

Research Article

Water Purification Through Moringa Oleifera Lam.

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Abstract

Water is used for variety of purposes like drinking, washing, bathing etc. Reports of WHO (World Health Organization) says that about one million people lack safe drinking water and many people die every year from water borne diseases. To deal with this situation water purification is needed. There are various methods of water purification, however biological methods are most promising and eco -friendly. The present study deals with use of Moringa oleifera to purify water. Moringa oleifera is grown in many countries as a multi -purpose tree as it possesses medicinal and nutritional values. Dry Moringa seeds and seed powder were used for water purification. Water samples collected from different localities like water from Tube well and Well of four localities of Jalgaon city. These samples were tested for Total Hardness, Calcium Hardness, Magnesium Hardness, Acidity, Alkalinity, TDS, TS, TSS, Chloride, Sulphate, Phosphate, pH, Temperature, etc. parameters before and after treatment. It is observed that Moringa oleifera Lam. seed is an effective purifier and coagulant to treat variety of water samples. Use of seed powder is more promising as compared to entire seeds of Moringa.

Keywords : *Moringa oleifera, Water purification, seed, seed powder, coagulant.*

INTRODUCTION

Water supply is basic need required for living creature and human. In this world available resources are limited for living creatures. Groundwater is one of the major sources of drinking water. But it's direct use for drinking is not suitable, for several reasons (Anekar N.R. 2017). Hence to make it suitable for drinking water treatment is essential. This study deals with water treatment using natural coagulant Moringa oleifera.

Importance

water is used for several purposes by humans such as, irrigation, cooking, washing, bathing, cleaning, drinking, also provides home to millions of creature, enables transportation. Regulates the temperature of Earth. Our body uses water in all its cells, organs and tissues to help regulate its bodily functions. Because our body loses water through breathing, sweating, digestion. It is important to rehydrate by drinking fluids and food containing water. Water is very important substance on earth. If there is no water there would be no life possible on earth.

These are several causes of water pollution such as sewage and wastage water, dumping garbage into river and accidental oil leakage, burning of fossil fuels, chemicals, fertilizers and pesticides, global warming, radioactive waste, urban development, animal wastage, underground storage leakage. According to United Nations estimates, the amount of waste water produced annually is about 1500 Km³, 6 times more water than that exist in all the rivers of world.

Purification

Though water pollution is a major problem but it can be overcome by various ways boiling, granular activated carbon adsorption, distillation, reverse osmosis, desalination, direct contact membrane distillation (DCMD), in situ chemical oxidation, and bioremediation. Of those bioremediation is cheapest and healthier method mostly followed. For this variety of biological things can be used such as cilantro, jackfruit, java plum, peel of fruits, banana peels, along with these Moringa Oleifera Lam. is easily available in each corner of world.

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Moringa Oleifera Lam

It is a tree of polypetalae most widely cultivated species in genus Moringa, the only genus in plant family Moringaceae common name include, Moringa, Drumstic tree, Horse Radish, Ben oil Or Benzoi tree (oil derieved from seeds). Moringa oleifera is fast growing, drought resistant tree. Native to 'tropical and sub-tropical' region of South Asia. Widely cultivated for its young seeds and pods and leaves used as vegetables. Also used for water purification. M. oleifera is considered to be an aggressive invasive species.

Water is used for several purposes by humans, but the level of purity of the water being consumed is very important since it has a direct effect on health. More than half of all illness caused by germs, which get into the mouth via water and food. Hence, purification of water is great need of time. This can be achieved through various ways. Chemical methods leads to purification by synthetic means however, use of biological methods are most convenient and eco-friendly. Hence these are more recommended.

There are various ways by which waters is purified biologically. Such as use of Jack fruit seeds : Prapat Pentamwa, Wanwisa Tanta, Pornwarin Milamai (2011) have studied effect of Jackfruit seeds on water in their work entitled "Water Treatment by Using Lychee, Jackfruit, and Rambutan seed coagulants". Muhammad Raziq Rahimi Kooh, Muhammad Khairud Dahri, Linda B.L. Lim (2016) also found effect of Jackfruit seed as sustainable adsorbent for the removal of Rhodamine B dye". Use of Coriander (cilantro) : Research done by undergraduate students at a community college, Douglas Ph. D. Said that Cilantro, also known as coriander shows activity as a new "Biosorbent" for removing lead and other toxic heavy metals from contaminated water. (Phys. org, 2013) Use of Jatropa curcus seeds : "Preliminary study on Jatropa curcas as coagulant in waste water treatment" had been studied by Zurina Zainal Abidin, N. Ismail, Robiah Yunus, I.S. Ahamad (2011) Robert Natumanya have worked on "Evaluating coagulant activity of locally available Syzygium cumini, Artocarpus heterophyllus and Moringa oleifera for treatment of community drinking water, Uganda."

MATERIALS AND METHODS

The study was conducted under a controlled environment in order to eliminate interference from human activities, rainfall and solar intensity.

Sample collection

The water samples were collected from Jalgaon district of Maharashtra. The two samples of water are taken. One of well and other tubewell. The geographical condition of Jalgaon i.e. latitude is 20°99'N and longitude is 75.56260E.

Materials

Dry Moringa oleifera seeds are used in this study. These seeds were harvested from the trees of residential area of Jalgaon, Maharashtra, India. Seeds of Moringa oleifera act as natural coagulants and biocoagulants. Wings and coat from seeds were removed, fine powder was prepared and sieved. Test-tube, measuring jar, cylinder, beakers, glass rod, lids, test-tube holder, durham tubes, mortar & pestle are required. Procedure - Extraction of Moringa seed powder: mature seeds of Moringa oleifera were chosen from dry dehiscent pod. The outer covering of seed kernels were removed using a sharp knife, and using a laboratory mortar and pestle. The containers were cleaned thoroughly before taking the sample to avoid contamination. The initial volume of each sample was recorded at the collection point. The following parameters were determined: Temperature, PH, alkalinity, TDS, conductivity, oil grease, total hardness, calcium hardness, chloride hardness, phosphate, acidity.

In this procedure crushed seed powder 7.5 grams were mixed with 250 ml water sample for 7 days. And also 15 grams seed powder were soaked in 250 ml water for 14 days. Stir quickly for 30 seconds, then slowly and regularly for Five minutes. Water is covered without disturbing it for at least an hour. After 7 days and 14 days the extraction were filtered using filter paper. And water samples are collected. Again the water is treated and all parameters are measured such as acidity, TDS, oil grease, temperature, total hardness, calcium hardness, pH, chloride hardness, phosphate, conductivity, etc. The results of treated water samples were compared with raw water sample along with WHO standards.

OBSERVATIONS

Table 1. Results Obtained Before Physio-Chemical Study Of Raw Water

Sr. No.	Parameters	Units	S1	S2	S3	S4	BIS Limits
1	Total Hardness	Mg/l	320	290	330	460	300
2	Acidity	Mg/l	110	180	120	160	120
3	Alkalinity	Mg/l	90	230	390	390	200
4	Chloride	Mg/l	290	420	370	410	250
5	Calcium Hardness	Mg/l	100	180	150	200	200
6	PH		7.68	7.63	7.94	7.48	6.5 to 8.5
7	Temperature	0 c	33.3	33.8	33.5	33.4	
8	Sulphate	Mg/l	37.0	93.6	64.0	85.6	200
9	Phosphate	Mg/l	9.6	35.4	15.3	35.6	5
10	MPN	MPN/100ml	130	50	8	4	0/100ml
11	Magnesium Hardness	Mg/l	220	110	180	260	100
12	Total Dissolved Solids	Mg/l	460.4	415.1	317	410.2	500
13	Total Suspended Solids	Mg/l	189.2	121.65	160.85	204.05	No Standard
14	Total Solids	Mg/l	649.6	536.75	477.85	614.25	500
15	Turbidity	NTU	7	6.8	10.2	15.4	5
16	Ca ion	Mg/l	60.9	77.7	48.3	73.5	75
17	Mg ion	Mg/l	31.60	21.88	14.59	19.54	50

RESULTS AND DISCUSSION

The results of the treated water samples were compared with raw water samples along with World Health Organization Standard. Total Dissolved Solids (TDS), Conductivity, Temperature, and pH of raw and treated water samples were determined. Turbidity and Total suspended solids were also determined.

According to Eilert (1978), the seeds of *Moringa oleifera* contains significant quantities of low molecular-weight water soluble protein which carries positive charge when the crushed seeds are added to the raw water, the proteins produce positive charges acting like magnets and attracting the predominantly negatively charged particles.

Aho, I. M. (2014) in his study reported that the coagulative efficiency of using *Moringa oleifera* seed extract is almost 100%, when compared with alum which is commonly used in conventional water treatment. Our study is in accordance with them as in terms of availability, *Moringa oleifera* seed or seed powder extract is a better alternative as compared to alum coagulant because it's high cost and non – biodegradability.

Raw water treated with *Moringa* seeds for seven days have shown positive results as compared to water treated for fourteen days. In seven days treatment, total hardness, Calcium hardness, Ca ions, Mg ions have been reduced and these values have come to standard range of BIS (Bureau of Indian standard). While pH and Chloride have increased in all samples those treated for seven days and treated for fourteen days.

If we compare these results sample wise then it is observed that sample number 3 which is sample of Tube well collected from residential area of Jalgaon city have shown positive results after treating with *Moringa* seeds and seed powder.

The experimental study includes treatment of raw water with *Moringa* seeds and another set of treatment of raw water with *Moringa* seed powder. Both treatments had shown improvement in quality of water. However it is faster in water treated with seed powder which can be observed through values obtained from Table number 2 and 3.

Thus from this, we can conclude that use of *Moringa* seed powder as a water purifier is more effective as compared to entire seeds. During this study two experimental sets were laid, one of seven days and another of 14 days. It has been observed that 7 days are quiet enough to purify water using *Moringa* seeds.

Table 2. Results obtained after Physio-chemical Study of Treated water with Seed Powder

Parameters	7 Days				14 Days			
	S1	S2	S3	S4	S1	S2	S3	S4
Total Hardness	280.00	250.00	277.00	247.00	270.00	309.00	351.00	305.00
Acidity	10.00	30.00	10.00	20.00	40.00	30.00	10.00	20.00
Alkalinity	310.00	230.00	90.00	290.00	620.00	230.00	210.00	260.00
Chloride	180.00	360.00	150.00	230.00	250.00	410.00	320.00	460.00
Calcium Hardness	144.00	139.00	139.00	103.00	150.00	148.00	168.00	117.00
PH	7.87	8.55	7.42	7.70	6.80	6.96	6.83	6.30
Temperature	23.80	24.20	23.60	23.30	24.00	23.90	24.10	23.50
Sulphate	25.80	80.30	54.10	75.30	25.10	81.40	55.20	77.40
Phosphate	7.20	24.20	7.55	24.60	7.70	23.10	7.20	24.20
MPN	130.00	50.00	8.00	4.00	130.00	50.00	8.00	4.00
Magnesium Hardness	136.00	111.00	138.00	144.00	120.00	161.00	183.00	188.00
Total Dissolved Solids	420.40	399.10	295.00	405.20	421.20	293.04	368.02	400.36
Total Suspended Solids	160.20	100.65	120.85	196.05	165.20	125.03	155.04	164.00
Total Solids	580.60	499.75	415.85	601.25	586.40	418.07	523.06	564.36
Turbidity	9.70	8.90	9.50	17.30	10.30	10.10	10.90	18.40
Ca ion	63.20	56.30	37.10	70.10	52.20	64.02	33.30	69.70
Mg ion	21.64	15.60	7.60	8.43	26.02	9.10	10.80	11.50

Table 3. Results Obtained After Physio-Chemical Study Of Treated Water With Seeds

Parameters	7 Days				14 Days			
	S1	S2	S3	S4	S1	S2	S3	S4
Total Hardness	290	257	284	251	246	320	360	312
Acidity	30	20	40	20	30	40	20	30
Alkalinity	180	410	190	410	120	250	430	610
Chloride	310	450	850	350	360	280	140	320
Calcium Hardness	140	147	152	110	110	163	178	138
PH	8.28	8.30	8.05	7.96	6.89	8.36	6.82	7.62
Temperature	22.8	22.9	23.1	22.7	23.8	23.9	24.1	24.2
Sulphate	24.1	79.8	53.1	75.9	25.9	80.20	50.4	70.5
Phosphate	7.9	23.8	7.64	25.7	7.5	23.6	7.15	22.8
MPN	130	50	8	4	130	50	8	4
Magnesium Hardness	150	110	132	141	136	157	182	174
Total Dissolved Solids	428.69	392.5	283.20	428.21	400.36	421.02	256.08	274.32
Total Suspended Solids	156.08	104.96	126.78	209.34	164	165.02	155.01	144.02
Total Solids	584.77	497.46	409.98	637.55	564.36	586.02	411.09	518.34
Turbidity	7.9	8.6	9.2	16.7	9.6	8.8	9.4	17.2
Ca ion	56.3	70.1	38.1	63.2	53.4	71.02	32.4	61.1
Mg ion	20.80	11.44	10.2	9.12	19.40	10.12	9.8	9.2

CONCLUSION

From present experimental study following conclusions are drawn. *Moringa oleifera* Lam. seed is an effective purifier and coagulant to treat variety of water samples. Use of seed powder is more promising as compared to entire seeds of *Moringa*. The water can be purified effectively using seed powder or seed within one week only. Quantity of *Moringa* seed powder required to purify one litre of raw water is around 30 gms. *Moringa oleifera* Lam. Being medicinal plant not only work as

water purifier but also add and improve quality of water as it possesses many phytochemicals that have wide scope in medicines. The present study deals with biological method of water purification thus it is eco-friendly.

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