

Moringa Oleifera - Water Purification and its Antibacterial Efficacy

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Abstract

Clean water and hygienic life are the need of every living being. This article focuses on the water purifying effect of Moringa Oleifera seeds by analyzing pH, TDS, hardness etc. and how it prevents life style diseases like diabetes, cholesterol and proving these scientifically. By understanding the properties of such plants, we can reduce the dependency on modern medicines to a large extent and thus, can ensure a sustainable future.

Keywords

Moringa Oleifera; Water purification; Antibacterial efficacy.

1. Introduction

It is a known fact that 71% of Earth is covered with water, but only 0.5% of it is termed as pure water and drinkable. Our world is in a situation that within 50 years, an alternate way for drinking water has to be realized. Many countries are trying to protect the pure water bodies and hence purifying water in a cost-efficient way is an important requirement today. Lifestyle diseases are common nowadays, and dependency on medicines for minor diseases has also increased a lot. Moringa Oleifera seeds can be used as a cost-effective solution for both [1]. It has the potential to purify water effectively [2, 3] and reduce the impacts of cholesterol, blood pressure and diabetes [4-6].

2. Experimental section

2.1. Preparation of moringa oleifera seed powder

The seeds are collected and the wings of the seeds are removed, well dried seeds are powdered using mortar.

2.2. Anti-bacterial test

Moringa Oleifera seed powder samples were sent to Unibios Laboratories, Kochi, Kerala to determine the antibacterial properties using well diffusion method. Stock solution (10mg/ml of sample) was prepared. Stock solutions in different volumes (25 ml, 50ml, and 100ml) were used against bacteria filled agar plates. Chloramphenicol was used as a comparison parameter. Results were noted down after separate time intervals.

2.3. Study on lifestyle diseases

A study was undertaken on people living in the experimenter's neighbourhood. The study population was directed to include moringa in their food cycle, either by using moringa leaves or seeds in curries or by adding moringa powder (maximum of a quarter teaspoon) to the dishes. Blood pressure and sugar levels of the study population were tested before and after this experiment.

3. Results

Water purification studies of Moringa Oleifera seeds are discussed in the following sub sections and the results are given in **Table 1**.

3.1.pH

The pH of the water collected from the well had shown some alkaline nature before treatment with moringa. This may be due to the reaction with atmospheric CO₂. After treating with moringa for 1 hour pH changed to 7, which is a good condition for drinking.

3.2. Conductivity

Conductivity of water collected from the well was 138.2 mho and it changed to

162.6, 183.3 and 209.2 mho after 1, 6, and 12 hours respectively. It is observed that conductivity is proportional to the time for which the experiment is conducted. This may be due to the cationic protein present in Moringa Oleifera seeds called Moringa Oleifera Cationic Protein (MOCP), which binds the minerals and helps in settling and thereby increasing the conductivity of water.

3.3.Total dissolved solids (TDS)

Before treatment with Moringa Oleifera, the TDS was indicated at 420 mg/l. After treatment for 1, 6 and 12 hours respectively, its value changed to 265, 170 and 112 respectively. These values come under the designed value kept by World Health Organization (WHO). This may be due to the fluctuant property of moringa seed powder.

3.4. Dissolved oxygen (DO)

Before treatment, the DO level was 4.7 mg/l and after treatment for 12 hours, the level changed to 8.1 mg/l. This may be due the bio active substances present in the moringa seeds.

3.5. Hardness

Before treatment, the hardness of water was 460 mg/l. After treatment with Moringa Oleifera seed powder for 1,6 and 12 hours respectively, hardness changed to 380, 320 and 270 mg/l. Hardness decreases as time proceeds and after 12 hours, its value came under WHO standards. The reduction in adsorption capacity may be the reason for decrease in hardness.

3.6. Fluoride

Before treatment, the level of fluoride in water was 2 mg/l, and it changed to 0 mg/l when treated with moringa for 12 hours.

3.7.Effect of Moringa Oleifera seed powder in reducing growth of bacteria

The results from the lab showed that when moringa seed powder was given in 25 μ l, 50 μ l quantity, it did not resist the growth of bacteria. When 100 μ l quantity was given,

it resisted the growth of bacteria (**Table 2**). When compared with the chosen control – Chloramphenicol, moringa showed an equally good performance against bacterial growth and this proved the fact that moringa can be used as an antibiotic in future.

Table 1: Water purification studies of Moringa Oleifera seeds

Parameters	Sample 1 (Water)	Sample 2 (After 6 hours)	Sample 2 (After 6 \hours)	Sample 2 (After 12 hours)	Standard value (WHO-2005)
Temperature (°C)	25.4	26.2	27.2	28.2	27.3
pH	6.5	7	6.7	6.6	7.4
Conductivity (mho)	138.2	162.6	183.3	209.2	300
TDS (mg/l)	420	265	170	112	500
Dissolved oxygen (mg/l)	4.7	5.8	7.1	8.1	5.6-9.5
Hardness (mg/l)	460	380	320	270	300
Chloride (mg/l)	180	120	90	70	250
Fluoride (mg/l)	2.0	1.5	1	00	4

Sample 1-Before adding Moringa Oleifera seed powder & Sample 2- After adding Moringa Oleifera seed powder

Table 2:Antibiotic property of Moringa Oleifera seed powder

Bacteria Type	Quantity added (µL)			
	Moringa Oleifera seed powder			Chosen Control- Chlorom Phenicol
	25	50	100	100
	Antibiotic property			
E. Coli	NO	NO	5	6

3.8.Study on lifestyle diseases

Test results showed that most of the study population's sugar, blood pressure and

cholesterol levels had decreased in small quantities on including moringa seeds to their diet.

3.9. Anti-oxidant and anti-microbial property of moringa seeds

Since moringa has antibacterial properties, a question arises whether moringa has anti-oxidant or anti-microbial effects. Based on other research papers, if a plant has an antibacterial effect most of the time it has an antimicrobial effect too. Antimicrobial activity was tested by using moringa against Streptococcus mutants and E Coli. Antioxidant activity was tested using nitrous oxide. Radical scavenging activity and the microbial activity are summarized in **Table 3**, **Table 4** and **Table 5**.

Table 3: Nitrous oxide radical scavenging activity

Sample concentration: 100mg/ml

Sample Name	Moringa Seed Extract			
Sample Concentration	0.5ml	1ml	1.5ml	2ml
Control OD	0.380	0.380	0.380	0.380
Test OD	0.302	0.292	0.284	0.261
Radical Scavenging Activity	20.52	23.15	25.26	31.31

Table 4: Antimicrobial property of moringa seed extract against Streptococcus mutants

Sample concentration : 100 mg/ml

Bacteria	Concentration(μ l)	50	100	150	200	250
<i>Streptococcus mutants</i>	Control OD	0.921	0.921	0.921	0.921	0.921
	Test OD	1.537	1.629	1.934	2.003	2.156
	OD of extract	0.853	1.044	1.469	1.638	1.844
	Final Test OD	0.684	0.585	0.465	0.365	0.312
	%of inhibition	25.73	36.48	49.51	60.36	66.12

Table 5: Antimicrobial property of moringa seed extract against E Coli mutants

Bacteria	Concentration(μ l)	50	100	150	200	250
<i>E.coli</i>	Control OD	0.785	0.785	0.785	0.785	0.785
	Test OD	1.425	1.541	1.864	1.881	2.014
	OD of extract	0.853	1.044	1.469	1.639	1.844
	Final Test OD	0.572	0.497	0.395	0.243	0.17
	%of inhibition	27.13	36.68	49.68	69.04	78.34

Conclusions

Pure water is the basic need of every human being. In the present situation purifying water is getting more and more costly. This project has shown that water can be purified in a cost-effective way. It was also understood that moringa can resist bacterial growth and hence in the future moringa can be used as an alternative to antibiotic medicines, which comes with a lot of side effects. Moringa has less or no side effects making it a better solution in the future. Moringa Oleifera seed has the potential to purify water efficiently. It increases the dissolved oxygen, conductivity, pH, temperature and reduces fluoride, chloride, TDS, and hardness. Moringa Oleifera has the capacity to prevent lifestyle diseases. Its seeds have the potential to resist the growth of bacteria i.e., antibiotic effect.

References

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