International Journal of Advance Research in Science and Engineering
Volume No.07, Issue No.02, February 2018
www.ijarse.com
IJARSE
ISSN: 2319-8354

Water Purification Using Moringa Oleifera (Drumstick) seed powder As A Natural Coagulant

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ABSTRACT

The high cost of treated water makes most people in the rural communities to resort to readily available water sources which are normally of low quality exposing them to waterborne diseases. The present study was carried out to confirm the effectiveness of seed powder extracted from mature-dried Moringa Oleifera seeds which are commonly available in most rural communities. The main objective of this work is to evaluate the antimicrobial activity and efficiency of a natural absorbent from Moringa Oleifera seeds in treating river water.

During this study, surface water samples were collected for treatment by Moringa seeds in powdered form, resulting in an effective natural clarification agent for highly turbid and untreated pathogenic water. Various doses of Moringa seed powder viz. 50, 100 and 150 mg/l were taken and checked for the efficiency dose on raw water. After treatment of seed powder with water samples were analyzed for different parameter like pH, Turbidity, TDS, TS, Hardness, Jar test, Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD) . All parameters were reduced with increasing dose of 50, 100 and 150 mg/l seed powder respectively (except alkalinity and pH). Application of this low cost Moringa Oleifera seeds is recommended for eco-friendly, nontoxic, simplified water treatment where rural and peri-urban people living in extreme poverty.

KEYWORDS*:-*Moringa oleifera, water treatment, natural coagulant, river water,alternatives, Turbidity

I. INTRODUCTION

Water supply is a basic need required for living creatures and human being specifically. In this world the amount of resources available to living creatures are limited. About 75% of the present world population lives in the developing countries of the world. About 1.2 billion people still lack safe drinking water and more than 6 million children die from diarrhea in developing countries every year.

However, it is untenable and unbelievable under all situations that waterborne diseases still kill on the average 25,000 people every day in developing countries while millions suffer the debilitating effects of these diseases.

Safe drinking water is essential to the health and welfare of a community, and water from all sources must have some form of purification before consumption. Various methods are used to make water safe and attractive to the consumer. The method employed depends on the character of the raw water. One of the problems with treatment of surface water is the large seasonal variation in turbidity.

Current operational procedures at many treatment works in developing countries are based on arbitrary guidelines, particularly in relation to the dosage of chemicals. Besides that, there is also the problem of inadequate number of skilled workers and inadequate laboratory facilities to monitor process performances required to operate the plants.Coagulation-flocculation followed by sedimentation, filtration and disinfection, often by chlorine, is used worldwide in the water treatment industry before distribution of treated water to consumers.

Many coagulants are widely used in conventional water treatment processes for potable water production. These coagulants can be classified into inorganic coagulant, synthetic organic polymer, and naturally occurring coagulant. Synthetic polyelectrolytes are used as primary coagulant as well as coagulant aid to improve the strength of particle aggregates, enhance coagulation and deposition (filtration).Naturally occurring coagulants are usually presumed safe for human health while there is a fear by using aluminum salts that may induce Alzheimer's disease. Some studies on natural coagulants have been carried out and various natural coagulants were produced or extracted from microorganisms, animals or plants.Recently, however, there has been a resurgence of interest in natural coagulants for water treatment in developing countries.

Moringa oleifera is one of the most wide spread plant species that grows quickly at low altitudes in the whole tropical belt, including arid zones. It can grow on mediumsoils having relatively low humidity.Later, many researchers have reported on the various uses of Moringa oleifera seeds as coagulant and coagulant aid in the last 20 years. Moringa oleifera coagulant has been found to have high coagulation activity only for high turbidity water. The activity is low for low turbid water. Therefore, it is important to improve the characteristics of this plant by identifying its bioactive constituents, which has high coagulation activity. This is one of the objectives of this study.

II.RELATED WORK

2.1Waste Water

The waste water was collected from Nasardi river which is flow through Nashik district Maharashtra.The type of sampling adopted in this study was grab sampling, consists of a single sample taken at a specific time. Samples were collected in the plastic cans and the characterization of surface water samples were conducted immediately after the sample arrived to laboratory. Care was taken not to introduce errors during sampling and storage, where contamination results from improperly cleaned sampling devices and sample containers

2.2Methods of purification of water

By using chemical coagulants

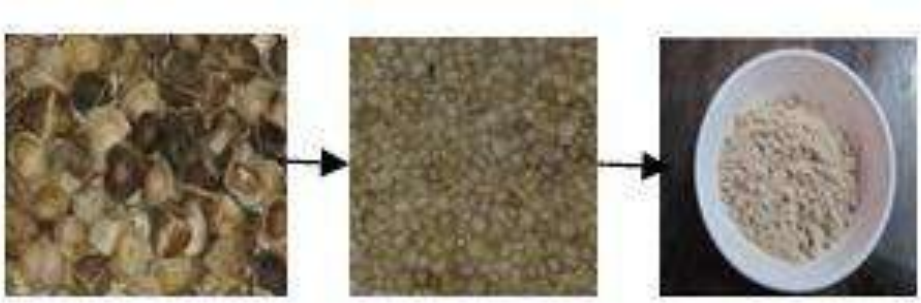
- Aluminum sulfate
- Aluminum chloride
- Sodium aluminate

By using Natural coagulants

- Neem
- Moringa Oleifera seeds
- Aloevera

2.3Moringa Oleifera seeds powder-Natural coagulant

Naturally occurring coagulants are usually presumed safe for human health. Some studies on natural coagulants have been carried out and various natural coagulants were produced or extracted from microorganisms, animals or plants. One of these alternatives is Moringa oleifera seeds. It is a native tree of the sub-Himalayan parts of North-west India, Pakistan and Afghanistan. Earlier studies have found Moringa to be non-toxic, and recommended it to use as a coagulant in developing countries. The use of Moringa has an added advantage over the chemical treatment of water because it is biological and has been reported as edible. According to Muyibi and Evison, 1994, hardness removal efficiency of Moringa oleifera was found to increase with increasing dosage. M. oleifera seeds act as a natural absorbent and antimicrobial agent as their seeds contain 1% active polyelectrolyte's that neutralize the negatively charged colloid in the dirty water. These seeds are also act as antimicrobial agent against variety range of bacteria and fungi.



Preparation of Moringa Oleifera seed powder

Physical and chemical methods of analyzing the surface water

Physical Tests

Sr. No.	Parameters	Method
1	pH	pH Meter
2	Turbidity	Nephelometer
3	TSS	Evaporation
4	TDS	Evaporation
5	Colour	-

Chemical Tests

Sr. No.	Parameters	Method
1	Total Hardness	Titration
2	BOD	-
3	COD	-

III.COAGULATION TEST

Jar test is most widely used experimental methods for coagulation-flocculation. A conventional jar test apparatus will be used in experiments to coagulate sample of water using MO. It will be carried out as a batch test; the jar test apparatus involves the use of stirring device. The stirrer consists of six paddles those which are capable of rotation with the different speed. In this method six beakers of 1 liter capacity are placed, which were dosed with different amount of coagulant and run the apparatus for 45 minutes at a speed of 110 rpm then the stirred sample allowed settle floc for 1-2 hours depending on the floc size formed then the supernatant was taken to analyzed. Before operating jar test, sample is mixed homogenously, then analyze for the initial concentration of the parameters such as pH, turbidity, suspended solids, dissolved solids, total solids, hardness. Then samples are tested for desirable parameters after the jar test, then the results are plotted on graphs.

SCHEMATIC VIEW OF CONVENTIONAL JAR TEST APPARATUS

IV.CONCLUSION

Moringa oleifera was proven to be able to be used for textile wastewater treatment and purification of groundwater. Moringa oleifera can be used in the coagulation process because it has properties as a natural coagulant. Our result suggested that Moringa oleifera is effective at the concentration of 100 to 150 mg/L as a coagulant to treat wastewater from textile industry and ground water. Moringa oleifera optimum coagulant dose is also influenced by the initial state of the sample to be coagulated. The heavier the burden of pollution, the higher the optimum dose that is needed.

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