

ASSESSMENTS OF WATER QUALITY IN SAGAING HILL SUPPLIED BY AYEYARWADDY RIVER

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ABSTRACT

Water is one of the most important natural resources on earth. All animal and plant lives require water for survival. Water intended for human consumption must be free from chemical substances and micro-organisms that may be a hazard to health. Sagaing Hill is not only one of the most famous historical places but also the main Buddhism Sermon distributional places in Myanmar. This research conducted about assessments of water quality in Ayeyarwaddy River that supplied water resources to the Monastery in Sagaing Hill, Sagaing Region where two river water samples and two other samples from Tank (2) and Tank (3) of monastery were collected in three seasons. The physicochemical parameters of all water samples such as color, turbidity, pH values, total dissolved solids (TDS), total hardness, total alkalinity, calcium, magnesium, chloride, sulphate and iron were determined by AOAC method and complex metric titration method. Moreover, the bacteriological examinations of water samples were also carried out in Public Health Laboratory of Mandalay under Ministry of Health and Sports. Furthermore, biochemical oxygen demand (BOD) and chemical oxygen demand (COD) of all water samples were studied in Ecological laboratory. Hence this research has been conducted to determine the various physicochemical parameters of water from Sagaing Hill and Ayeyarwaddy River showing that the high contents of TDS (346 mg/L), Total alkalinity (130 mg/L), Total hardness (40 mg/L) and sulphate (118 mg/L) are not suitable for direct drinking as well as there are two bacteria groups of Probable Coliform Count and Escherichia coil Count in both types of river water and water in monastery.

Key Words: water quality, AOAC, COD, BOD, total alkalinity

1 INTRODUCTION

Pure water is an essential resource for life. Man uses it for different purposes like drinking, washing, in agriculture, food processing and in other applications. Water can serve as a vehicle for spreading illness caused by such microorganisms as *Vibrio cholera*, *Yersinia enterocolitica*, *Escherichia coli*, and *Cryptosporidium* sp(Welch,P.et al.,2000) Fecal contamination, combined with the failure to adequately treat water, has been incriminated in many waterborne epidemics. The worldwide interest in the quality of drinking water stems from the documented association between contaminated water and diarrheal diseases (Simeonov,V.,et al.,2003). Diminished water quality is associated with factors such as economics and geographical location. A good ecological status implies that all biological quality elements show low levels of distortion by human activity and deviate only slightly from those normally associated with this type of surface water under undisturbed conditions. Rivers are systems that carry a significant load of materials in dissolved and particulate phases from both natural and anthropogenic sources in one direction. Human activities, use of agricultural chemicals, and land use changes are the major factors that influence surface water quality. Effluent discharge standard of FAO, UN for COD is 120 mg/L. The chemical oxygen demand (COD) test is commonly used to indirectly measure the amount of organic compounds in water. Most application of COD determine the amount of organic pollutants found in surface water or waste water, making COD a useful measure of water quality. Indicates the amount of oxygen which is needed for the oxidation of all organic substances in water. (<http://ww.ysi.com/parameter>)

Firstly, the water samples have been collected from Vippassala Monastery, Maha Ghandayon Chaung, Sagaing Hill as well as from Ayeyarwaddy River. The physicoparameter of water samples were measured and compared with the WHO standard. Secondly the bacteriological examination of all samples were investigated. Finally, the values of the biochemical oxygen demand (BOD) and chemical oxygen demand (COD) of all water samples were also determined.

2 METHODS and MATERIALS

2.1 Materials

Sterilized glass bottles and plastic containers were purchased from Public Health Laboratory of Mandalay under Ministry of Health and Sports. EDTA, EBT and some required chemicals were purchased from Abel chemical company, Myanmar.\

2.1.1 Sample Collection

Water samples were collected in three seasons where two samples from Ayeyarwaddy river and other two samples from Tank (2) and Tank (3) of Vippassala Monastery, Maha Ghandayon Chaung, Sagaing Hill in Myanmar. Each sample was collected in three seasons such as summer, rainy and winter season.



Figure (1) Collecting water samples in Tank (2) and Tank (3)



Figure (2) photo of Tank (3)

2.2 METHODS

2.2.1 Analysis of Physical Properties of Water Collected from Ayeyarwady River and Monastery

2.2.1.1 Estimation of Colour

Method : APHA platinum cobalt standard method

The colour of the collected water sample was estimated by APHA platinum cobalt standard method (APHA 18th Edt, 1992).

2.2.1.2 Estimation of pH Value

Method : Direct Measurement by pH meter

The pH of water was determined by using a pH meter (AOAC, 2000).

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3 RESULTS AND DISCUSSION

3.1 Determination of Physicochemical Parameters of Collected Water Sample from Ayeyarwaddy River and Monastery in summer

No	Parameters	Sample 1	Sample 2	Sample 3	Sample 4	Maximum value	unit
1	Appearance	Slightly Turbid	Slightly Turbid	Clear	Clear		
2	Colour	6	6	5	5	50	Units
3	pH value	7.4	7.3	7.2	7.3	6.5 to 9.2	
4	Total Solids	307	277	262	346	1500	mg/L
5	Total Hardness	50	80	20	40	500	mg/L
6	Total Alkalinity	195	130	130	130	950	mg/L
7	Calcium	12	20	8	8	200	mg/L
8	Magnesium	5	7	0	5	150	mg/L
9	Chloride	20	20	20	20	600	mg/L
10	Sulphate	20	49	39	118	400	mg/L
11	Total Iron	Nil	Nil	Nil	Nil	1	mg/L

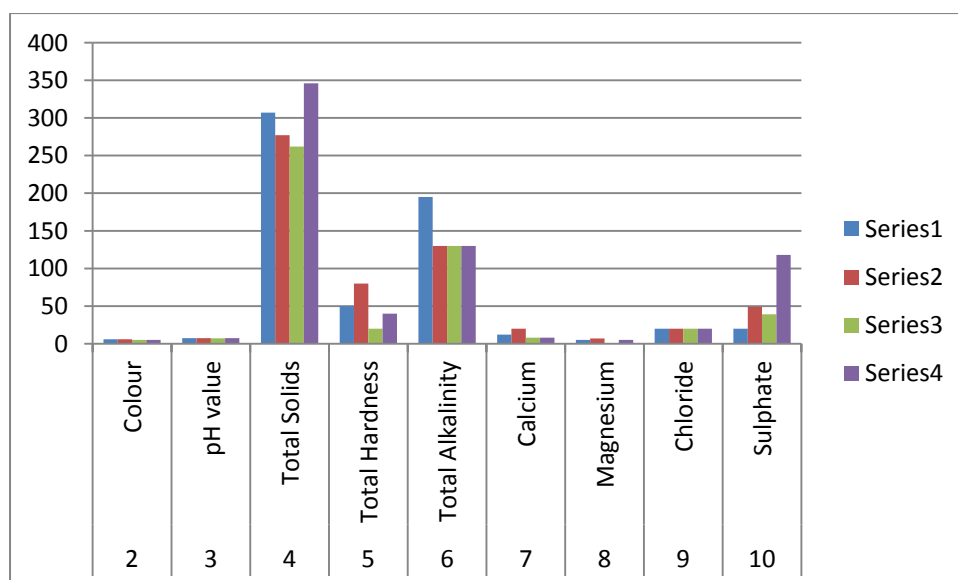


Figure (3) Comparative graph for sample 1,2,3 and 4 in summer

According to above comparison, sample 1 has highest amount of total solids and sample 4 has highest amount of total alkalinity and sulphate contents in summer.

3.2 Determination of Physicochemical Parameters of Collected Water Sample from Ayeyarwaddy River and Monastery in rainy season

No	Parameters	Sample 1	Sample 2	Sample 3	Sample 4	Maximum value	unit
1	Appearance	Turbid	Turbid	Clear	Clear		
2	Colour	12	10	5	5	50	Units
3	pH value	7.1	7.6	7.2	7.3	6.5 to 9.2	
4	Total Solids	257	267	262	346	1500	mg/L
5	Total Hardness	40	40	20	40	500	mg/L
6	Total Alkalinity	130	130	130	130	950	mg/L
7	Calcium	8	8	8	8	200	mg/L
8	Magnesium	5	5	0	5	150	mg/L
9	Chloride	20	20	20	20	600	mg/L

10	Sulphate	39	39	39	118	400	mg/L
11	Total Iron	Nil	Nil	Nil	Nil	1	mg/L

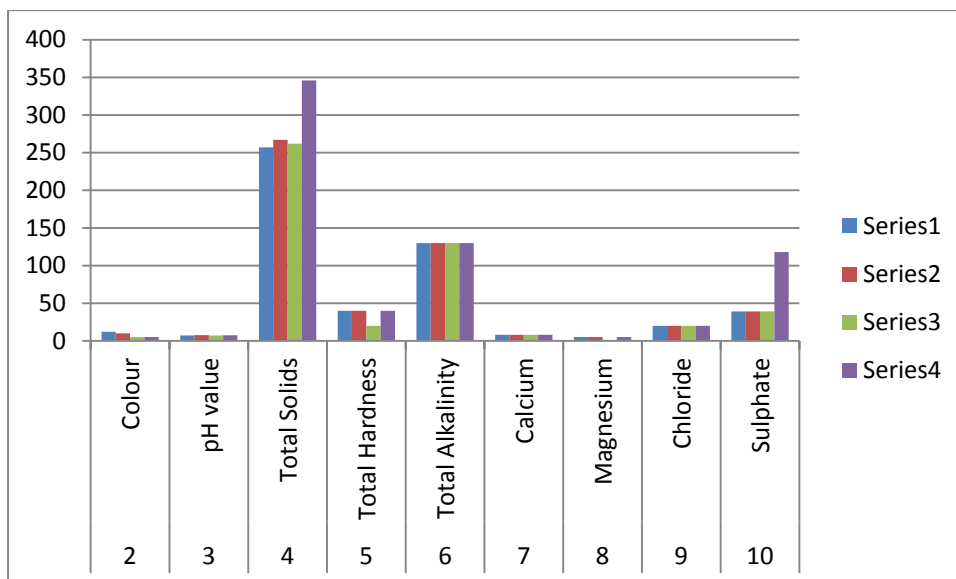


Figure (4) Comparative graph for sample 1, 2, 3 and 4 in rainy season

According to above comparison, sample 2 has second highest amount of total solids and sample 4 has highest amount of total solids and sulphate contents in summer.

3.3 Determination of Physicochemical Parameters of Collected Water Sample from Ayeyarwaddy River and Monastery in winter season

No	Parameters	Sample 1	Sample 2	Sample 3	Sample 4	Maximum value	unit
1	Appearance	Turbid	Turbid	Clear	Clear		
2	Colour	12	10	5	5	50	Units
3	pH value	7.1	7.6	7.2	7.3	6.5 to 9.2	
4	Total	257	267	262	346	1500	mg/L

	Solids						
5	Total Hardness	40	40	20	40	500	mg/L
6	Total Alkalinity	130	130	130	130	950	mg/L
7	Calcium	8	8	8	8	200	mg/L
8	Magnesium	5	5	0	5	150	mg/L
9	Chloride	20	20	20	20	600	mg/L
10	Sulphate	39	39	39	118	400	mg/L
11	Total Iron	Nil	Nil	Nil	Nil	1	mg/L

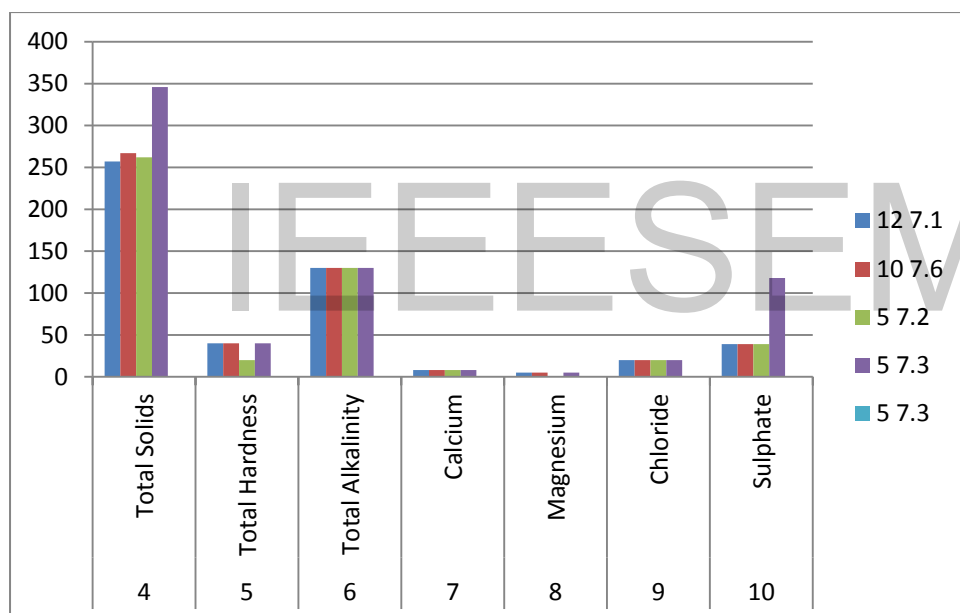


Figure (5) Comparative graph for sample 1, 2, 3 and 4 in winter season

According to above comparison, sample 2 has second highest amount of total solids and sample 4 has highest amount of total solids and sulphate contents in summer.

3.4 Water Bacteriological Examination

bacteria	Sample 1	Sample 2	Sample 3	Sample 4
Probable Coliform Count	5/5	5/5	5/5	5/5
Escherichia coil Count	Isolated	Isolated	Isolated	Isolated

according to bacteriological result, all selected water samples from Ayeyarwaddy river ,Tank (2) and Tank (3) contain two types of bacteria that are danger for human health.

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3.5 BOD and COD Parameters of Ayeyarwaddy River

Table (5) BOD and COD Parameters of Ayeyarwaddy River

Sr.	Quality parameter	Results	Method	Drinking standard	Effluent standard	Remarks
1	BOD	9 mg/L	Estimated by Ecolab with Jenway Dissolved OxygenMeter (Model-970)	≤ 3 mg/L	≤ 50 mg/L	Above DW limit
2	COD	< 30 mg/L	Lovibond SpectroDirect Method No. 130, 131, 132	NG	≤ 250 mg/L	Normal

According to BOD and COD parameters determination, high amount of BOD parameters display that Ayeyarwaddy is beyond the drinking water standard parameter and so water sources are unfit for drinking and danger for aquatic lifes.

4 CONCLUSION

According to this research work, the physicochemical parameters of each selected water sample such as colour, turbidity, total solids, total hardness, total alkalinity, calcium content, magnesium content, chloride and sulphate contents were determined in three seasons in which sample 4 has the high contents of TDS (346 mg/L), Total alkalinity (130 mg/L), Total hardness (40 mg/L) and sulphate (118 mg/L). Moreover, the bacteriological results point out all of water samples have two bacteria groups such as Probable Coliform Count and Escherichia coil Count showing that how many human facial wastes are present in those water resources and these bacteria can cause diarrhea. Studying on water resources supplied from Ayeyarwaddy river to Tank (2) and Tank (3) in monastery are unsuitable for direct drinking and domestic usages. Furthermore, the BOD parameters of river water is 9 mg/L that is very high compared with the maximum permissible level pointing that the water quality is severe for aguatic animals in this river. Health care is necessary for water resources of monastery in Sagaing Hill.

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