



Effectiveness of Moringa oleifera in Treatment of Water and Post Treatment Recommendations

Datla Uma Devi¹, Isukapatla.Tejaswi¹, yandra.Rohtih¹, S. Vamsi Harischandra Prasad², Dr. D.Venkateswarlu³

¹B-Tech. Student, Civil Engineering, Godavari Institute of Engineering and Technology(A),Affiliated to JNTUK, Kakinada, Rajahmundry, A.P, India.

²Assistant Professor, Department of Civil Engineering, Godavari Institute of Engineering and Technology (A) , Affiliated to JNTUK, Kakinada, Rajahmundry, A.P, India.

³Professor, Head of Department of Civil Engineering, Godavari Institute of Engineering and Technology (A) , Affiliated to JNTUK, Kakinada, Rajahmundry, A.P, India.

To Cite this Article

Datla Uma Devi, Isukapatla.Tejaswi, Yandra.Rohtih, S. Vamsi Harischandra Prasad and Dr. D.Venkateswarlu. Effectiveness of Moringa oleifera in Treatment of Water and Post Treatment Recommendations. International Journal for Modern Trends in Science and Technology 2022, 8(S01), pp. 30-33. <https://doi.org/10.46501/IJMTST08S0105>

Article Info

Received: 01 May 2022; Accepted: 25 May 2022; Published: 30 May 2022.

ABSTRACT

In water treatment the clarification of water is generally achieved by the mechanism of coagulation aided by chemical compounds like aluminium sulphate and iron salts. The addition of which when followed by gentle and continuous stirring causes the opposed charge particles to form heavy masses. These are removed by the process of filtration or sedimentation. For many communities however the use of expensive chemical coagulants is not feasible.

So, the application of an indigenous, naturally derived coagulant, namely seed material from the multi-purpose tree Moringa oleifera. (*M.oleifera*) is an alternative solution to the use of expensive chemical coagulants. The presence of a positively charged protein is the reason behind the coagulation mechanism in the seed powder. This mimics the action of chemical coagulants but at different efficiency.

At optimal dosage substantial change in turbidity of the water was observed. While pH and TDS remained largely unaffected. The change in hardness and chlorides altered based on the source of pollution. BOD levels of the water were noted to change. MPN tests showed no growth of micro bial content.

The natural coagulant may remain limited to domestic use for minimally polluted water but further treatment prior consumption by user is high recommended.

KEYWORDS-Aluminium Sulphate, Coagulation, *Moringa Oleifera*

1. INTRODUCTION

Moringa oleifera belongs to the genus Moringaceae. Moringa oleifera is a fast growing tree. The species is characterized by its long drumstick shaped pods that contain its seeds. Moringa trees grow 4 to 5 meters in height and can bear fruit within a year of growth. The

pods/fruits of the tree are typical 25cm to 50cm in length and contain seeds of 1cm diameter.

Moringa oleifera commonly known as horse-radish or drumstick tree is an active of the sub-Himalayan region of India but has been spread to many tropical nations. It has been observed to be used by

no madic African tribes in water purification, as an antis corbutic and anti-irritant.

Moringa oleifera seed kernels contain significant quantities of a series of low molecular weight, water soluble proteins which in solution carry an overall positive charge. The proteins function similar to synthetic polymer coagulants. Heavy negatively charged particulates in raw water that contribute to the turbidity bind with the protein. Under proper agitation these particulate form flocs and settle by gravity or may be removed by filtration.

Drinking water is a basic humanneed, including food, shelter and clothing. The lack of safe drinking water is a leading cause of morbidity and mortality, especially in local communities where water borned is eases are prevalent and persistent due to low quality surface source waters. Appropriate treatment technology can render this poor water resource into safe potable water; however, conventional technology may not be appropriate for those communities in term so feconomics, availability, and operational constraints

2. LITERATURE REVIEW

1.Oria-Usifo E. E., Anyata, B.U, 2014:

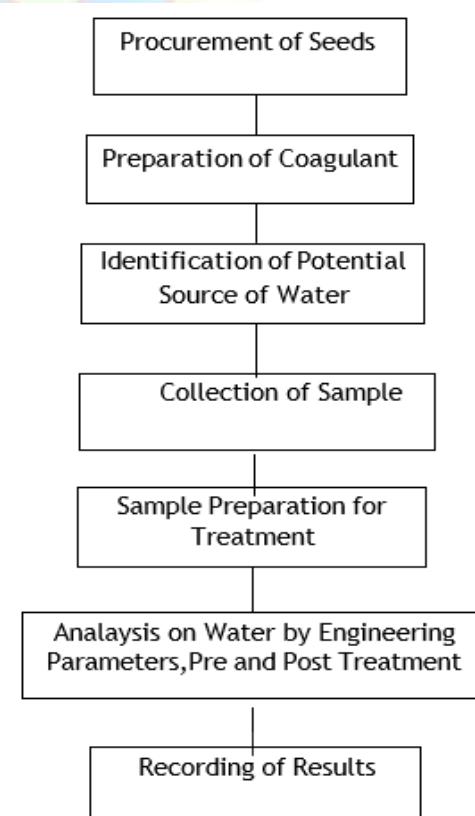
Investigated the effectiveness of the use of different Moringa Oleifera coagulants for the removal of turbidity, bacteria, and natural organic matter (NOM) from natural surface water using laboratory experiment. In the laboratory study water sample with turbidity of 64NTU was analyzed and treated with the three coagulants produced from the Moringa oleifera seed namely: the shell- blended (without oil extraction) seed powder, de-oiled seed powder and the purified protein (polymer) powder. e. The concentration of the dose selected for the jar tests were; 30mg/l, 50mg/l, 70mg/l, 90mg/l, 100mg/l and 120mg/l for all three coagulants. The optimum dosages for the shell- blended, de-oiled seed powder and the purified protein powder were found to be 100mg/l, 100mg/l and 90mg/l respectively. The use of Moringa oleifera coagulant in combination with alum and ferric chloride showed that reduced usage of inorganic salts to an average of 60% could be achieved. Bactericidal activity seemed to be evident through analysis of E.coli viability in the water and sludge treated by the Moringa oleifera coagulant.

2. Eman N. Ali , Suleyman A, 2010

Focused on developing an efficient and cost effective processing technique for Moringa oleifera seeds to produce natural coagulant for use in drinking water treatment. Moringa oleifera seeds were processed for oil extraction using electro thermal soxhlet. Isolation and purification of bio-active constituents using chromatography technique were used to determine the molecular weight of the bio-active constituents. The turbidity removal was up to 96.23 % using 0.4 mg/L of processed Moringa oleifera seeds to treat low initial turbidity river water between 34-36 Nephelometric Turbidity Units (NTU) without any additives.

3.Hendrawati, Indra Rani Yuliastri, 2016carried out a research to observe the effect of Moringa oleifera seed as natural coagulant to replace synthetic coagulant. M. oleifera reduced 98.6% turbidity of wastewater, 10.8 % of its conductivity, 11.7% of its BOD and removed its metal contents (Cd, Cr, Mn). When applied to ground water, M. oleifera removed the turbidity of ground water as much as 97.5%, while reduced the conductivity and BOD of ground water 53.4 % and 18%, respectively. The use of M. oleifera also reduced total number of coliform.

3. EXPERIMENTAL WORK:



4. TESTS ON MATERIALS:

- Determination of pH
- Turbidity
- Total Hardness
- Determination of Chlorides
- Biochemical Oxygen Demand (BOD)
- Most Probable Number (MPN)
- Total Solids

Experimental Results of Bandharla Palli-Hand pump sample

Experimental Results of Nagaiyagari Palli-Hand pump sample

Parameters	Before Treatment	Post Treatment	Potable Water Qualities
pH	7.14	7.11	6.5 - 8.5
Turbidity	50 NTU	4 NTU	10
Hardness	685 ppm	1200 ppm	600
Chlorides	808.44 mg/l	818.44 mg/l	250 - 1000 mg/l
BOD	0.2 mg/l	2.7 mg/l	2 mg/l
MPN	No growth	No growth	1 per 100ml
Total Solids	174400 mg/l	840 mg/l	

Comparative Tabulation of Results

Parameters	Bandharla Palli		Kuchiwari Palli		Nagaiyagari Palli		Kalyani Dam		Potable Water Qualities
	Before Treatment	Post Treatment	Before Treatment	Post Treatment	Before Treatment	Post Treatment	Before Treatment	Post Treatment	
pH	6.9	7	7.14	7.11	7.1	7.0	7.35	7.45	no relaxation
Turbidity	29 NTU	7 NTU	50 NTU	4 NTU	50 NTU	4 NTU	0 NTU	2 NTU	10
Hardness	790 ppm	650 ppm	685 ppm	1200 ppm	920 ppm	800 ppm	ppm	ppm	600
Chlorides	879.72 mg/l	133.95 mg/l	808.44 mg/l	818.44 mg/l	349.89 mg/l	419.8 mg/l	300 mg/l	500 mg/l	250 - 1000 mg/l
BOD	2.3 mg/l	2.7 mg/l	0.2 mg/l	2.7 mg/l	2.3 mg/l	2.7 mg/l	4 mg/l	10 mg/l	2 mg/l
MPN	No growth	No growth	No growth	No growth	No growth	No growth	No growth	No growth	1 per 100ml
Total Solids	25200 mg/l	16000 mg/l	174400 mg/l	840 mg/l	47600 mg/l	5600 mg/l	100 mg/l	110 mg/l	

Experimental Results of Kuchiwari Palli-Hand pump sample

Parameters	Before Treatment	Post Treatment	Potable Water Qualities
pH	7.1	7.0	no relaxation
Turbidity	50 NTU	4 NTU	10
Hardness	920 ppm	800 ppm	600
Chlorides	349.89 mg/l	419.86 mg/l	250 - 1000 mg/l
BOD	2.3 mg/l	2.7 mg/l	2 mg/l
MPN	No growth	No growth	1 per 100ml
Total Solids	47600 mg/l	5600 mg/l	

Experimental Results of Kalyani Dam-Reservoir water sample

Parameters	Before Treatment	Post Treatment	Potable Water Qualities
pH	7.35	7.45	no relaxation
Turbidity	0 NTU	2 NTU	10
Hardness	ppm	ppm	600
Chlorides	300 mg/l	500 mg/l	250 - 1000 mg/l
BOD	4 mg/l	10 mg/l	2 mg/l
MPN	No growth	No growth	1 per 100ml
Total Solids	100 mg/l	110 mg/l	

5. RESULTS & DISCUSSION

From our experimental results we can ascertain that satisfactory results of coagulation may be achieved from the use of Moringa oleifera seeds as a coagulant in water samples of minimal pollution.

There was a sub spatial change in the turbidity of the sample post treatment. This stands to prove that the particulates influencing the turbid nature of water are flocculated by the seed coagulant.

The Hardness and content of Chlorides were observed to vary in reduction and increase in different samples. The reaction of the coagulation is limited to a certain particulates only. In presence of a few pollutants there is an undesired effect of increase in these properties. The

nature of the result of the treatment depends on the type of pollutants.

The Biochemical Oxygen Demand was observed to increase. This is due to the demand by the organic content of the seed powder to decompose. This cause skeptical views about the growth of bacteria with in the water but the threat is only in case the water has pathological content pretreatment. We were able to eliminate the scope of growth of bacteria using MPN tests on the treated water.

Significant change in the Total solids of the sample was observed post treatment in water. This is due to the settlement of particles in the water by the action of the seed powder coagulant.

6. CONCLUSION:

Moringa oleifera was utilized as a coagulant in the experiments to study the efficiency of the mechanism in comparison to that of the chemical coagulants in the market. From the results of various tests the following is our conclusion about the use of Moringa oleifera in the process of water treatment.

At optimal dosage substantial change in turbidity of the water was observed. While pH and TDS remained largely unaffected. The change in hardness and chlorides altered based on the source of pollution. BOD levels of the water were noted to change. MPN tests showed no growth of microbial content.

From the study of composition of the seeds we speculate that the use of defatted Moringa oleifera seed powder as a coagulant will result in greater efficiency than seeds containing oil as it interferes with the hardness of water and chloride content.

Due to the risk of the addition of addition of organic coagulant contributing to the growth of pathological - microbial - organic matter in the water we are skeptical about the ability of this treatment to be standalone. We strongly advice the process to be followed by filtration and disinfection treatments before the consumption by user.

While the coagulant is efficient, it is not an appreciable alternative to the synthetic compound coagulants at this point. Hence are not a suggested replacement. It may be utilized in combination to achieve better results. In this regard it is best limited to use in small scale /domestic treatment of minimally polluted water.

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

REFERENCES

- [1] Moringa oleifera Lamon paracetamol-induced hepatotoxicity. Indian JPharmSci60:33-35
- [2] Ghe bremichael KA. Moringa seed and pumice as natural alternative materials for drinking water treatment. KTHL and Water Resources Engineering;2004.Ph.D. thesis.
- [3] Ndabigengesere A. and Narasiah K.S., Use of Moringa oleifera seeds as a Primary Coagulant in Waste water Treatment, Environmental Technology,19(8),789-800(1998b)
- [4] Yung K., Bio sand Filtration, Application in the Developing World, CE 401 Project Civil Engineering, University of Waterloo, Canada(2005)
- [5] Ndabigengesere A. and Narasiah K.S., Quality of Water Treated by Coagulation Using Moringa oleifera seeds, Water Research, 32(3), 781-791 (1998a)
- [6] Anwar,F,Zafar,S.N.andRashid,U.(2006).Characterization of Moringa oleifera seed oil from drought and irrigated regions of Punjab. Grasasy Aceites, 57(2):160-168.
- [7] NandV.,Water Purification Using Moringa oleifera Seeds and Other Local Seeds: APacific Perspective, M. Sc.Thesis, University of the South Pacific, Suva, Fiji (2006)
- [8] Anwar, F., Bhanger, M. I. (2003). Analytical characterization of Moringa oleifera seed oil grown in temperate regions of Pakistan. J.Agric. Food Chem. 51, 6558–6563.
- [9] Soladoye, M. O. and Chukwuma, E. C. (2012). Quantitative phytochemical profile of the leaves of *Cissuspopulnea* Guill. and Perr. (Vitaceae) – An important medicinal plant in central Nigeria. Arch.Appl. Sci. Res. 4:200–20
- [10] Anselme Ndabigengesere, K. Subba Narasiah, and Brian G. Talbot "Active agents and mechanism of coagulation of turbid water using Moringa oleifera" vol.29.no-Z.Pp-703-710(1995)
- [11] Babu Ravendra&Chandurimalay "Home water treatment" vol--03,(1)2005.
- [12] Suleyman A. Muyibi and Lilian M. Evison Moringa oleifera seeds for softening hard water(2002)
- [13] BholeAG(1987)'Performance studies of a few natural coagulants 'J. Of the IWWA,XIX(3)Pp205-209
- [14] DishnaSchwarz(June2000)'WaterclarificationusingM.O.'Gateinformationservice,pp1-5
- [15] Trichopoulou,A.;Vasilopoulou,E.;Hollman,P.;Chamalides,C.;Foufa,E.;Kaloudis,