



Coagulant Activity of Moringa Oleifera Seed to Removal of Water Turbidity and Its Antimicrobial Activities on Water Borne Pathogens

KEYWORDS

Moringa oleifera seed, microbial examination, physical parameters.

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ABSTRACT *Moringa oleifera* tree is very useful in developing countries and all parts of the tree have potent medicinal value and seed has coagulant activity to remove the turbidity from water as a natural coagulant instead of chemical coagulant. In the present study oiled and deoiled preparation of dried seed powder of *Moringa oleifera* of the concentration of 1gm, 1.5gms, 2gms, 2.5gms and 3gms were activated with 100ml of distilled water and that was treated with raw water in 20% of the dilution. After treatment with raw water, samples were analyzed for all the parameters such as pH, turbidity, TDS, total hardness and bacterial examination. The result showed that the *Moringa oleifera* seed is eco-friendly and non-toxic natural coagulant and is effective against the water borne pathogens.

INTRODUCTION

Water sources like lake, pond, river and well are contaminated by many ways such as disposal of solid and liquid waste on land and surface water. Among them the most significant are domestic wastewater, industrial effluent, agriculture residues and chemicals continuously discharging directly into the river is one of the main cause of water pollution in the stream (Poudyal, 2000: Online; Forum for Environmental Management and Research, n.d.: Online).

The drinking water contaminated from different sources cause many water borne diseases such as diarrheal diseases and gastrointestinal infections. The diseases are caused by pathogenic bacteria, some parasites, and viruses.

With more and more Indians becoming aware of the hazards of drinking impure water, the demand for effective water purifiers is growing rapidly to improve smell, taste, clarity, or to remove disease-causing pathogens by using the various water treatment process. Conventional water treatment methods available for the removal of turbidity and pathogens are coagulation, filtration and disinfection. Coagulant alum is added to remove the settled colloidal and suspended materials contaminated in the water. But these chemicals cause some toxic effect to the environment and the aluminum is one of the factors which might contribute to Alzheimer disease (Okuda et al., 1999, & Sharma et al., 2005).

Natural macromolecular coagulants have attracted the attention of many researchers because of their abundant source, low price, multi-purposeness and biodegradation [Katayon et al., 2005, Muyibi et al., 2001]. Okra, rice and chitosan are natural compounds which have been used in turbidity removal [Sharma et al., 2005, Ozacar 2002, Roussy et al., 2005]. The seeds of moringa oleifera tree are used to reduce water turbidity in water treatment. Moringa oleifera coagulant has been found to have high coagulation activity only for high turbidity water. The activity is low for low turbid water (Muyibi et al., 1995). Many researchers have reported on the various uses of Moringa oleifera seeds as coagulant and coagulant aid in the last 20 years. Therefore, it is important to improve the characteristics of this plant by identifying its bioactive constituents, which has high coagulation activity. This is our one the objective of study.

MATERIALS AND METHODS

Water Sample collection

The water sample was collected from our college hostel

drainage which is located in Nehru arts and science college, T.M.Palayam, Coimbatore, Tamil Nadu, India in sterilized 1liter container.

Preparation of Moringa Seed powder

Dry Moringa oleifera seeds used in this study were collected from our college garden. The pods collected were allowed to completely dry on the tree (the brown colour pods) and each pod contained around (20-30) seeds. The Moringa seeds were de-shelled and dried at ambient temperatures (23 to 25°C) for a period of five days before milling. The white kernels were milled into a fine powder using with the aid of a Starlite blender (Model SL-999) and was sieved through a small mesh to get the fine powder.

Preparation of M. oleifera seed solution and water treatment:

Different concentrations of Moringa seed solutions were made by dissolving 1 g, 1.5 g, 2 g, 2.5 and 3 g of the Moringa seed powder weighed on a triple beam balance into a 100 ml of distilled water each contained in a conical flask to obtain 1 %, 1.5 %, 2 %, 2.5% and 3% concentration of the solution respectively (Schwarz, 2000). The solution was shaken properly for 1 minute to extract and activate the coagulant and antimicrobial proteins in the seed powder. It is important to note that 5 Moringa dried seeds make up 1 g of the seed powder. Each of the concentrations was poured into one liter of the raw water contained in a beaker (2 liter capacity) and the water stirred for 60 seconds and then slowly for 2 minutes. The treated water was then allowed to stand undisturbed for 6 hours. After that the 100 ml of water was collected from the top of conical flask and subjected to post-treatment analysis [Suleiman and Evison 1994; Folkard et al., 1999 and Doerr 2005].

Deoiled powder [Gidde et al., 2012 mehtod] and water treatment:

To the crushed shelled blended Moringa oleifera powder, ethanol (95%) was added in 1:10 ratio (1gm of seed powder and 10ml ethanol) to form a suspension. Then it was mixed with the help of magnetic stirrer for 10 minutes. The resulting supernatant was separated by centrifugation (300 rpm, 45 min) and the settled material was dried at room temperature for 24 hours. The seed powder was taken in the same concentration as above mentioned concentration

Table-1 Methods used for Physico-chemical and biological study of water

S. No	Parameters	Method
1.	pH measurement	pH meter
2.	Total hardness	Total hardness(NICE) Kit
3.	TDS	TDS digital meter
4.	Turbidity	Nephelometer
5.	Bacterial examination	MPN test, EMP Agar plates and S.S.agar plates

RESULT AND DISCUSSION

The collected water sample was analyzed all the parameter before and after the treatment of various doses of Moringa oleifera seed powder. The present study was conducted to obtain preliminary information on the coagulant activity of Moringa oleifera seed. The result was shown in table 2 and 3. The seed grinded powder was tested the coagulant activ-

ity by two methods such as crude extracted (with oil) and deoiled extracted. The result was showed that M.oleifera seed has more coagulant activity compare with Alum coagulant. Mangale et al., 2012 was reported that the application of this low cost Moringa oleifera seeds is recommended for eco-friendly, nontoxic, simplified water treatment.

Bina et al., 2010 has reported that the Moringa oleifera Coagulant Protein as coagulant aid can be used for drinking water treatment without the risk of organic or nutrient release. He has reported that M.oleifera more active against E.coli from the turbidity. Several studies were carried out to identify the efficacy of M. oleifera spp. as natural coagulants especially by Muyibi et al., 2003; Ndabigengesere et al., 1998, and Okuda et al., 1999

Table-2 Parameters studied before and after treatment of water sample with various doses of M. oleifera seed powder.

S.No.	Parameters	Before treatment	After treatment with diff. conc.					WHO/USPH Standards
			1%	1.5%	2%	2.5%	3%	
1.	pH measurement	8.5±0.05	7±0.07	7±0.05	7±0.02	7±0.02	7±0.03	6.5-8.5
2.	Total hardness(mg/ml)	296±0.68	190±0.57	150±0.57	123±0.57	100±0.57	100±0.57	500
3.	TDS	360±0.57	300±0.27	250±0.57	200±0.57	200±0.05	159±0.02	500
4.	Turbidity (NTU)	25 ±0.02	10±0.05	8±0.03	8±0.02	3±0.01	3±0.05	5
5.	MPN/100ml	1600±0.57	152 ±1.13	102±0.12	52±0.12	20±0.02	10±0.05	Nil
6.	On EMP Plate/1ml	205 ±5	100 ±2	52±3	23±3	13±2	4±1	Nil
7.	On S.S. agar Plate/1ml	231 ±2	102±1	62±3	21±2	10±3	5±1	Nil

Table-3 Parameters studied before and after treatment of water sample with various doses of deoiled M. oleifera seed powder.

S.No.	Parameters	Before treatment	After treatment with different concentration					WHO/USPH Standards
			1%	1.5%	2%	2.5%	3%	
1.	pH measurement	8.5±0.05	7±0.01	7±0.01	7±0.02	7±0.00	7±0.00	6.5-8.5
2.	Total hardness(mg/ml)	296±0.68	180±0.57	140±0.57	113±0.57	100±0.57	90±0.57	500
3.	TDS	360±0.57	200±0.24	220±0.17	200±0.15	170±0.04	129±0.02	500
4.	Turbidity (NTU)	25 ±0.02	8±0.05	7±0.03	7±0.01	3±0.02	2±0.01	5
5.	MPN/100ml	1600±0.57	120 ±1.11	92±0.00	45±0.01	12±0.02	4±0.05	Nil
6.	On EMP Plate/1ml	205 ±5	81±2	62±1	13±1	10±2	2±1	Nil
7.	On S.S. agar Plate /1ml	231 ±2	85±1	53±3	13±2	9±3	1±1	Nil

CUNCLUSION

The present study carried out in the M.oleifera seed as a natural coagulant to remove the turbidity of water and inhibits the growth of water borne pathogens. The seed was taken with oil and deoiled powder to treat the waste water among the treatment the deoiled powder has more effective to re-

move the turbidity. The removal of oil reduces the organic matter content of the water thus making water more suitable for drinking.

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