"A NOTE ON NATURAL ADSORBANT (MORINGA OLEIFERA) AS ANTIMICROBIAL AGENT IN WATER PURIFICATION"

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Abstract

The efficacy of Moringa Oleifera on water purification, especially, antimicrobial activity was studied in this paper by adding different concentrations to turbid water sample. Microbe reduction in water is achievable using Moringa Oleifera even when the coagulation process is slow but proper Moringa Oleifera Seed dosage along with disinfectant like chlorine will produce better results.

Keywords: *MoringaOleifera, Alum, Antimicrobial efficiency, Raw water purification, Dosage, Coagulation.*

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1. INTRODUCTION

Water is one of the fundamental requirements of life and any undesired addition of unwanted materials leads to contamination and makes it unfit for human usage. Presently there are no appropriate low cost methods for removal of water contaminants. In rural areas like study area, people live in extreme poverty are drinking highly turbid and microbiologically contaminated water, due to limited clean and safe water sources.

The coagulant activity of MoringaOleifera Seeds is widely known and applied in water treatment at house level in rural areas[2]. However, there are constraints in the use of chemical coagulants (alum) such as, scarcity of foreign currency for importation and inadequate supply of chemicals. Although alum is most commonly used coagulant in developing countries, its presence in drinking water develops some neurological diseases. Hence, there is a need to develop and to meet cost effective and also environmentally friendly coagulants like MoringaOleifera[9].

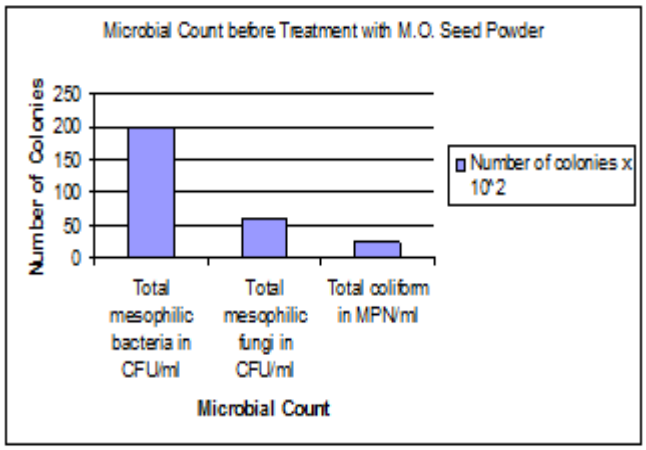
MoringaOleifera is most widely cultivated species of a monogeneric family native tree of Sub-Himalayan parts of North West India, Pakistan and Afghanistan. Earlier studies have found MoringaOleifera to be non-toxic and recommended it for the use as a coagulant[4]. In this a preliminary study was done, to check the efficiency of MoringaOliefera as Antimicrobial agent for the water of this study area.

2. MATERIALS AND METHODS

MoringaOleifera seed powder were obtained from Tekkali residential area, A.P., India. The seed coats were removed to get the kernels. The kernels were dried and ground to powder. Different concentrations of Moringa Seed solutions were made by diluting 1gr, 1.5 gr and 2 gr of the Moringa Seed Powder into 100ml of distilled water to obtain 1%, 1.5% and 2% concentrations of the solutions. The solutions were shaken properly for 1 minute to extract and activate the antimicrobial properties in the seed powder. Each of the concentrations was poured into one litre of water sample and stirred for 2 minutes. After undisturbed for 6 hours, 100ml was taken for the use of analysis. For comparison sake alum coagulant was prepared by adding 1gr. of alum in 100ml. of distilled water and shake for 60 seconds. The solution was then added to 1 litre of the water sample. The microbial analysis was performed to check the microbiological quality of water samples. These tests analyses total mesophilic bacteria count, total mesophilic fungal count and total coliform bacterial before and after treatment with MoringaOleifera into the water sample.

Table-1*:* Microbial analysis of the water sample before treatment with M.O**.**

Sl.No.	Microbial counts	Number of colonies
1	Total mesophilic bacteria	200 x 10^2 CFU/ml
2	Total mesophilic fungi	60 x 10^2 CFU/ml
3	Total coliform	25 x 10^2 MPN/ml

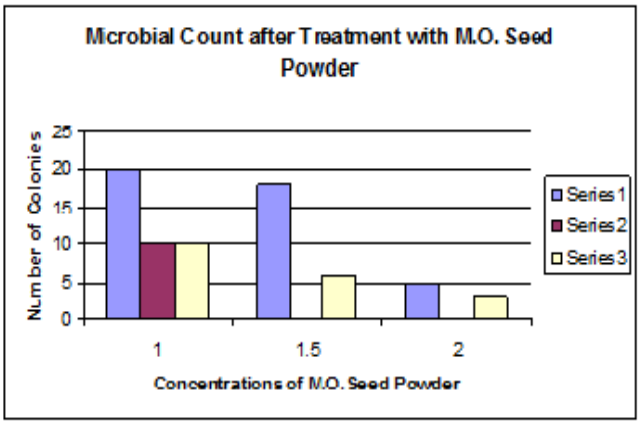


Graph-1: Microbial Count before Treatment with M.O.Seed Powder

Table-2: Microbial analysis of the water sample after treatment with M.O. seed solution at different concentrations

Sl. No.	Concentration of MoringaOleifera Seeds in %	Total Mesophilic bacteria in CFU/ml	Total mesophilic fungi in CFU/ml	Total coliform in MPN/ml
1	1.0	20 x 10^2	10 x 10^2	10 x 10^2
2	1.5	18 x 10^2	No growth	06 x 10^2
3	2.0	05 x 10^2	No growth	03 x 10^2

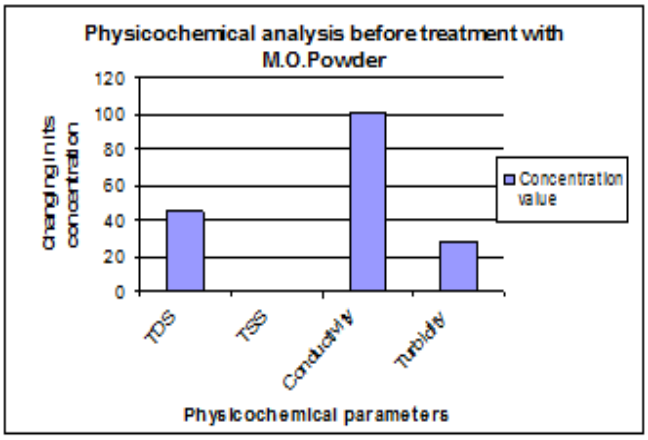
Series 1: Total MesophilicBateria in CFU/ml.
Series 2: Total Mesophilic Fungi in CFU/ml.
Series 3: Total coliform in MPN/ml.



Graph-2: Microbial Count after Treatment with M.O.Seed Powder

Table-3: Physicochemical analysis of the water sample before treatment with M.O.

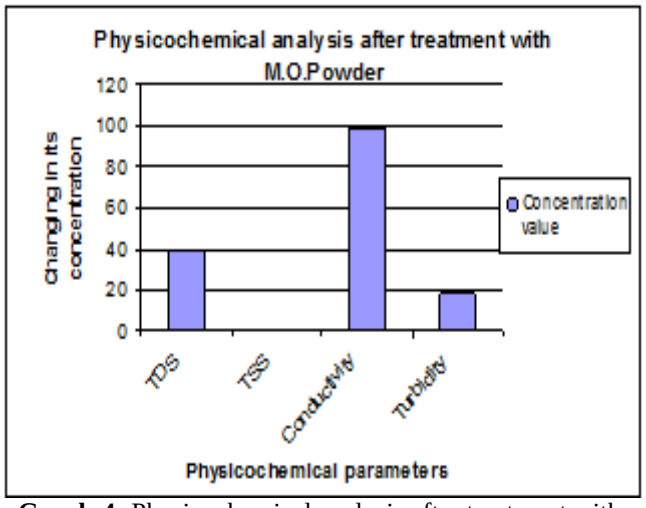
Sl.No.	Physicochemical parameters	Concentration value
1	TDS (Total Dissolved Salts)	45 ppm
2	TSS (Total suspended solids)	0.7 gr./ml
3	Conductivity	100.2 □ s
4	Turbidity	28 NTU



Graph-3*:* Physicochemical analysis before treatment With M.O.Powder

Table-4: Physicochemical analysis of the water sample after treatment with M.O. and alum

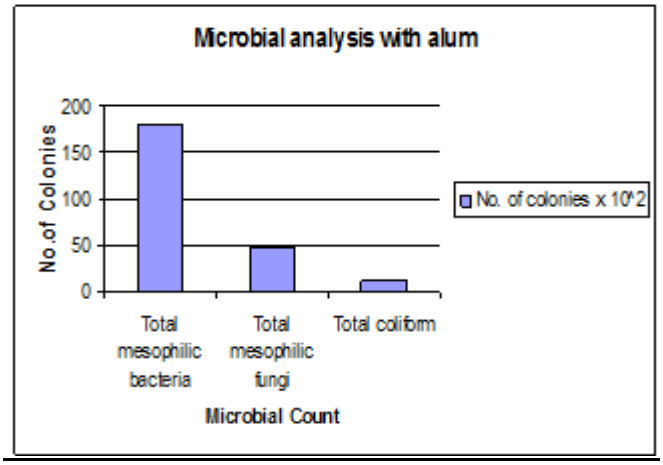
Sl. No	Physicochemical parameters	Concentration value	
		Moringa Oleifera	Alum
1	TDS (Total Dissolved Salts)	40 ppm	--
2	TSS (Total suspended solids)	0.2 gr/ml	--
3	Conductivity	98.2 □ s	--
4	Turbidity	18 NTU	7 NTU



Graph-4: Physicochemical analysis after treatment with M.O. Powder

Table-5*:* Microbial assessment of the sample with 1% by weight concentration of alum as a coagulant.

Sl.No.	Microbial count	No. of colonies
1	Total mesophilic bacteria	180 x 10^2
2	Total mesophilic fungi	47x 10^2
3	Total coliform	13 x 10^2



Graph-5: Microbial analysis with alum

3. RESULTS

The microbial assessment of raw water sample before treatment indicated that the water sample contains 200 x 10^2 CFU/ml of mesophilic bacteria, 60 x 10^2 CFU/ml of mesophilic fungi and 25 x 10^2 MPN/ml of Coliform bacteria (Table-1). The physicochemical analysis shows that the water sample has TDS of 45 ppm, TSS of 0.7 gr./ml, Conductivity of 100.2 □ s and turbidity of 28NTU, as indicated in Table-3.The above observations have been shown graphically in Graph-1 and Graph-3 respectively.

Table-2 depicts the results for microbial analysis of water sample with MoringaOleifera at different concentrations. The data indicates that the microbial load in the water sample reduced considerably as the concentrations are increased from 1 to 2%[1][3]. Table-5 gives microbial assessment of the sample with 1% by weight of alum.

The results of physicochemical analysis of water sample after treatment with 1% (1gr/100ml) by weight concentration of MoringaOleifera and alum solution indicates that the turbidity is reduced to 18 NTU and 7 NTU respectively[1][3](Table-4), but no significant changes in other parameters. This may be because of floc formation size, when MoringaOleifera was added, its seed coagulant proteins were tiny and light thus settled so slowly whereas the flocs formed by the alum coagulant were large enough and sedimentation rate was higher and faster[6].

4. DISCUSSIONS

The data obtained from microbial analysis of water sample before treatment with Moringa Seed solution (Table-1) indicates that the total mesophilic bacteria and total mesophilic fungi concentrations are as high as 200 x 10^2 CFU/ml and 60x10^2 CFU/ml respectively. The total fecal coliform bacteria were found to be 25x10^2 MPN/ml, suggesting the presence of pathogens in the water samples. This data thus indicate how unsafe the raw water is for human consumption as it could cause gastrointestinal diseases. The presence of mesophilic fungi in the water supports this.

However, treatment of water with MoringaOleifera seed solutions at different concentrations reduces in microbial counts in water (Table-2)[6]. The observations have been shown graphically in Graph No.2.

At 1% (1gr/100ml) concentration of the Moringa Solution, total mesophilic bacteria, total mesophilic fungi and total coliform bacteria count were reduced to 20x10^2 CFU/ml, 10x10^2 CFU/ml, 10x10^2 MPN/ml.At 1.5% (1.5gr/100ml) Moringa concentration, total mesophilic bacteria and total coliform bacteria count were reduced to 18x10^2 CFU/ml, and 6x10^2 MPN/ml respectively, where total mesophilic fungi showed no growth. At 2% concentrations of the Moringa solution, total mesophilic bacteria and total coliform bacterial count were reduced to 5x10^2CFU/ml, and 3x10^2 MPN/ml respectively where total mesophilic fungi showed no growth. Also coagulating the solid matter in water will also removes a good portion.

The reduction observed in bacterial population of raw water treated with MoringaOleifera can be attributed to an antibacterial properties of the bio-active ingredients.

These encouraging findings support the recommendation of MoringaOleiferawhich is a cheap and easy alternative for purifying water, especially in remote areas of this study area.

MPN means total coliforms which are calculated quantitatively. The presence of coliforms indicates water is fecally contaminated and not safe for drinking purpose. Due to coliforms various water borne diseases occurred therefore MPN should be nil for drinking water and other purposes.

MPN during present study was observed beyond the limit of WHO standards [7]. After treatment, MPN/ml coliform was decreased as increased dose of M.O. Powder. MPN found in the range 10x10^2 MPN/ml - 3x10^2 MPN/ml to all samples after the treatment which indicates above the limits of WHO standards [7]. The presence of MPN gives direct proof of dangerous impurities in water and the treated samples are not safe for drinking purpose. Addition of another disinfectant like chlorine alongwith the seed powder which may give MPN zero.

5. CONCLUSIONS

This study successfully revealed that MoringaOleifera possess antimicrobial properties against mesophilic bacteria, mesophilicfungi. These extracts could be promising antimicrobial agents with potential applications in controlling bacteria which causes diseases. M.Oleifera can be cultivated very cheaply at household levels which is to be encouraged among rural populations. The MPN test had shown positive which indicates fecal contamination. Higher doses of Moringa Oleifera alongwith another disinfectant like chlorine may give best results and the water may be used for drinking purpose. Moringa Oleifera seed is not giving toxic effect. It is ecofriendly and cheaper method of water treatment. Moringa seeds can be used in rural areas where no facilities are available for drinking water

treatment. After treatment, the sludge settled at the bottom of tank, can be used as bio-fertilizers.

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