

“Experimental investigation on effectiveness of natural herbal coagulant and other low cost filter materials in the development of water filters for rural and urban areas situated in Dharwad”

¹Sunil Umachagi, ²Muskan Kalasgeri, ³Muskaan Gadawale, ⁴Sushma S Kabbur, ⁵Sajeed Kagadagar

¹Assistant Professor, Department of Civil Engineering, Jain College of Engineering and Technology, Hubli, Karnataka.

^{2, 3, 4, 5} UG Students, Department of Civil Engineering, Jain College of Engineering and Technology, Hubli, Karnataka.

Abstract—The primary objective of this study is to identify the most appropriate herbal plants for the removal of contaminants from water and also to develop a water treatment kit at an affordable cost for rural folk. Nearly 3 herbs namely Neem, Moringa tamarind were chosen for this study. The effectiveness of these herbs in the removal of Chemical Oxygen Demand (COD), Total dissolved solids (TDS) and Biological oxygen Demand (BOD) has been investigated using locally available domestic wastewater. The results obtained from this study satisfy the drinking water standards prescribed by World Health Organization (WHO). Based on the laboratory experiments we have observed and concluded that, The decrease in COD level after using Neem+Tamarind as a coagulant the initial COD of wastewater was 310 mg/lit which later reduced to 40 mg/lit for the dose of 50 grams.87% of COD has been removed The decrease in BOD level after using Neem+Tamarind as a coagulant the initial BOD of wastewater was 180 mg/lit which later reduced to 20 mg/lit for the dose of 50 grams.88% of BOD has been removed.

Index Terms—Natural Herbs, Coagulants, Rapid Gravity Sand filter, Treatment of domestic wastewater .

1. INTRODUCTION:

Water is an important compound which plays many roles. It gives life to plants and animals. It is universal solvent used in many of the reactions. It regulates the temperature. Due to less rain fall and increased population, we are experiencing the scarcity of water. Also human activities are polluting the water. Water is getting polluted not only chemically but also biologically. It is very important to remove harmful microorganisms as they affect the human physiology. various methods such as ultraviolet treatment, chlorine, chlorine dioxide and ozone treatment are used for water purification. Chlorine is most widely used. Drinking water is a vital resource for all human beings, and the access to safe and clean drinking water is a major concern throughout the world (who). when surface water is used as raw water the removal of organic and inorganic material from raw water is essential before it can be supplied to human for consumption. this is being carried out by chemical coagulation. in developing countries like india, this system is inappropriate because of the expensive and low and non-availability of chemical coagulants. water treatment plant through natural filters means treating of water through natural materials like herbs, aquatic plants, sand, charcoal, pebbles, gravel, seashells, oysters, coconut etc. its main purpose is to produce water fit for a specific purpose. Neem leaves It indicates that the use of the neem leaves in the water contributes to protecting the environment from contaminants that can harm the environment . For example; farmers use volatile chlorine in water treatment . It may hurt plants and humans themselves if they do not follow same precautions . Moringa seeds It involves use of moringa seed powder as a natural coagulant and flocculent to clarify turbid water and copper as an antibacterial agent to destroy pathogens like e.coli to produce clean drinking water. allow the moringa seed pods to dry naturally on the tree before harvesting them. Remove the seed husks, leaving a whitish kernel. crush the seed kernels to a powder with a stone or mortar. mix the powder with a small quantity of clean water in a small cup. Tamarind seed kernel powder: Tamarind seed kernel powder, discarded as agricultural waste, is an effective agent to make turbid municipal and industrial wastewater clear. The present practice is to use aluminium salt to treat such water. It has been found that alum increases toxic metals and ions in treated water and could cause diseases like the Alzheimer's. Kernel powder, compared to alum, is not-toxic and biodegradable. Neem and Tamarind seed is an organic material that has proven effectiveness in treating water and successfully adopted for use in developing countries.

The primary objective of this study is to

1. To provide safe and clean drinking water
2. To collect locally available natural herbs from nearby places.
3. To develop low cost natural coagulant using natural herbs.
4. To find out optimum dose of coagulant.
5. To find out maximum BOD and COD removal efficiency.

2. MATERIALS AND METHODOLOGY:

Materials:

Materials for fabrication of water filter: 1. Water storage tank 2. PVC and rubber pipes 3. wire mesh 4. Cotton Materials for preparation of Herbal Coagulant: Different types of herbs like Neem, Moringa, Tamarind seeds etc.

Methodology:

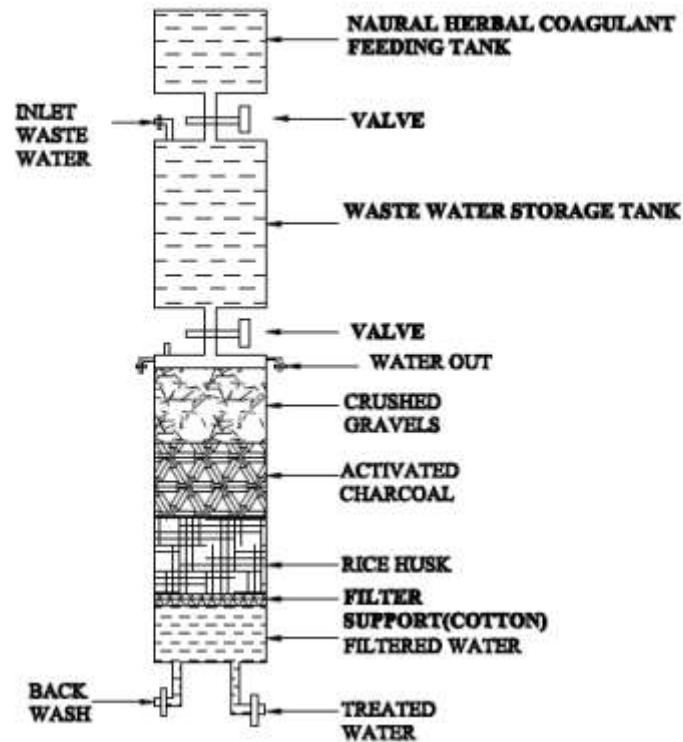


Fig:Water filetr cross view

Procedure:

1. Collection of water and waste water from different locations situated in dharwad district.
2. Collection of suitable herbs from nearby places situated in dharwad district.
3. Preparation of coagulant from natural herbs.
4. Fabrication of lowcost ecofriendly portable water filters using locally available lowcost materials.
5. Application of different dose of coagulant to prefabricated filter to check the water quality and optimum dose of coagulant.
6. During study period important controlling parameter like ph fluoride,acidity,alkalinity,chloride, hardness, cod,bod andotherparameters will be analyzed.



Fig:Coagulant Feeding tank cum filter

3.RESULTS AND DISCUSSION:

In this Research work we have prepared 8 Natural coagulants namely Neem, Moringa, Tamarind, Neem+Moringa, Neem+Tamarind, Moringa+Tamarind, Moringa+Neem, Neem+Tamarind+Moringa. Out of those **Neem+Tamarind** coagulant gives best results after filtration process, The Results and discussion are as below:

Table no1.Coagulant Dosage for COD removal:

Sl.no	Coagulant	Dose (g)	COD
1	Neem+Tamarind	10	300
2		20	240
3		30	160
4		40	100
5		50	40

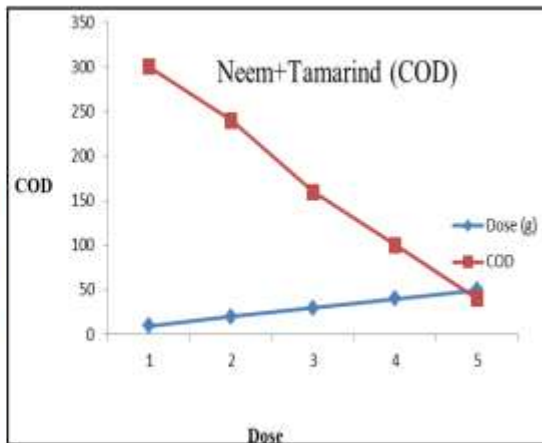


Fig:COD Removal in mg/lit with different dose of Neem+Tamarind and filtration

The above graph shows the reduction in COD level with increasing in the dosage of Neem and Tamarind coagulant. The coagulant prepared using neem and tamarind was good and effectively worked in removing COD level of domestic wastewater after the treatment using rapid gravity filter. About 87% COD has been reduced.

Table no2.Coagulant Dosage for BOD removal:

Sl.no	Coagulant	Dose (g)	BOD
1	Neem+tamarind	10	150
2		20	120
3		30	80
4		40	50
5		50	20

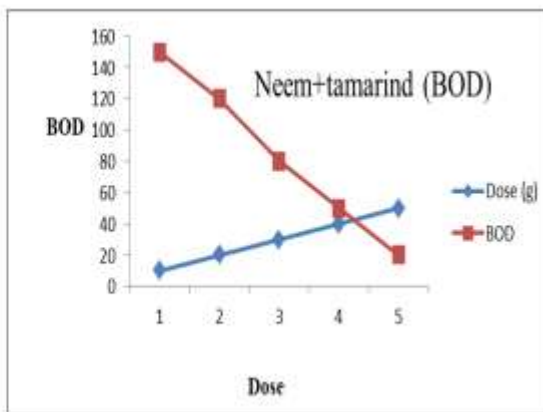


Fig: Fig:BOD Removal in mg/lit with different dose of Neem+Tamarind and filtration

The above graph shows the reduction in BOD level with increasing in the dosage of Neem and Tamarind coagulant. The coagulant prepared using neem and tamarind was good and effectively worked in removing COD level of domestic wastewater after the treatment using rapid gravity filter. About 88% has been reduced.

4. CONCLUSIONS:

Based on the laboratory experiments we have observed and concluded that, The decrease in COD level after using Neem+Tamarind as a coagulant the initial COD of wastewater was 310 mg/lit which later reduced to 40 mg/lit for the dose of 50 grams.87% of COD has been removed. The decrease in BOD level after using Neem+Tamarind as a coagulant the initial BOD of wastewater was 180 mg/lit which later reduced to 20 mg/lit for the dose of 50 grams.88% of BOD has been removed.

References:

1. Francis Kweku Amagloh, Amos Benang (2009). Effectiveness of Moringa oleifera seed as coagulant for water purification. African Journal of Agricultural Research 4: 119-123
2. Rahul tripathi, imran ahmad (april 2016): removal of iron content from ground water by herbal techniques, international journal of emerging technologies in engineering research. 119-122.
3. Berger MR, Habs M, John SA, Schmah D (1984). Toxicological assessment of seeds from Moringa Oleifera and M.stenopetala two efficient primary coagulants for domestic water treatment of tropical water. East Afri. Med. J. Sept. 712-716
4. Robert L, Matthews, Michael R, Templeton, Sabtri K, Tripath, Kiran B, (2009). Disinfection of Waterborne Coliform Bacteria by Neem Oil.Environmental Engineering Science 26:1435-1441
5. Bhattacharjee et al. (2013): disinfection of drinking water in rural area using natural herbs, international journal of engineering research and development. 5, 07-10.
6. Apha (1998). Standard methods for the examination of water and wastewater. American public health association.20th edition.
7. R. Sowmeyan*, J. Santhosh and R. Latha ,Effectiveness of herbs in community water treatment, International Research Journal of Biochemistry and Bioinformatics (ISSN-2250-9941) Vol. 1(11) pp. 297-303, December 2011.