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Water Quality Assessment of Paravoor Lake

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Abstract –Water quality testing is important because it identifies contaminants and prevents water-borne diseases. Essentially, water quality testing makes sure that water is safe and meets local and international water standards. For this study we selected the water sample of Paravoor Lake. The major problem related with the Paravoor lake is its salinity. The excess salinity present in the water make it unsuitable for drinking, irrigation and for other purposes. In this study we have assessed the water quality of samples taken from seven different points of the Paravoor lake. The sample collection points are Pozhikkara, Mukkam, Thani, Kalakkode, Yakshikkavu, Hariharapuram and Nelletil. From this study we analyzed that water sample contain higher percentage of chloride and adopting a technique MDC(Microbial Desalination Cell) to desalinate the water and also helps other parameters to be within the permissible limit using two different algaes

***Key Words*: water quality, drinking water, TSS, TDS, Turbidity, Conductivity, chloride**

1. INTRODUCTION

Paravoor lake is famous for its natural beauty. It is also known for its fish rich waters and natural estuary. The major problem related with the Paravoor lake is its salinity. The excess salinity present in the water make it unsuitable for drinking, irrigation and for other purposes. In this study we have assessed the water quality of samples taken from seven different points of the Paravoorlake. The sample collection points are Pozhikkara, Mukkam, Thani, Kalakkode, Yakshikkavu, Hariharapuram and Nelletil.

This study mainly emphasis on introducing a sustainable and eco-friendly way to desaline the water. Here we are employing the Microbial Desalination Cell (MDC) technology using two different algaes *Chlorella vulgari* and *Nano chloropsis.* Desalination is done using both these algaes to find out which is more efficient .The MDC consists of an anode chamber, a cathode chamber and a middle chamber. Anode is fed with synthetic waste water containing organic matter, the middle chamber is fed with saline water and the cathode chamber is provided with algae. The decomposition of organic matter in anode produce electrons which move with the help of an electric circuit and reaches the cathode where electrons are received by an electron acceptor in the cathode chamber. Saline water in the middle chamber gets desalined through the ion exchange membranes due to the potential difference as well as the difference in ionic concentration between the anode and cathode chamber.MDC technology could be used over other costly desalination techniques like reverse osmosis, evaporation etc. to desaline water in a cost effective manner. This technology also make use of the algal biomass and helps in producing some amount of electricity. Sustainable use of water over generations has been ensured through cultural adaptation to water and living in harmony with nature's ways. However in the last three to four decades at least in an Indian context the consequences of urbanization and adaptation to the consumer culture have taken its toll on water bodies. Ill conceived developmental policies to suit the needs of business or commercial interests have had detrimental effect on our water bodies and the ecosystem surrounding it. Appropriate water management techniques have to be adopted to ensure food security and to stop driving indigenous communities to desperation. But there is tremendous deficit in understanding of natural issues within the perspective of development. The impact of the ill-conceived developmental policies on the pristine Environment, habitat, loss of biodiversity, Livelihood factors affecting the indigenous fishermen community, overall state of fresh water fishing occupation in Kollam district and the current ill health of the once majestic lake. In this study we can look at the corrective measures that need to be adopted to nurse it back to its former glory.

2. OBJECTIVE

- To assess the water quality of Paravoor lake.
- To demonstrate the method of Microbial Desalination Cell technique using the algae *Chlorella vulgaris* and *Nannochloropsis salina* compare which algae is more efficient in desalination.
- To recommend some mitigation measures to make the water quality parameters within the permissible limit.

3. MATERIALS AND METHODS

The collection of water samples is from 7 different locations of Paravoor lake and tests are conducted on these different samples. The details of seven locations and the tests conducted on these samples are described below.

3.1 **Sample collection**

These are locations and coordinates of the seven places that are collected from seven different parts of Paraoor Lake.

Table 3.1Location of Sample Collection

Location	Coordinates
Pozhikkara	8°48'55.92"N/76°39'1.13"E
Thanni	8°49'3.13"N /76°38'47.54"E
Mukkom	8°47'8.47"N/76°40'15.61"E
Kalakkode	8°47'48.73" N/ 76°41'21.31 E
Yakshikkavu	8°82'97.1" N/ 76°67'16.6 E
Hariharapuram	8°78'39.1" N/ 76°70'68.6 E
Nellettil	8°78'82.4" N/ 76°68'48.9 E

3.2 Method of analysing samples.

These are the parameters that are analyzing with the samples. The method used to assess the parameters is as follows.

Table 3.2 Method of Analysis of Sample

Parameters	Method
Temperature	Thermometer
pH	pHmeter
Total solids	Oven dry method
DO	Acid modification
BOD	5 day BOD test
Turbidity	Nephelometric
Alkalinity	Titration
Total hardness	EDTA titrimetric
Chlorides	Argentometric
Electrical conductivity	Electrometric

4. RESULT AND DISCUSSION

From the above test the following results are obtained.
Test results of all samples.

Table 4.1 The test results of the seven samples

Test conducted	Sample 1	Sample 2	Sample 3
Temperature (^{0}C)	26	24	25
pH	7.5	7.47	7.52
Turbidity(NTU)	5.2	2	1
Hardness(mg/l)	5000	5000	4150
DO(ppm)	3.8	3.8	4.1
Chlorides(mg/l)	17091.72	16187.49	13563.45
Electrical conductivity(µSm/cm)	38.2	37.2	32
BOD	2.3	2.1	2.35
COD	640	224	320
TDS (mg/l)	57.01	55.52	47.76

Test conducted	Sample 4	Sample 5	Sample 6	Sample 7
Temperature (^{0}C)	22	23.5	24	25
pH	7.74	6.25	6.14	6.1
Turbidity(NTU)	2.6	9	9.2	8
Hardness(mg/l)	2750	3225	2600	2425
DO(ppm)	4.2	4.8	3.8	4.7
Chlorides(mg/l)	8953.65	11879.1	7978.5	8510.4
Electrical conductivity(µSm/cm)	20	33.6	21.9	23.1
BOD	3	2.4	2.06	3.01
COD	64	640	224	325
TDS (mg/l)	29.85	50.15	32.68	34.47

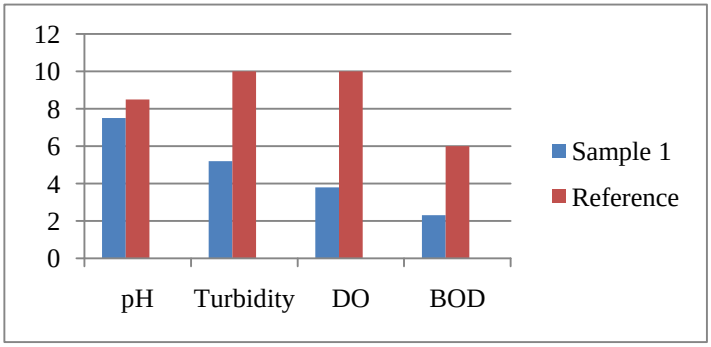

Fig 4.1: Comparison of pH, Turbidity, DO and BOD of sample 1 and reference

From the graph we can see that sample1 turbidity is very high as compared to the reference value. DO and BOD are also not within the permissible limit. Only pH is within the limit.

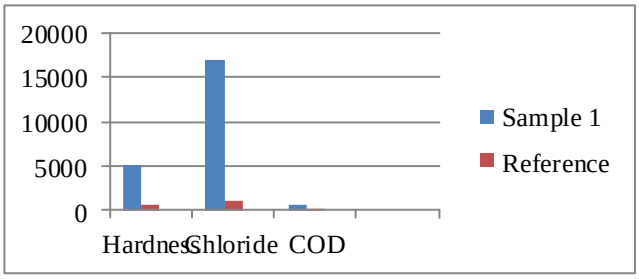

Fig 4.2: Comparison of Hardness, Chloride and COD of sample 1 and reference

From the graph it is clear that hardness and chloride content of sample 1 is very high as compared to the reference value. Chloride content of the sample is due to the excess salinity content

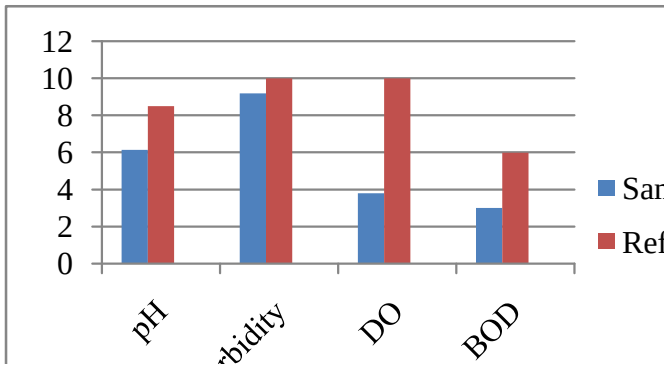

Fig 4.3 : Comparison of pH, Turbidity, DO and BOD of sample 6 and reference

From the above graph we can see that sample 6 parameters like pH and DO of the sample is in permissible limit. But BOD level is not within the permissible limit

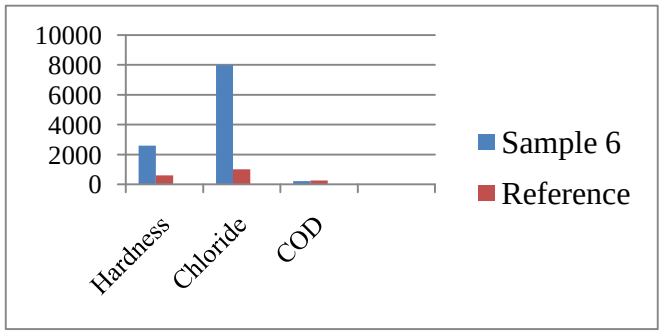

Fig 4.4:Comparison of Hardness, Chloride and COD of sample 6 and reference

From the graph it is clear that sample 6 chloride content and hardness is very high this may be due to some reasons.so here our main aim is to bring down the level of chloride content within the permissible limit.

Table 4.1: Results after using *Chlorella vulgaris*

Test conducted	Sample 1	Sample 6	Permissible limit
Temperature (^{0}C)	25	25	25
Colour	Nil	Nil	5
Taste	-	-	Agreeable
pH	7.9	6.3	6.5-8.5
Turbidity(NTU)	7	9.5	5-10
Hardness(mg/l)	3120	2252	300-600
DO(ppm)	4	4.1	10
Chlorides(mg/l)	1356.89	6326.20	250-1000
BOD(mg/L)	1.92	1.5	< 6
COD(mg/L)	590	198	< 250

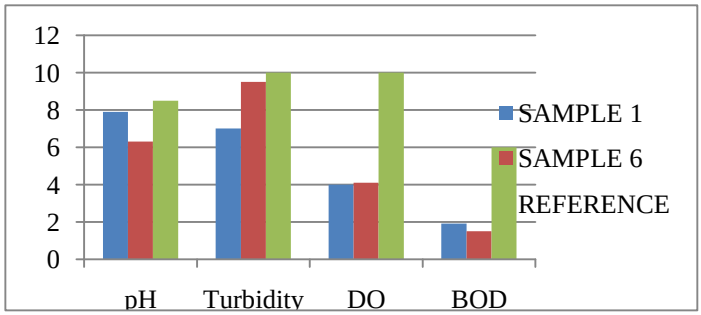

Fig 4.5: Comparison of pH, Turbidity, DO and BOD by using

Chlorella vulgaris

This is the graph showing values of of pH, Turbidity, DO and BOD by using *Chlorella vulgaris* for 10 days for sample 1 and sample 6. The 10 day results show that some of the parameters which are not in permissible limits are going to achieve reference limit.

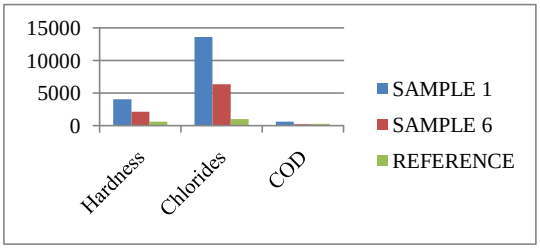

Fig 4.6: Comparison of Hardness, Chlorides and COD after using *Chlorella vulgaris*

From this graph we can see that hardness value decreased in 10 days. And about 18% of the chlorine content is decreased. If we continue the test for about 45 days we can remove the content of chlorine to about 92%.

Table 4.2: Results after using *Nanochloropsis salina*

Test conducted	Sample 1	Sample 6	Permissible limit
Temperature (^{0}C)	25	25	25
Colour	Nil	Nil	5
Taste	-	-	Agreeable
pH	7.5	7.1	6.5-8.5
Turbidity(NTU)	6.2	8.9	5
Hardness(mg/l)	4164	2176.72	500
DO(ppm)	3.85	4.01	10
Chlorides(mg/l)	14387.87	6665.24	250-1000
BOD	2	2.1	< 6
COD	550	200	< 250

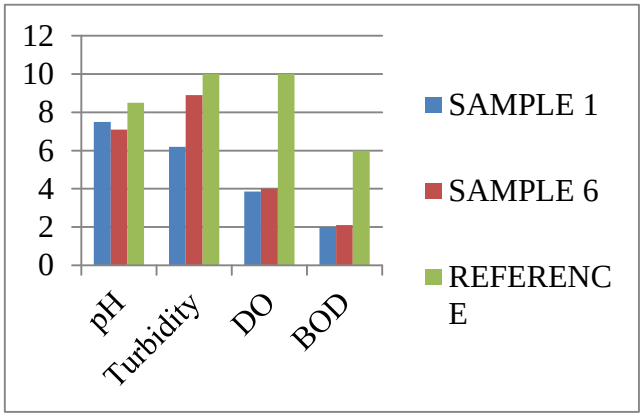

Fig 4.7: Comparison of pH, Turbidity, DO and BOD by using *Nannochloropsis salina-*

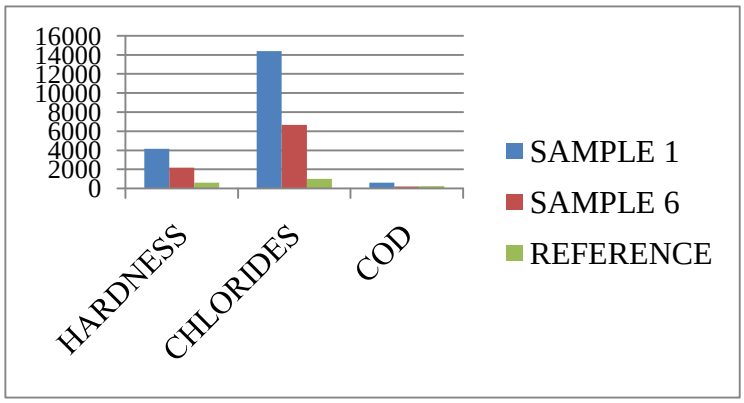

Fig 4.8 Comparison of Hardness, Chlorides and COD by using *Nannocloropsis salina*

5. CONCLUSION

On the assessment of water quality of Paravoor lake it shows that it is contaminated by various factors. By assessing different parameters we can say that the water is more contaminated by chloride content.MDC tests conducted using algaes prove that the impurities can be removed by the use of algae (Nannochloropsis salina and Chlorella vulgaris) . This also shows that for 10 days the impurities are uptake by the algae and uses in its metabolism. The effectiveness of the system can be increased by increasing number of days If this process continues for about 45 days the algae Chlorella vulgaris can achieve an average efficiency of about 92.98% ie; about 92.98% of salinity can be removed. Whereas in the case of Nannochloropsis salina for 45 days only 72.63% efficiency can be achieved. The system gives low pollution to surrounding environment, with maximum benefit. This is an easy environmental and economic solution for water pollution comparing to other systems (solar distillation,reverse osmosis etc...). The proposed system for 10 days of experiment shows around 20.4% and 16% Chlorella vulgaris and Nannochloropsis salina . So if the concentration of algae increases there may get a better performance. By comparing these two results we can conclude that Chlorella vulgaris gives better performance than Nannochloropsis salina. So by using the algae Chlorella vulgaris intensively in MDC techniques large amount of water can be desalinated in eco-friendly manner.

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