

# Ecological, Microbiological And Biochemical Analysis Of Mullaiperiyar River Water-2014

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**Abstract:** *The study was carried out the Mullai periyar river water to analysis variation season in analysis the biochemical parameter and microbial analysis of water. To the asses the quality of water at various station to microbes with content to present in this water. The long term river in various district to drinking purpose and agricultural used this mullaiperiyar river water. The study indicated that moss of water contaminated with coliform and faecally associated microorganism and unsafe for drinking purpose hence properly treated water should be used for drinking purpose.*

**Keywords:** *water quality, coliform, Hetrotrophic bacteria, drinking purpose.*

## I. INTRODUCTION

Water is the one of the most important aspect of survival and a precious resource of the earth. The quality of the water is rapidly changing according to their sources. River is providing main water resources for domestic, agriculture, industrial and drinking purpose. The quality and quantity of surface water in a river is influenced by natural factors such as wind, rainfall, temperature and weathering of rocks etc....There are several states in India where more than 90% population are dependent on river water for drinking and other purpose (Ramachandraiah, 2004).

The mullaiperiyar river is one of the longest river of the south India it organinates from the sundaramalai hills in Western Ghats, The people residing in various districts of tamilnadu and Kerala depends on the mullaiperiyar river for domestic and agricultural needs. The Mullaiperiyar River is very use full to the people of theni district. Importance of mullaiperiyar river water was domestic usage (urban and rural) from 4 per cent to 6 per cent of population and due to urbanization. The domestic requirement would increase by 55.72 percent. Agriculture use will remain stagnant or may even decrease due to progressive urbanization. The share of industry may not change much, but in absolute terms the increase will be about 27.7 per cent.

River mullaiperiyar approximately in north latitude 9°10' and at altitude of 5000ft is the largest among the river flowing

west through Kerala state and hence the name mullaiperiyar river. The rainfall in the region range from 3000mM to 4000mM which augments the flows of water into river mullaiperiyar then runs through the suruliyar in the cumbum valley in tamilnadu. The river water is widely used for bathing, washing, agriculture and religious purpose.

The quality of the water is deteriorated by the agricultural waste and the discharge of sewage waste, human activities and local car festivals in around the districts. Previously less number of studies was carried out about mullaiperiyar river water but nobody can deal this aspect. In this study is to be analyze the ecological, microbiological and biochemical analysis mullaiperiyar river water were collected form various stations like Lower Camp, Cumbum, K.K.Patty, Uthamapalayam, Chinnamanur, Silayampatty, Kottur, Veerapandi, Kunnur, and Vaigai Dam etc....

## II. STUDY AREA

Figure 1 shows the Mullaiperiyar river sampling location map. The study area has been divided into ten sampling sites with the stretch of 53.5 km Study area has been selected for the collection of samples on the basis of certain characteristic features.

First Site Lower camp (lat 9°38'48.93"N, long 77°12'51.61"E) which is located 2 Km away from mini

hydroelectric power station. This site is free from contamination because there is no intensive agriculture activities and discharge of sewage or waste water.

Second site K.K.patti (lat 9044'16.91"N, long 77018'28.93"E). The site is exactly located near the heavy traffic bridge. Intensive agricultural activity is going. Heavy cloth washing, cattle washing and vehicle washing activities are enormous. There is no sewage or domestic waste water discharge in the site or near the site.

Third site cumbum ((lat 9046'19.98"N, long 77019'24.63"E) the site is high drainage bridge located in cumbum. all the wastage particles of the house hold waste, Industrial waste, temple waste to mixed with the mullaiperiyar river.

Fourth site Uthamapalayam (lat 9048'22.55"N, long 77020'17.71"E) the site is located exactly near the heavy traffic bridges and waterfalls. Cloth washing is prime activity in this site. This site is surrounded by paddy field.

Fifth site chinnamanur (lat 9050'58.07"N, long 77022'07.16"E) This site located away from human inhabitation. However intensive agricultural activities are going on. Worship activities and cattle washing are also noticed.

Six site silayampatty (lat 9053'70.05"N, long 77023'09.16"E) this site mostly used agricultural wastage particles mixed in directly in river.

Seventh site kottur (lat 9055'82.21"N, long 77025'09.10"E) this site located in agricultural wastage and temples mainly present in the river area to the temple wastage particles dumble to the river water

Eighth site is located at the temple site near the heavily populated village Veerapandi (lat 9058'01.03"N, long 77026'10.46"E). Two huge temples are located on the banks of the river. Cattle washing, vehicles washing and cloth washing are dominant activities. This site is also surrounded by paddy fields. The river banks are contaminated by animal wastes and human excreta which are washed into the water. Large number of draining channels from the paddy fields is found. Water is always turbid and muddy.

Ninth site is Kunnur (lat 10000'18.43"N, long 77030'59.50"E), which is exactly located under heavy traffic national highways bridge and at the outskirts of theni town. That site is characterized by shallow water, more sandy substrates and with more width.

Tenth site is vaigaidam (lat 13.00'22.43"N, long 77032'67.50"E), all station river water to stored in vaigaidam. All the contaminated particles crowd in this station long day stored water to color was change in the vaigaidam river water

### III. MATERIALS AND METHODS: ECOLOGICAL AND BIOCHEMICAL TEST

#### SAMPLE COLLECTION

The river water samples were collected from ten different stations in the mullaiperiyar river basin in Theni district Tamilnadu, India, during the period of July 2014 and November 2014. The selection of samples spots according to the distance of river. In each station, The sample was collected

using sterilized blundered pet 1 liter bottle. Then carefully transported into the laboratory and stored at 4°C and analyzed of Ecological test and Bio chemical test.

#### IV. BIOCHEMICAL TEST

##### ✓ TOTAL ALKALINITY

5ml of water added to test tube and 1ml of phenolphthalein reagent was added and 3ml of the methyl orange indicator was added mixed.

##### ✓ TOTAL HARDNESS

5ml of water taken in at test tube and 2ml of ammonium buffer solution and 2 drop of ethyllum bromide indicator is added before 2ml of EDTA solution to a mixed.

##### ✓ CHLORIDE

5ml of water taken in a test tube add to a 3ml potassium chromate solution the few ml of silver nitrate mixed.

##### ✓ TDS

Alkalinity + Hardness + chloride X 1.2 = TDS.

##### ✓ FLUORIDE

5ml of water taken in at test tube add to a 3ml of fluoride reagent mixed.

##### ✓ IRON

5 ml of water added 2 ml of hydrochloric acid and then 1ml of Hydroxylamine solution and 10ml of Ammonium acetate buffer solution is added 4ml of phenathroline solution mixed.

##### ✓ AMMONIA

5ml of water and 0.02N sulphuric acid and add to boric acid indicator.

##### ✓ NITRITE

5ml of water added to a 1ml of sulfanilamide solution and add to a 1ml of Dihydrochloride solution.

##### ✓ NITRATE

5ml of water and 2ml of phenolsulphonic acid add to a 8ml of 12n potassium hydroxide and added to a EDTA solution.

##### ✓ PHOSPHATE

5ml of water add to a 5ml of molybdate reagent and then few ml of tannium chloride powder.

✓ RESIDUAL CHLORINE

5ml of water add to a few ml of diethylparaphenylene diamine is mixed.

V. MICROBIOLOGICAL TEST

TESTS FOR ESCHERICHIA COLI

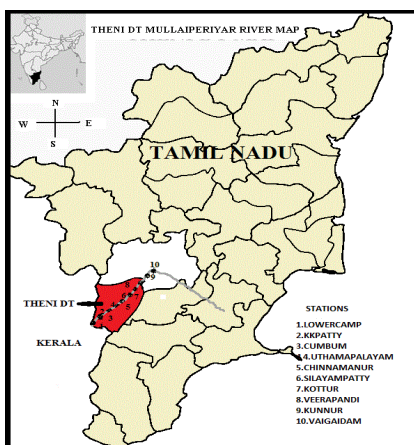
Total fecal coli form colony counted the test for total aerobic microbial count but using lactose broth or macconkey agar medium shown to have no antimicrobial activity under the conditions of test in place of buffered sodium chloride-peptone solution pH 7.0. Place the prescribed quantity in a sterile screw-capped container, add 250 ml of Macconkey agar medium, shake, and allow standing for 1hour (4hours for gelatin) and shaking again .Loosen the cap and incubate at 37° for 18 to 24 hours.

TOTAL HETEROTROPHIC BACTERIAL POPULATION (THBP)

To determine the total heterotrophic bacterial population in the effluents, samples were collected in sterile plastic bags and immediately transported to the laboratory. Bacteria were enumerated as colony forming units (CFU) employing the standard pour plate technique following methods described in APHA (2005) and Cruickshank et al. (1975).

Plate count agar medium (III Media laboratories, India) was used for enumeration purposes. The agar medium was autoclaved Porto use. Effluent samples were collected in sterile containers and were serially diluted using sterile tap water before inoculation into sterile Petri dishes. Plating was done employing pour plate technique and the plates were incubated at 30o C in an incubator. After 3-5 days of incubation, colony counts were made using a colony counter. THBP and expressed as no. per 100 ml.

VI. RESULT AND DISCUSSION



Map 1: Theni district mullaiperiyar river map

Map 1, indicates the samples collection spots the selection of samples of spots according to the mullaiperiyar pollution (D.Ramkrishnan, 2012) Report, the selection sample

collection month based on the hydrology of mullaiperiyar river, It hydrograph was obtain from PWD department of uthamapalayam, Theni district in Tamilnadu.

TEMPERATURE

Temperature is one of the most important factor that the control the quality of water and flora and funny of river aquatic system. Mullaiperiyar River was saturated. In this river mainly used for agricultural irrigation in around south tamilnadu generally atmospheric temperature in a rounding river 32° C to 40° C in months of July to November in present study was revealed that the temperature of all water samples is slightly differ due to their anthropogenic activity of humans .station 10 after sample have 32° C this a optimum temperature of river water (the temperature was existed from 28° C to30 °c from chemical analysis of kodhaiyar river in Tamilnadu, India (Jemila Rose, 2013).

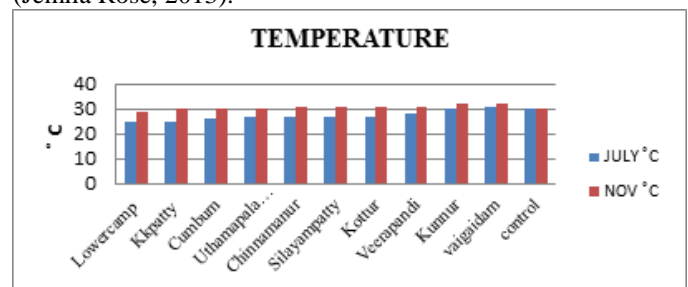


Figure 1

pH

pH is a measure of the intensity of acidic and alkalinity and the concentration of hydrogen ion in water. pH value below 4 produce sour taste and a higher value above 8.5 given alkaline taste. The normal river water pH is (standard pH value any purpose is 6.5-8.5 mg chemical analysis of kodhaiyar river in tamilnadu, india, (K.Jemila Rose 2013) The presen study was exhibited the pH of mullaiperiyar river stations water is the highest pH (7.2) was noted at Vaigai, Cumbum, Kunnur and Kottur.

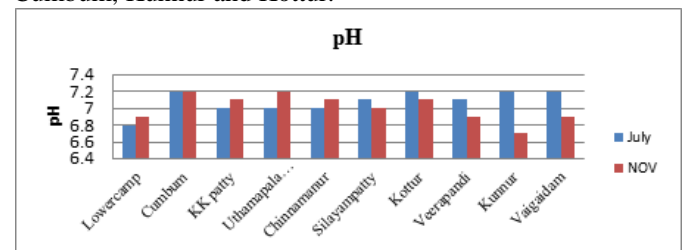


Figure 2

The pH changes may due to the various reasons; Cumbum is urban city, and majority of sewage water discharged in to river. In addition, between the Kunnur and Kottur an important temple Veerapandi was situated and huge number of pilgrim were visited the temple after bathing, the river water was a main source bathing and gets polluted by human activities. Therefore, the pH of river water was significantly changed.

**TURBIDITY**

The mullaiperiyar river water is also mixing with the agricultural waste particles, pond water releasing waste particles, sewage waste particles. All contaminated and microorganisms particles mixed with directly into the river .so the turbidity is present in the July and November In all station river water samples.

**ODOR**

The Mullaiperiyar river water samples contain sodium, potassium and any of the organic solvent in the sewage wastes is directly mix with the river. The odor is present in the Mullaiperiyar river waste is therefore unplacement, due to the presence of organic matter.

**COLOR**

In the month of July and November. The waste of the particles to mixed directly to the river water. Therefore color of river water is pale red in color. The river to supply in ponds that water is stored in ponds, so the color was changed due to the microorganisms that Ponds water supply to the agriculture purpose and mixed with soil is waste particle mixed findly discharged It is may due to the agricultural activity and home activity in river so the color change all station river water in pale yellow color.



1. Lowercamp 2, Kkpatty 3, Cumbum 4, Uthamapalayam 5, Chinnamanur 6, Silayampatty 7, Kottur 8, Veerapandi 9.Kunnur 10.Vaigaidam 11,control

Figure 1: Mullaiperiyar river water in bottles

**SEDIMENT**

Sediment was present in all water samplesduo to the sedimentation particles of the agricultural wastage particles, industrial wastage particles, temple wastage in Chinnamanur, Uthamapalayam, veerapandi, silayampatty other station water sediment particles of the wastage dress, wastage flower to the river sediment.

**REFRACTIVE INDEX**

Refractive index in all station of the river water in same of the refractive index value in 3<sup>0</sup>c in 0.52‰.

**INSECT**

No insect was observed.

**TOTAL ALKALINITY**

The ionic concentration in the water referred as the alkalinity. Total alkalinity has the tendency to neutralize the hydrogen ions. The phenolphthalein alkalinity value is nil .which indicates the absence of carbonate and hydroxyl ions. The bicarbonate alkalinity range from 5.0 mg/l to 10 mg/l and 3.0mg /l in few station .the value found were within the permissible limits (600pm). Moreover little abnormalities in the value of alkalinity are not harmful for human being.

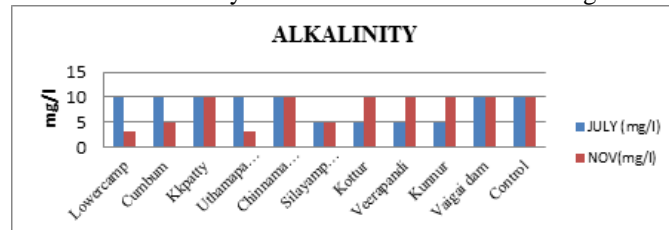


Figure 2: Total Alkalinity in MullaiPeriyar Water Samples (Left- Month of July and Right-Month of November)

**TOTAL HARDNESS**

The hardness is water is caused by carbonate, fluoride and sulphates of calcium and magnesium. It the hardness value varied between 1.0gm/l to 3.0gm/l. The hardness compared to river water the July in 3.0mg/l and November is 1.0mg/l.

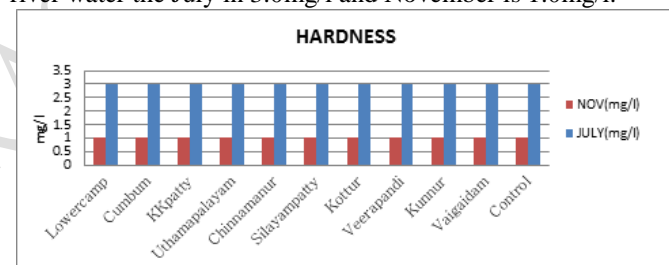


Figure 3: Total hardness in MullaiPeriyar Water Samples (Left- Month of July and Right-Month of November)

**TOTAL CHLORIDE**

Chloride occurs in all type of water. Most of the Mullaiperiyar river station water of chloride level is 10mg/l and also originates the activities such as dissolution of salt, deposits, use of the inorganic fertilizer, sewage waste, landfill, animal filled etc... To harmful when present in irrigational water and are toxic to plants.

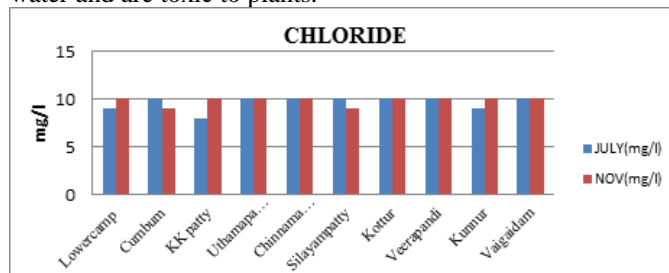


Figure 4: Chloride in MullaiPeriyar Water Samples (Left- Month of July and Right-Month of November)

**TOTAL DISSOLVED SOLID**

TDS indicates the general natural of water quality or salinity. The range of TDS for river water in between 21.6mg/l to 27.6mg/l. The mineral constitutes dissolved in water constitute dissolved solid in water decides its applicability for drinking, irrigation and industrial purpose. The total dissolved solid was classified to three range 0-500 mg/l, 500-1000mg/l, and >1000 mg/l. The range of TDS for river water in between 21.6 mg/l to 27.6mg/l. all other portion have good quality range for TDS.

**FLUORIDE**

The fluoride occur in all natural water supplies the fluoride Concentration of the in the river water sample varied from 0.5 mg/l to 2.0 m. The fluoride concentrations in the surface water samples varied from 0.52 to 0.72mg/L) ingestion of river water with fluoride concentration above 1.5mg/l cause fluorosis or crippling effects. (Ashamed 2012.)

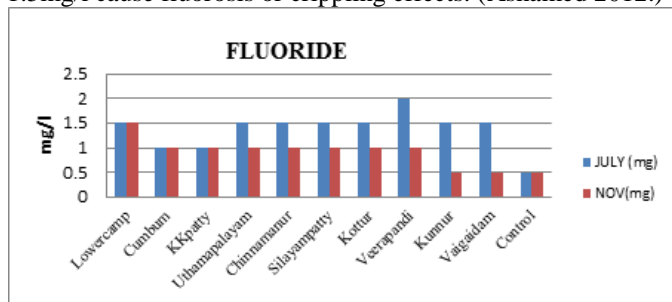


Figure 5: fluorides in MullaiPeriyar Water Samples (Left-Month of July and Right-Month of November)

**IRON**

The iron concentration of 1.0 mg/l to 3.0 mg/l presence of excess of iron in river water cause discoloration. Turbidity and deposits Green peace India describes the lower mullaiperiyar as "a cesspool of toxins, which have alarming level of deadly poisons like DDT, endosulfan, hex and trivalent chromium, lead, cyanide, BHC. Several studies have pointed out that the riverbed has deposits of heavy metals like lead, cadmium, mercury, chromium, nickel, cobalt and zinc and the ecosystem of the river has many dead zones .iron bearing water. Have astringent metallic or bitter taste.

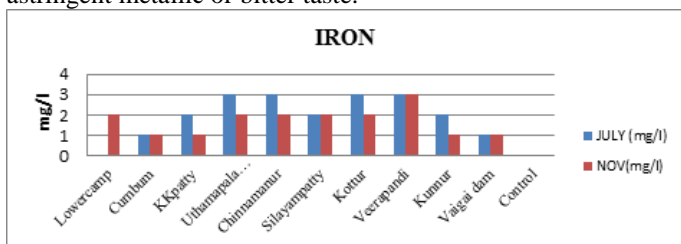


Figure 6: Iron in MullaiPeriyar Water Samples (Left- Month of July and Right-Month of November)

**AMMONIA**

The standard value of ammonia range for 0.5mg/l to 3mg/l. (The standard value of ammonia ranges for good

quality water should be less than 1.2mg S. Krishna Kumar May 2013)

Mullaiperiyar river water samples ammonia content was normal and quality of range of ammonia in presence in water present.

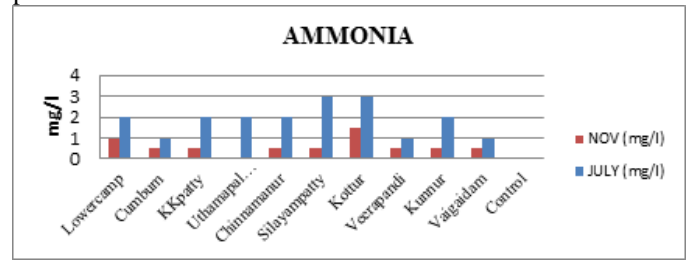


Figure 7: Ammonia in MullaiPeriyar Water Samples (Left-Month of July and Right-Month of November)

**NITRITE**

The standard value of nitrite range all station for 0.2mg/l is below the good and moderate of the river water. The Nitrite ion concentration in surface water varies from 0.08 to 0.18 mg/L. In groundwater, the nitrite content ranged from 0.08 to 1.10 mg/L

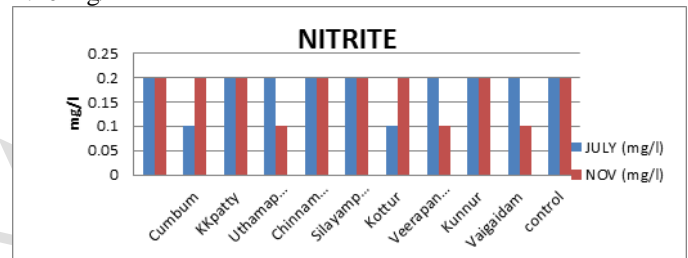


Figure 8: Nitrite of Mullai Periyar Water Samples (Left-Month of July and Right-Month of November)

**NITRATE**

The nitrate standard value in natural river water is due to organism's sources or from industrial and agricultural chemicals. Nitrate concentration of greater then 45mg/l can cause blue baby syndrome among infant. The standard value of nitrate range for a good quality water in 45mg/l in all the sample.

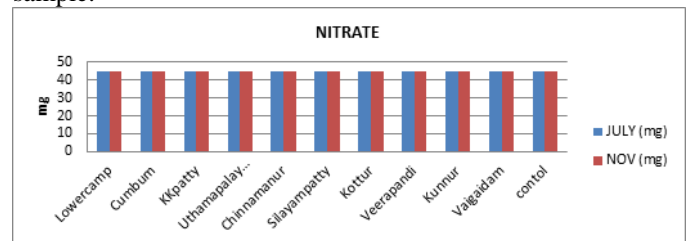


Figure 9: Nitrate of Mullai Periyar Water Samples (Left-Month of July and Right-Month of November)

**PHOSPHATE**

Phosphate enter into river water from phosphate containing rock fertilizer And percolation of sewage and industrial water .the value of phosphate range from 0.5mg/l to 2mg/l in s2,s3,s4,s, in July and November s3 and s4 in

eutrophication is the main cause for phosphate pollution in the environment.

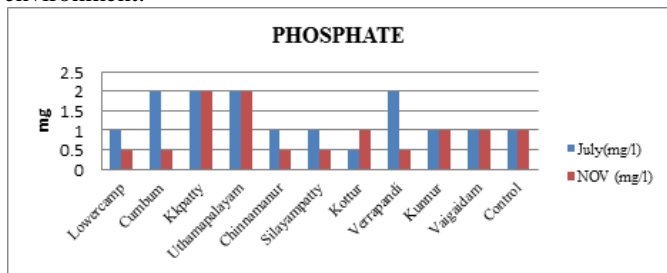


Figure 10: phosphate of Mullai Periyar Water Samples (Left-Month of July and Right-Month of November)

RESIDUAL CHLORINE

The standard sample solution all the station river water sample residual chlorine value 0.2 below. So the good and moderate of the river water.

Month-2014	PARAMETER (mg/l)	contro 1	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
July	PH	7.1	6.8	7.0	7.2	7.0	7.0	7.1	7.2	7.1	7.2	7.2
Novemb er	PH	7.6	6.9	7.2	7.1	7.2	7.1	7.0	7.1	6.9	6.9	6.9
July	Alkalinity	10	10	10	10	10	5.0	5.0	5.0	5.0	10	10
Novemb er	Alkalinity	3.0	5.0	10	3.0	10	5.0	10	10	10	10	10
July	Hardness	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Novemb er	Hardness	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
July	Chloride	9	10	8	10	10	10	10	10	10	10	9
Novemb er	Chloride	10	9	10	10	10	9	10	10	10	10	10
July	TDS	27.6	27.6	27.6	27.6	27.6	21.6	21.6	21.6	21.6	27.6	27.6
Novemb er	TDS	16.8	192	252	252	252	192	252	252	252	252	252
July	Fluoride	0.5	1.0	1.0	1.5	1.5	1.5	1.5	1.5	2.0	1.5	1.5
Novemb er	Fluoride	0.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.5	0.5
July	Iron	0.0	1.0	2.0	3.0	3.0	2.0	3.0	3.0	2.0	2.0	1.0
Novemb er	Iron	0.0	2.0	1.0	1.0	2.0	2.0	2.0	2.0	3.0	1.0	1.0
July	Ammonia	0.0	2.0	1.0	2.0	2.0	2.0	3.0	3.0	1.0	2.0	1.0
Novemb er	Ammonia	0.0	1.0	0.5	0.5	0.0	0.5	1.5	0.5	0.5	0.5	0.5
July	Nitrite	0.2	0.1	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2
Novemb er	Nitrite	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
July	Nitrate	45	45	45	45	45	45	45	45	45	45	45
Novemb er	Nitrate	45	45	45	45	45	45	45	45	45	45	45
July	Phosphate	1.0	1.0	2.0	2.0	2.0	1.0	1.0	0.5	2.0	1.0	1.0
Novemb er	Phosphate	1.0	0.5	0.5	2.0	2.0	0.5	0.5	1.0	0.5	1.0	1.0
July	Residual chlorine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Novemb er	Residual chlorine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

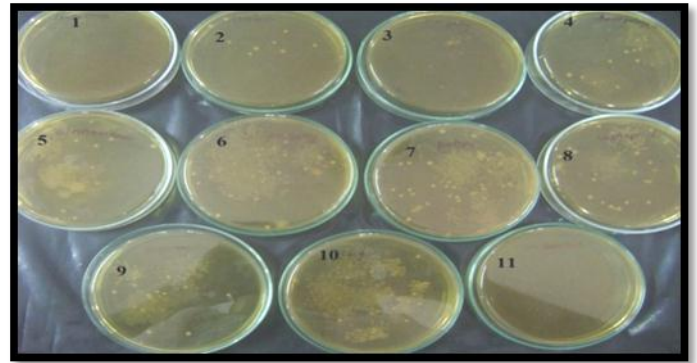
1. Lowercamp 2, Kkpatty 3, Cumbum 4, Uthamapalayam 5, Chinnamanur 6, Silayampatty 7, Kottur 8, Veerapandi 9, Kunnur 10, Vaigaidam

Table 1: Chemical and biochemical content of mullaiperiyar river water in 2014

VII. TOTAL HETROPHIC POPULATION BACTERIA RESULTS

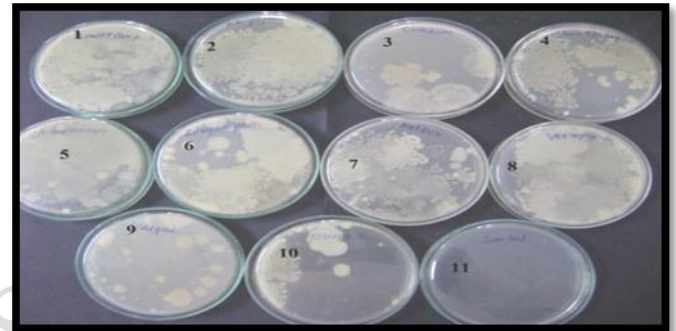
Total hetrophic bacterial population of were observed all samples the results was shown in figure 12and 13.

The result indicates THBP present due to the various ratio such as cattle washing, agricultural waste discharge village drainage discharge and nutrient present in the water. Besides THBP not increased threshold value.



1. Lowercamp 2, Kkpatty 3, Cumbum 4, Uthamapalayam 5, Chinnamanur 6, Silayampatty 7, Kottur 8, Veerapandi 9, Kunnur 10, Vaigaidam 11, control

Figure 12: THBP-of river water samples in July-2014



1. Lowercamp 2, Kkpatty 3, Cumbum 4, Uthamapalayam 5, Chinnamanur 6, Silayampatty 7, Kottur 8, Veerapandi 9, Kunnur 10, Vaigaidam 11, control

Figure 13: THBP of river water samples in November-2014

Station	COLONY COUNT IN MONTH JULY-2014	COLONY COUNT IN NOVEMBER MONTH-2014
Lowercamp	0x10 <sup>1</sup>	10x10 <sup>2</sup>
Kkpatty	10 x10 <sup>1</sup>	10x10 <sup>2</sup>
Cumbum	16 x10 <sup>1</sup>	5x10 <sup>2</sup>
Uthamapalayam	10 x10 <sup>1</sup>	5x10 <sup>2</sup>
Chinnamanur	50 x10 <sup>1</sup>	3x10 <sup>2</sup>
Silayampatty	30 x10 <sup>1</sup>	6x10 <sup>2</sup>
Kottur	50 x10 <sup>1</sup>	5x10 <sup>2</sup>
Veerapandi	60 x10 <sup>1</sup>	10x10 <sup>2</sup>
Kunnur	100 x10 <sup>1</sup>	2x10 <sup>2</sup>
Vaigaidam	100 x10 <sup>1</sup>	5x10 <sup>2</sup>
Control	0	0

Table 2: THBP In the mullaiperiyar river water in 2014

VIII. COLIFORM RESULTS

Spread plating of mullaiperiyar water sample on mac con key agar media showed development of colonies that are of enterobacteraceae species. However Mullaiperiyar River all station sample had very low such microbial growth development in season. But the had high level of microbial growth development in November season. Because the November season times in agricultural activity in samba season in theni district. The protected water sources had low

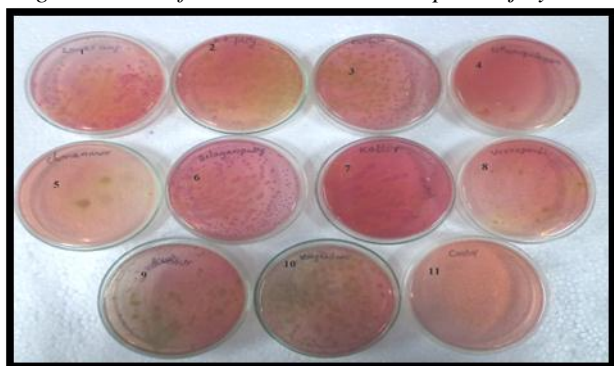
level of  $\geq 23$  Cfu /ml MPN as compared to unprotected once that produced high level of coli form by several magnitudes ranging from 23 to 469 Cfu /ml. so the all station river sample coli forms present. (Zvidzai 2007)

Station	Coli form colony counts in July	Coli form colony counts in November
Lowercamp	$1 \times 10^1$	$50 \times 10^1$
Kkpatty	$0 \times 10^1$	$50 \times 10^1$
Cumbum	$3 \times 10^1$	$50 \times 10^1$
Uthamapalayam	$1 \times 10^1$	$0 \times 10^1$
Chinnamanur	$8 \times 10^1$	$3 \times 10^1$
Silayampatty	$2 \times 10^1$	$50 \times 10^1$
Kottur	$11 \times 10^1$	$10 \times 10^1$
Veerapandi	$8 \times 10^1$	$7 \times 10^1$
Kunnur	$5 \times 10^1$	$15 \times 10^1$
Vaigaidam	$10 \times 10^1$	$50 \times 10^1$
Control	$0 \times 10^1$	$0 \times 10^1$

Table 3: fecal coli form In the Mullaiperiyar river water in 2014

1. Lowercamp 2, Kkpatty 3, Cumbum 4, Uthamapalayam 5, Chinnamanur 6, Silayampatty 7, Kottur 8, Veerapandi 9, Kunnur 10, Vaigaidam 11, control

Figure 14: coli form in river water samples in july -2014



1. Lowercamp 2, Kkpatty 3, Cumbum 4, Uthamapalayam 5, Chinnamanur 6, Silayampatty 7, Kottur 8, Veerapandi 9, Kunnur 10, Vaigaidam 11, control

Figure 15: coli form in river water samples in November-2014

## IX. CONCLUSIONS

In many cases domestic drinking and industrial water supply at the current level of development of the national economy can be provided only by reservoirs. Large reservoirs, other conditions being equal, improve the quality of river water and adjust it seasonally. The development of reservoirs usually requires relocation of water intakes and outfall sewers and the accomplishment of many sanitary measures. It is necessary to find means to combat bluegreen algae and to utilize more fully the potentialities created by reservoirs for recreation.

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