

Use of Herbal Mixture of *Moringa oleifera* Seed, *Ocimum tenuiflorum* and *Azadirachta indica* in Wastewater Treatment

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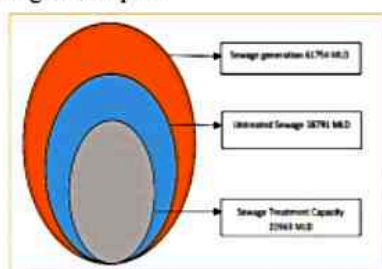
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Abstract: India has been investing in wastewater treatment since 2004. under the Swachh Bharat Abhiyan since 2014, a number of private corporations are taking increased interest in the sector of sanitation and wastewater recycling. As water quality testing is an important part of environmental monitoring and its recycling is a strong need of time. As per previous data available, *Moringa oleifera* seed powder can be used for water purification, we have tried to prepare the Herbal solution of *Moringa oleifera* seed extract, *Neem* extract and *Tulsi* extract for water purification in domestic level. Prepared herbal mixture then used in treatment of sewage water to get clean water so that it can be use in other domestic purpose..

Keywords: Wastewater Treatment

I. INTRODUCTION

As per previous study today's fresh water is a scarce resource. Human requires fresh water and fresh water is one of the most important substances on the Earth but today knowingly unknowingly we ignore its important fact. It is a renewable resource and it is steadily decreasing. It is essential for human beings to enjoy healthy and safe lives, also important for social-economic sustainable development. Ecosystems are also in extricably linked with water. As per previous studies water quality is determine by physical properties include temperature and turbidity whereas chemical characteristics involve parameters such as pH and dissolved oxygen and biological indicators for water quality include algae and phytoplankton. When water quality is poor, it affects not only aquatic life but the surrounding ecosystem as well.¹ The presence of ions like calcium (Ca^{+2}) and magnesium (Mg^{+2}) which on reaction with the cleaning action of soap, forms hard sulfate and soft carbonate.² So we need softened this hard water thorough removing these ions. The softening process often substitutes sodium cations,³ since health problems is associated with excess sodium and with calcium and magnesium deficiencies also Softening decreases nutrition level.⁴ Hence there is no mean to use artificial ways of water recycling. Various industries' wastes and effluents pollutes the sewage water and receiving water bodies.⁵ So therefore, we need more studies towards recycling water in natural ways. The Central Pollution Control Board (CPCB) calculated that by 2030, India's water requirements are expected to increase up to 1.5 trillion cubic metres. Lack of proper infrastructure, resources and awareness regarding to wastewater recycling in India has leads over utilization of India's water resources. so, there is a need to be go toward domestic water conservation and waste water recycling techniques.



National status of waste water generation & treatment⁶, as per the data of year 2019, from ENVIS Centre on Hygiene, Sanitation, Sewage Treatment Systems and Technology the status of sewage water treatment and its re-use is shown in below image.

Maharashtra state generates 8143 MLD of sewage from urban areas, from that 5160.36 MLD of sewage is treated and recycled for the other uses Water pollution is a serious problem for the entire world. Water pollution has contributed to negative environmental and human health impacts.

For overcome the need of water recycling through natural ways we used the powdered seed of the *M. oleifera* which has coagulating properties that have been used for various aspects of water treatment such as turbidity, alkalinity, total dissolved solids and hardness.

M. oleifera (MO) seed, which is not harmful to human and does not have significant drawbacks, has been applied for wastewater treatment. There is several disadvantages such as high cost and pH alteration have been reported by using chemical coagulant while the use of MO coagulant is biodegradable, non-toxic, non-corrosive and easy to use. These MO seed powder also help to remove dirt, solid particles and even some bacteria and fungi.

In present study we have prepared a herbal mixture of MO seeds, Tulsi (*Ocimum tenuiflorum*) and neem (*Azadirachta indica*) powder. Tulsi which is a wonderful herb has antibiotic, antifungal and antibacterial properties while Neem leaves eliminate the germs and reduce the acidity and salinity rates and will increase conductivity in wastewater which benefits the environment. Our study reveals that the MO seeds, Tulsi and neem mixture has effective in treating sewage water. The hardness of water is notified by determining the PH level of treated water. The conductance of the sewage water before and after treatment is also determined to confirm the purity. Our results may definitely beneficial for purifying waste water using homemade herbal mixture so that wasted water can be re-use in many domestic purposes.

II. METHODOLOGY

2.1 Preparation of Moringa Herbal Mixture

The MO seeds shells were removed manually; kernels were grounded in a domestic blender. The fresh Tulsi leaves were added with water and prepared paste in grinder while neem leaves were dried over 2-3 nights and then powdered in grinder, later it was soaked in water over night to get aqueous neem extract.

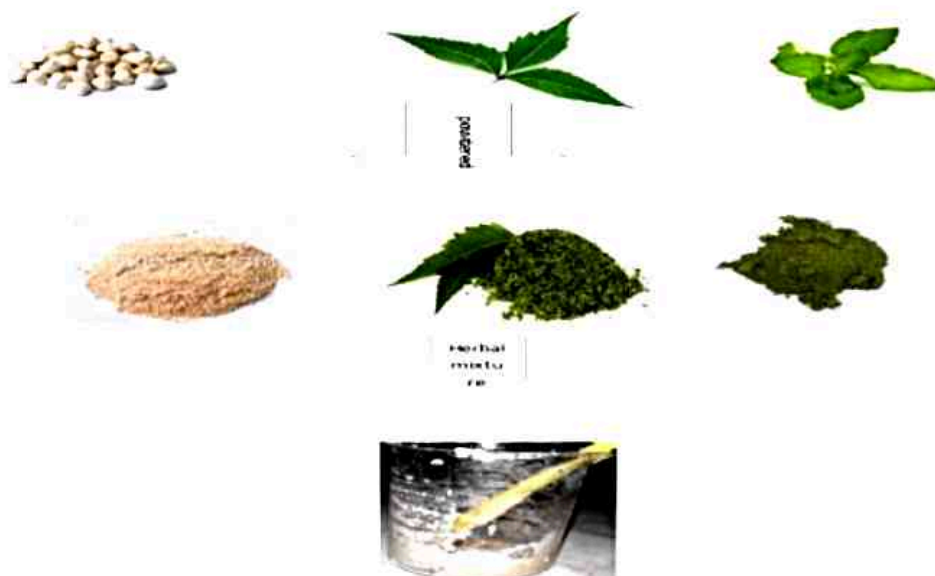


Fig.a- Shows preparation of herbal mixture

2.1 Sample Collection

The sewage water sample is collected from the gutter of domestic area. The sample is highly alkaline, having solid material, insects and micro-organisms.



Fig.b- Shows sewage water collection

Addition of Moringa Herbal mixture in sewage water-

Firstly, the sewage water sample are treated with MO seeds powder and then with the herbal mixture, after stirring for 5 minutes, the coagulation of solids were noted with in 10-15 minutes. Later the solids were settles down, after decantation the upper level water were then treated with tulsi and neem extract.

III. RESULTS AND DISCUSSION

1. When the sewage water is treated with only MO seed powder the solids part get coagulates and settles down at bottom of the container(as shown in image), the colour of the water samples clarifies the purity of sample water.
2. While the addition of moringa herbal mixture kills the harmful bacterias and fungi, and reduces the acidity of sample water upto 7.32 from 6.06 P^H and increases the conductivity 1.437 x 10⁻³ ms to 1.974 x 10⁻³ ms indicates the hardness of water is decreasing very well.



Fig.C- Shows effect of MO seed powder and its herbal mixture in sewage water

Later on we added the herbal mixture directly to the sewage water sample and filtered, the below picture shown the results clearly.

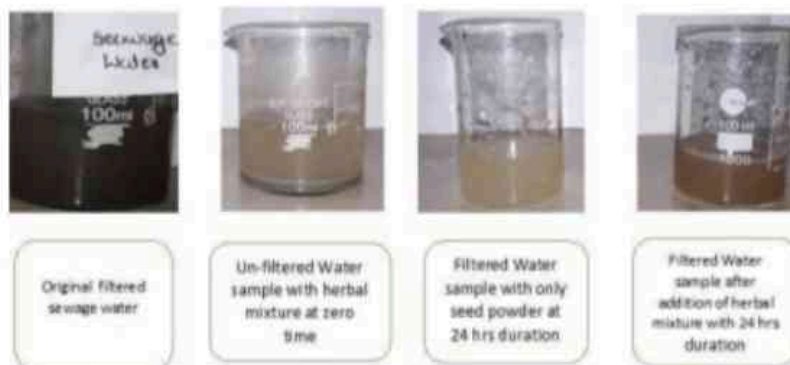


Fig.d- shows effect of direct addition of herbal mixture into sewage water

After 24 hours more percentage purity of water is increased, these results is clarified in below images-



After 24 hours the results for water purification using Moringa herbal mixture



After 24 hours more water is purified

Fig.e- shows effect of herbal mixture on sewage water after 24 hours.

Applications and Conclusion:

1. The prepared moringa herbal mixture is effective in purification of water with increasing time duration.
2. This home-made herbal mixture is effective in decreasing water hardness as well as acidity.
3. This herbal mixture is can be prepared commercially or domestically to purify sewage water and can be apply in recycling of waste water.
4. With some more improvements it can be useful in moringa gel form so that it can be store for a long-time use.
5. It can give results even at very low concentration that is 1gm herbal mixture is sufficient for 10 litres of sewage water.

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