

ASSESSMENT AND TREATMENT OF SURFACE WATER FROM MYITNGE RIVER NEAR MIGYAUNGTAT VILLAGE TRACT (AMARAPURA TOWNSHIP)

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Abstract

The research work concerning the assessment of water quality and treatment of household water was done by surface water from Myitnge River near Migyaungtat Village Tract in Amarapura Township. The water sample was collected in the rainy season (6-8-2017). The water sample was treated with *Moringa* seeds and carried out by coagulation (such as *Moringa* seeds) and filtration approaches. The experimental works have been done by physical examination, determination of chemical constituents and bacteriological analysis. Although most parameters of untreated water are in conformity with the W.H.O guide-line limits for drinking water, bacteriological examination shows that the sample (untreated sample) is unsatisfactory for drinking purpose due to the presence of *E.coli*. It is found that the sample which is treated with *Moringa* seeds powder is satisfactory for household water purpose due to the absence of *E. coli*. So, it is suggested that the water should be used only after treated with *Moringa* seeds powder for health safety.

Key words: household water, *Moringa* seed, treatment, coagulation, filtration, bacteriological examination

Introduction

Water is a important liquid. No one can survive without water. Water is still plentiful in our country, but it certainly needs to be managed and protected from pollution. This research intends to provide some information on household water treatment using seeds of the *Moringa oleifera* tree. Water sample was collected from Myitnge River near Migyaungtat Village Tract in rainy season (6-8-2017). It is located at the junction of Latitude 21°47'57.76" N and Longitude 96°05'19.17" E. It is situated in the southern end of Amarapura Township. Most of the people in this village use river water for household from Myitnge River. They prefer drinking river water although they can get ground water. Surface water will have a significant bacterial load. The presence of coliform bacteria in water may lead to serious waterborne diseases. That is why the work of testing water quality is the main aim and then the goal of the treatment is to remove the bacteria in water.

Moringa oleifera seeds treat water on two levels, acting both as a coagulant and an antimicrobial agent. It is generally accepted that *Moringa* works as a coagulant due to positively charged, water-soluble proteins, which bind with negatively charged particles (silt, clay, bacteria, toxins, etc) allowing the resulting "flocs" to settle to the bottom or be removed by filtration.

Aim and Objectives

The **aim** of this research work is to provide information on household water treatment using seeds of the *Moringa oleifera* tree.

Objectives are to collect the water sample and to prepare solutions of *Moringa* seeds for water treatment, to characterize the physical parameters, to determine the chemical constituents and bacteriological analysis of water and to determine the amount of heavy toxic metal by AAS (before and treatment).

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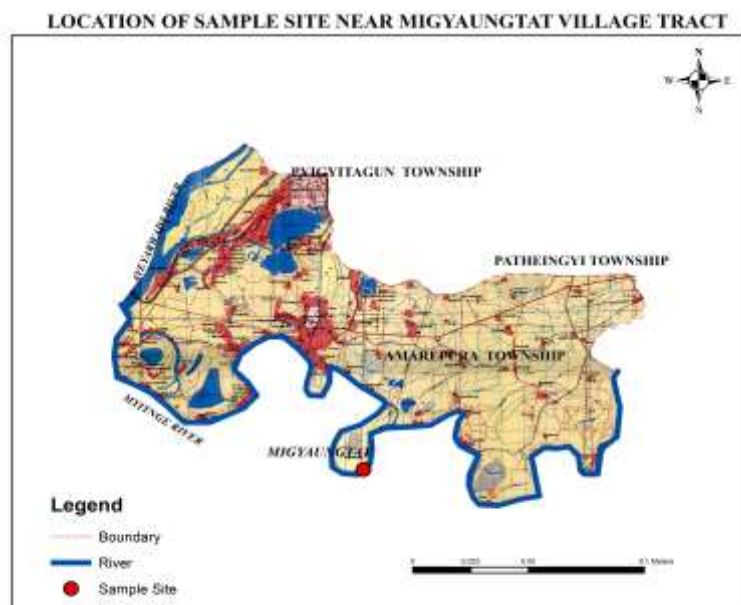


Figure.1. Sample Collection Area

Botanical Description

Family	:	Moringaceae
Botanical name	:	<i>Moringa oleifera</i> Lam.
English name	:	Horse-Radish tree, Drum-Stick tree
Myanmar name	:	Danda-lun
Part used	:	The whole plant

Figure.2. Plant and Seeds of *Moringa oleifera*

Uses of *Moringa oleifera*

Important medicinal properties of the plant include antipretic, antiepileptic, antiinflammatory, antiulcerative, antihypertensive, cholesterol lowering, antioxidant, anti diabetic, hepatoprotective, antibacterial and antifungal activities. In addition, *M. oleifera* seed possesses water purifying powers. They are known to be anti-helminthic, antibiotic, detoxifiers, immune builders and have been used to treat malarial and it can also be a less expensive bio-absorbent for the removal of heavy metals.

Materials and Methods

Sample Collection

The sample was collected from surface of Myitnge river near Migyaungtat village tract in Amarapura Township. The water sample was collected in the rainy season (6-8-2017).

Table (1) Methods used in the Analysis of Water

No	Parameter	Test Method	Type of Instrument
1	pH	Digital/Colour	pH Meter/strip
2	Colour	colour Matching	Test kit (HACH)
3	Turbidity	Digital	Turbidity Meter (HACH 2100P)
4	Conductivity	Analog Indicator	DREL/5 With ConductivityHACH
5	Total Alkalinity	Titration	Titration
6	HardnessTotal	EDTA Titrimetric	Titration
7	Calcium	EDTA Titrimetric	Titration
8	Magnesium	Calculation	
9	Chloride	Argentometric	Titration
10	Sulphate	Colour Disc & colour Matching	Test kit (HACH)
11	Iron	Colour Disc & colour Matching	Test kit (HACH)
12	Manganese	Colour Disc & colour Matching	Test kit (HACH)
13	As, Cu, CN, Pb	Colour Disc & colour Matching	Test kit (HACH)
14	Dissolved oxygen (DO)	Probe	Sension 378 (HACH)
15	Biochemical Oxygen demands (BOD)	Probe and Winkler	Sension 378 (HACH)
16	Microbiological examination	Multiple tubes	

Determination of pH

The glass electrode assembly was first standardized by using buffer solution of pH 4-7 and the electrometer was adjusted to those values. Then pH of water samples was determined by pH meter. The results were shown in Table (4).

Determination of Physicochemical parameters

The conductivity, turbidity, calcium and magnesium, total hardness, sulphate and chloride of the samples were directly measured by the conductivity meter HACH (DREL/5 with Conductivity). The results were shown in Table (4).

Determination of Heavy Metals and other

The manganese, iron, alkalinity, arsenic, copper, cyanide and lead of the samples were directly measured by HACH (Test kit). The contents of dissolved oxygen (DO), biochemical oxygen demand (BOD) and chemical oxygen demand (COD) of water samples were measured at Mandalay City Development Committee, Water and Sanitation Department, Water laboratory. Standard Plate Count, Probable coliform count and *E. coli*. (*Escherichia coli*) counts of collected water samples were measured at Mandalay Public Health Association. These results were shown in Table (4).

Treatment of water sample with *Moringa oleifera* Coagulant

Water sample was added with appropriate amount of Moringa seed powder (such as 0.1 g, 0.3 g, 0.6 g) and stirred at once for 1-2 minutes. The supernatant solutions were filtered with filter paper into another containers. The most suitable dosage would be determined as shown in Table(2).

Results and Discussion

Physical properties

Physical parameters examined for the quality of Myitnge water (surface water) are color, conductivity, turbidity and pH.

In the present investigation, analytical data for color of two water samples (before treatment and after treatment) were found to be (>50 and 10 units). These values were not beyond the maximum acceptable limit.

Turbidity is used to describe the presence of substances in water which interferes with its clarity. Turbidity values for two samples were (34.9 and 7.65 N.T.U). Untreated water sample exceed the Imperative value of W.H.O Standard but treated water was not.

Conductivity measurements are used to determine the purity of water and total dissolved solid in boiler and cooling tower water. The conductivity values of all water samples were (378 and 389 μ mhos/cm).The mandatory health limit of drinking water standard is 800 μ mhos/cm.

The pH of water samples was slightly greater than pH 7 (pH = 7.1) and hence it was said to be slightly alkaline.

The amount of *Moringa oleifera* seeds was determined under optimum conditions for coagulation as shown in Table (2).The most suitable condition of adding *Moringa* seeds was 0.6 g/L .

Table (2) Effect of Moringa seeds on Sludge Formation for Water Sample

No.	Moringa Dosage (g/L)	Data Turbidity (N.T.U)	Sludge Formation
1	0.1	10.11	Fair
2	0.3	12.45	Poor
3	0.6	7.65	effective

According to the results of physical parameters, it was found that the colour unit of treated water was decreased by 80%. Turbidity was reduced by 75.21%.

Chemical properties

The maximum desirable limit for total hardness is 100 mg/L. The total hardness of water samples were the same (200 mg/L). According to WHO limit, these water samples were **hard water**.

Calcium and magnesium are major contributors to “ water hardness”. The maximum desirable limits for calcium and magnesium were 75 mg Ca/L and 50 mg Mg/L. The observed values of two water samples were (48 mg Ca/L) and (20 mg Mg/L) respectively.

The total alkalinity of three water samples were found to be (188 and 184 mg/L) and phenolphthalein alkalinity values of all water samples were less than half of the value of total alkalinity, this indicating the absence of hydroxide alkalinity.

High chloride content may harm metallic pipes and structures as well as growing plants. The chloride contents in all water samples (5 and 75 mg/L) were lower than the acceptable limit of 200 mg/L proposed by WHO.

The presence of sulphate in drinking water can also result in a noticeable taste; the lowest taste threshold concentration for sulphate is approximately (<200) mg/L, as the sodium salt. Sulphate may also contribute to the corrosion of distribution systems. The observed concentrations of sulphate were lower than the value of the standard recommendation limit (200-400 mg/L). So, these water samples do not have a laxative effect on humans.

The observed values of iron and manganese contents of samples were (>0.2 and 0.02 mg Fe/L) and (0.03 and 0.02 mg Mn/L). Only the value of iron (untreated water) was exceed the standard recommendation limits (0.1-1.0 mg Fe/L) and (0.05-0.5 mg Mn/L), W.H.O, 1972.

Arsenic, Copper, Cyanide and Lead

The concentration of arsenic, copper, cyanide and lead were not detected in two samples.

DO, BOD and COD

Dissolved Oxygen is the amount of oxygen dissolved in water. DO content indicates whether the water is fresh or not. Color of some pollution will show higher amounts of BOD and COD also pollution indicators.

DO values of all water samples were (6.89 and 1.77 mg/L). The suitability of water for fish and other organisms and the process of self purification can be estimated from DO content. According to European Standard (W.H.O), DO for drinking water should be at least 5 mg/L. So the content of DO of the water from Myitnge river(sample 1) was higher than treated water.

BOD values of water samples were (4.80 and 2.60 mg/L). BOD values of all water samples were higher than the imperative value. COD contents of all samples were (12 and 6.50 mg/L).

According to the results of chemical parameters, total iron recorded a decrease of 90% after treatment. The content of Manganese was reduced 33.33%. Similarly, the parameters of DO, BOD and COD were also reduced 74.31%, 45.83% and 45.83% respectively.

Bacteriological Results

The bacteriological analysis of water is done to determine its portability i.e., fitness for drinking. According to the bacteriological results, untreated sample was shown that the quality of water is unsatisfactory and treated water sample was **satisfactory**. Thus, the water samples should be used for drinking and cooking only after proper treatment.

Table (4) Results of Water Samples (Before and After Treatment : 6-8-2017)

Parameter (6-8-2017)	Before Treatment Sample 1	After Treatment Sample 2	WHO Standard	
			Desirable	Imperative
pH (scale)	7.1	7.1	7-8.5	6.5-9.2
Color (units)	>50	10	5	50
Turbidity (N.T.U)	34.9	7.65	5	25
Conductivity (μ mhos/cm)	379	389	100	400
Calcium (mg/L)	48	48	75	200
Total Hardness as CaCO ₃ (mg/L)	200	200	100	500
Magnesium (mg/L)	20	20	50	150
Chloride (mg/L)	5	75	200	600
Total Alkalinity as (mg/L) CaCO ₃	188	184	200	500
Total iron (mg/L)	>0.2	0.02	0.1	1.0
Manganese (mg/L)	0.03	0.02	0.05	0.5

Sulphate (mg/L)	< 200	<200	200	400
Dissolved oxygen(DO)(mg/L)	6.89	1.77	Above 5	5
Oxygen demands, Biochemical (BOD)(mg/L)	4.80	2.60	-	2
Chemical Oxygen demands (COD)(mg/L)	12	6.50	-	-
Arsenic (mg/L)	Nil	Nil	-	0.05
Copper (mg/L)	Nil	Nil	1.0	2.0
Cyanide (mg/L)	Nil	Nil	-	0.07
Lead (mg/L)	-	-	-	0.01
Standard Plate Count	>300(fu/mL)	200(fu/mL)		
Probable Coliform Count	5/5	2/5		
<i>Escherichia coli</i> Count	Isolated	Not-Isolated		
Bacteriological Results	Un-Satisfactory	Satisfactory		

Conclusion

In this research work, the water sample from Myitnge river near Migyaungtat village tract in Amarapura Township was collected to be analyzed (6-8-2017).

It was also found that the water has high concentration of iron before treatment and the value of manganese was low concentration before and after treatment. The contents of arsenic, copper, cyanide and lead were not detected. Most of the concentrations of inorganic metallic constituents do not exceed the standard limit. Therefore, the water sample may not be injurious to health and there may occur no migration of toxic metals. According to Alkalinity Relationship Table, there was no hydroxide alkalinity. From the results of sulphate concentrations, it may be recorded that the water was not polluted.

According to comparative analysis from the results of before and after treatment, it was found that, all parameters of properties were slightly changed. The water quality of the sample was fit according to W.H.O standard and it was suitable for domestic use, agricultural use and industrial use. It can be concluded that the water of Myitnge river was not polluted. However, it till now should be used for drinking water only after proper treatment. It was obvious that, the water sample after various treatment with suitable dosages such as *Moringa* seed was affected for potable purpose.

From bacteriological examination of water by the Public Health Laboratory Mandalay, *E. coli* was isolated in before treatment but after treatment the water was not isolated. The water sample was given satisfactory remark after treatment. Thus the water from Myitnge river were said to be unwholesome and it should be treated with *Moringa* seeds to get safety water.

The quality of water from Myitnge water was generally good enough for drinking purpose. The water was physically unclear and has color. It was found that the physical properties such as pH, color, turbidity, conductivity, of samples (before and after treatment) were not beyond the W.H.O standard limit.

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