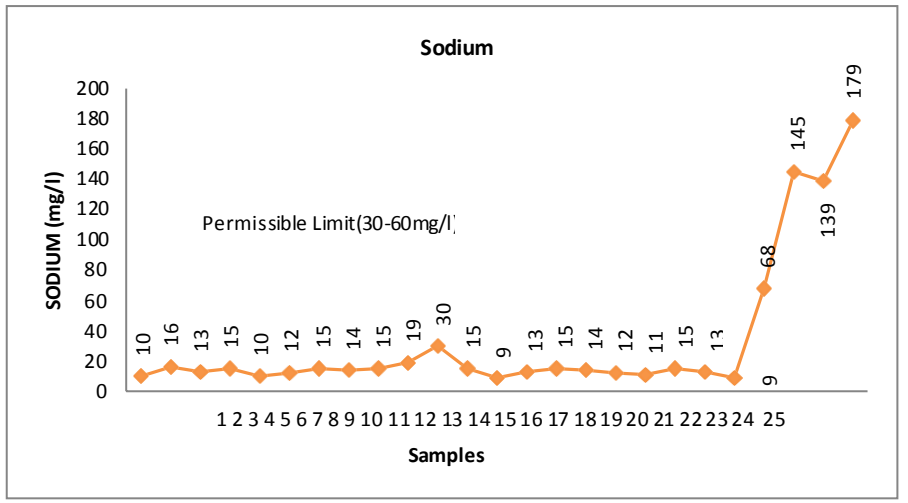

Figure.7

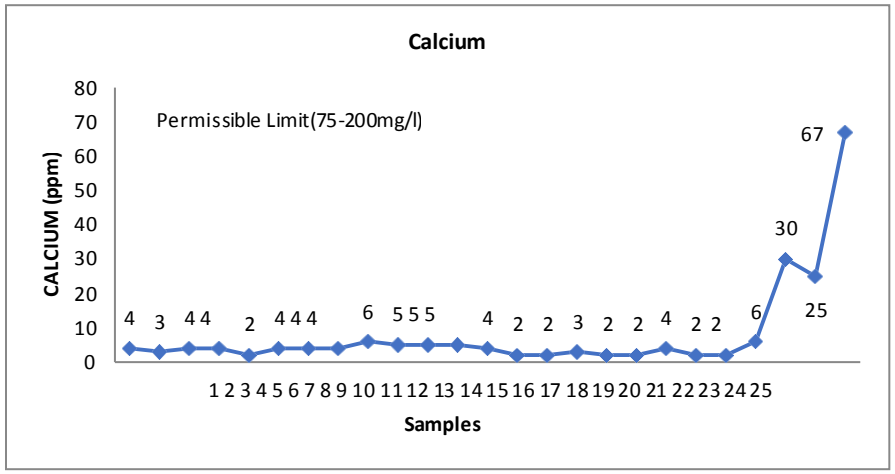

Figure.6

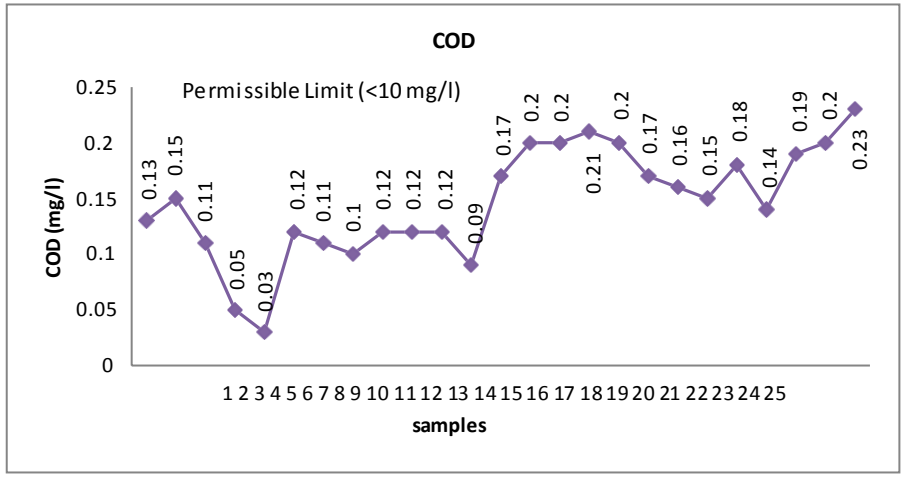

Figure.8

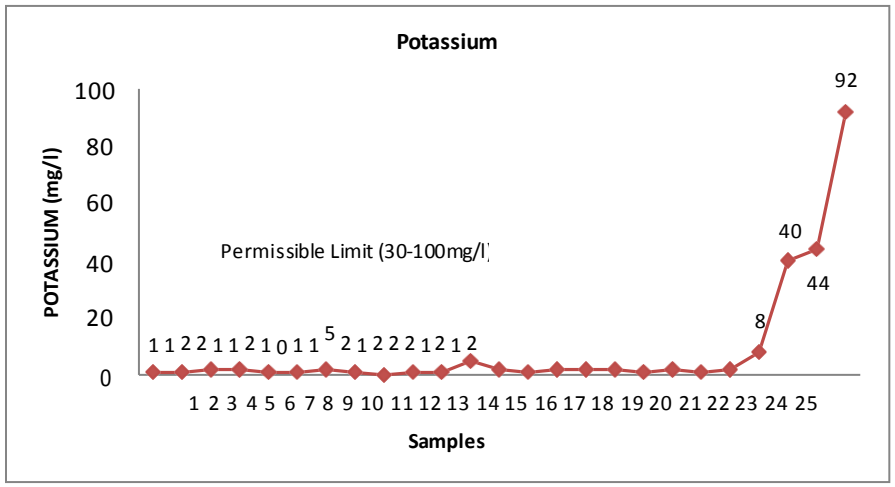

Figure.9

CONCLUSION

Hence, we conclude that due to the intrusion of sea water to the Cauvery River, the last three stations "S-23, S-24 & S-25" has the characteristics of sea water and not suitable for domestic use, by Reverse Osmosis Process and Ion exchange process we can make them fit for domestic purpose. Extraction of minerals such as potassium, Calcium etc., can be done by available methods.

REFERENCE

[1]S.Priya, S. Sam Manohar Dasand K. Vareethiah. Analysis of water quality in selected stations along river, Tambaraparani Kanyakumari District, Tamilnadu, India. 2016

[2]S.Susheela, S.Srikantaswamy, D. Shiva kumar, Appaji Gowda and K.Jagadish. Study of Cauvery River water pollution and its Impact on socio-economic status around KRS Dam.2014, 91-109

[3] F.K. Togue, G.L.O. Kuate, L.M.Oben. physio-chemical characterization of the surface water of Nkam River using the Principal Component Analysis. 1910-1920

[4] Indian standard specifications for drinking water, IS: 10500-2012

[5] k. Venkateshraju, p. Ravikumar, R.K. Somasekha, K.L. Prakash (2010). Physiochemical and Bacteriological Investigation on the River Cauvery Kollegal Stretch in Karnataka. Journal of Science Engineering and Technology, 6(1):50-59.

[6] Smita Rout, Asit Kumar Behera, Aliva Patnaik. Water Quality Analysis of River Mahanadi in Sampalpur City, Sampalpur University, Odisha, India 2016.