Bio- Derived Materials and Their Application in Water Purification

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***Abstract*— The scarcity of clean and safe drinking water is one of the major problems faced by humans nowadays. The study is focused on the filtration of domestic waste water. This filtration is done by preparing a different bed using different layers of powdered cactus, pine bark, sand and coarse aggregate. The use of pine bark enhances the purification by preventing microbial action and reducing turbidity. But the application of the pine bark increases the concentration of acidity. In order to reduce the acidity. Coarse aggregate is used as another layer. Finally, a sandy layer is provided as a supporting layer for powdered cactus. The thickness was fixed by the column study method. As per the column study, three different layers of filter bed were used in the current research. The maximum percentage reduction for turbidity, alkalinity, hardness, chloride, acidity, BOD_5 for f3 were obtained 56%, 13%, 43%, 85%, 58%, 84%. Respectively**

Keywords:- Cactus, Pine Bark, Efficiency, Coarse Aggregate.

I. INTRODUCTION

The growth of the global population, the increasing need of water for agriculture and the increasing urbanization put great pressure on the existing resource of freshwater and the finding of new resource of fresh water become necessary. An alternative source of water can be reuse waste water. Grey water is all waste water from a household, with the exception of toilet water, which is called black water, water from dishwashing, from kitchen sinks and from laundry machines constitute grey water and it account for 80% of the household waste water. Grey water can be reused in areas that do not require portable water such as irrigation and toilet flushing. The reuse of grey water reduces the pressure on fresh water resources and thereby pressure the environment and decrease the cost of water. grey water in this scenario is resource of water rather than wastewater. Unfortunately, grey water origins contain chemicals, bacteria and viruses. The reuse of raw grey water without a pre-treatment can have negative impacts on the soil. Can pollute the ground water. The surface and contribute to the transmission of diseases.

The high cost and the insufficiency of centralized waste water treatment plants mainly in low-income countries justify the choice of the onsite filtration system with local and inexpensive filter materials in this study, pine bark, powdered cactus, coarse aggregate and sand were used as filter media in column filters, some physical and chemical parameters of grey water that can have a negative environmental impact were measured before and after filtration with different materials and with different layer thickness.

The filtration efficiency depends on both the low rate of different filter material. Pine bark, cactus, coarse aggregate and sand were found to be better in reducing some of the chemical and biological parameters. The bark filters have an acidifying effect on the filtrated grey water. This study has contributed to the finding of methods to improve the quality of grey water for reuse. The study confirmed the possibility to improve the quality of grey water by filtration and showed that degree of the reduction depends on the filter material used and the characteristics of the microorganisms. Water purification using natural materials such as pine bark, cactus, sand and coarse aggregate can be affordable for all class people and it have some advantages over the most preferable water purifiers.

II. OBJECTIVES

- To investigate the treatment efficiency of cactus powder and pine bark.
- To evaluate the optimum dosage and effect in treating waste water.
- To improve the quality of municipal waste water by filtration.

III. MATERIALS AND METHODOLGY

MATERIALS

- Pine bark
- Cactus powder
- Sand
- Corse aggregate

A. Pine bark

Pine bark the reduction of turbidity is done. The bark originated from undefined mixture of fine bark is air dried and is sieved through 4.75, 2.35 and 1mm screens. The bark retained on 2.36 and 1mm screens was mixed in 3:2 ratio by weight. As the first layer from top, the pine bark was filled in the filter pipe at a thickness of 5cm. Pine bark chips

Pine bark

B. Cactus powder

Powdered cactus was used as the second layer. Cactus were sliced, dried grinded into a fine powder and sieved to a size of 600. It was filled in the filter pipe at a thickness of 3cm. cactus powder is helps in there duction BOD and turbidity. Cactus powder as shown in below figure

Cactus powder

C. Sand

Sand is bottom most layer act as supporting layer to other three layers which is passing through 4.75mm IS sieve, 2.36mm IS sieve and which retains on 1mm IS sieve is taken. Sand as shown in figure

Sand

D. Coarse aggregate

Coarse aggregate is the top layer of the filter media the size of the coarse aggregate various from to 4.75 to 5mm. laterite soil is used as coarse aggregate which helps in the reduction of acidity as shown in figure

Laterite soil

E. Methedology

- The water sample will be collected from sewage treatment plant. The various physio-chemical parameters such as pH, chloride, hardness, dissolved oxygen, bod, acidity alkalinity and turbidity were analysed
- In the research work pine bark powdered cactus, coarse aggregate and sand were used as filter media in column filters.

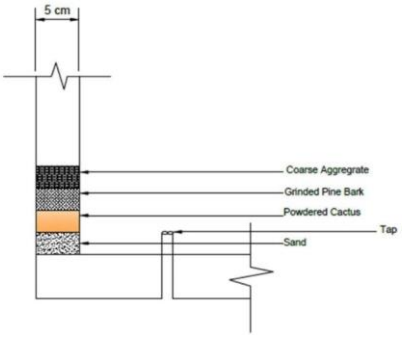
IV. PREPRATION OF FILTER METARIAL

The waste water filter is constructed in 4 layers. These layers are filled with 4 different materials. The materials are coarse aggregate, grinded pine bark powdered cactus and sand. The materials are added in order to remove various biological chemical and physical characteristic of waste water.

The filter is constructed using a 50mm PVC pipe. The top most layer is filled with the coarse aggregate (laterite). the application of coarse aggregate is more effective in removing acidity (Tesfaye Betela Bekalos (2017)). Pine bark is used as the second layer. By the addition of pine bark, the reduction of turbidity is achieved. The third layer is filled with powdered cactus. COD BOD and Turbidity can be reduced by the application of cactus. The bottom most layer is filled with sand, which act as a supporting layer for the top layers. The bottom most portion of the pipe is attached to a reduce with a sieve net. The flow rate is found out for three filter bed F1, F2 and F3. Study in three different filter media which gives better results taken in to consideration.

A. Three different layer filtration

Filtration 1 =3cm thickness of pine bark and 3cm of cactus powder
Filtration 2 =3cm thickness of pine bark and 5cm of cactus powder
Filtration 3 =5cm thickness of pine bark and 5cm of cactus powder



Schematic Diagram of Filter Colum

B. Physio-chemical parameters

The physio-chemical parameters of collected domestic waste water sample Sewage treatment plant as shown in table no. 1

Table no. 1

Parameters	Units	Raw waste water	F 1	F 2	F 3
Turbidity	NTU	9	7	6	4
Alkalinity	mg/l	172	160	158	150
Hardness	mg/l	612	515	390	350
Chloride	mg/l	85	67	46	38
D, O	mg/l	0.6	2.4	3.9	5.4
Acidity	mg/l	95	67	52	40
BOD5	mg/l	425	225	150	68
pH		7.5	7.1	6.8	6.5

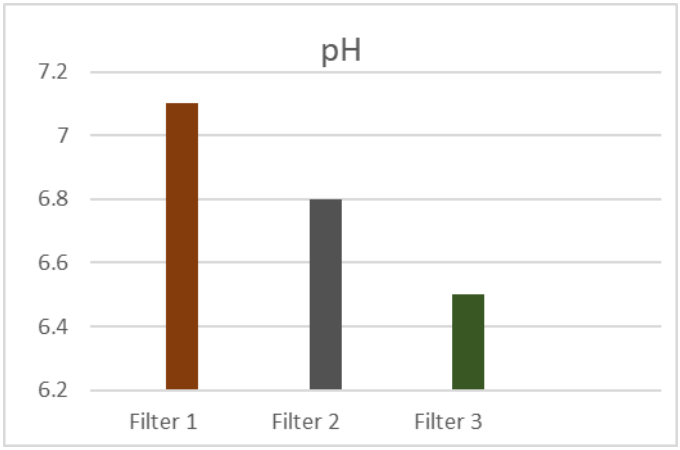
V. RESULT AND DISCUSSION

Treatment efficiency for the various filter units i.e., F1, F2 and F3 as shown in table no. 2

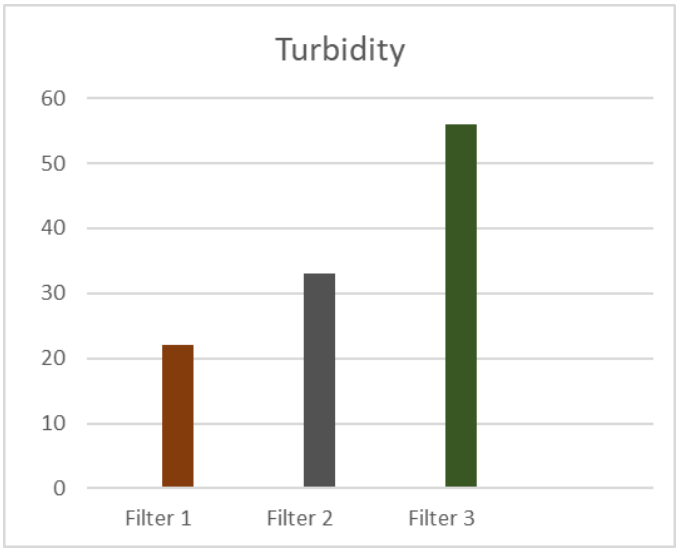
Table no 2

Parameters	Units	Raw water	F1	Efficiency (%)	F2	Efficiency (%)	F3	Efficiency (%)
Turbidity	NTU	9	7	22	6	33	4	56
Alkalinity	mg/l	172	160	7	158	8	150	13
Hardness	mg/l	612	515	16	390	36	350	43
Chloride	mg/l	85	67	21	46	46	38	55
Acidity	mg/l	95	67	29	52	45	40	58
BOD_5	mg/l	425	225	47	150	65	68	84

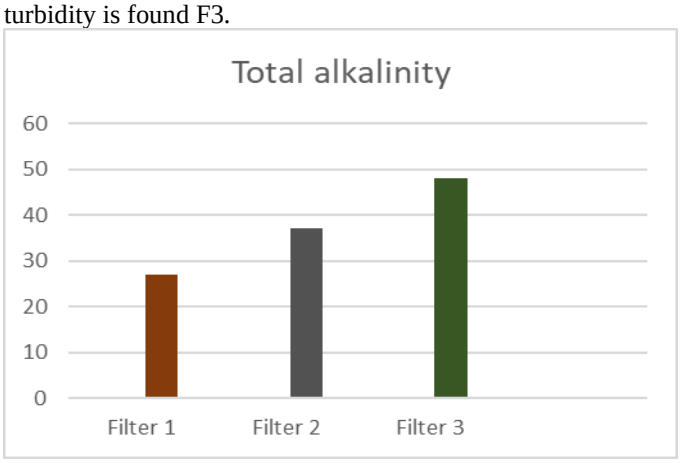
A. Bar charts



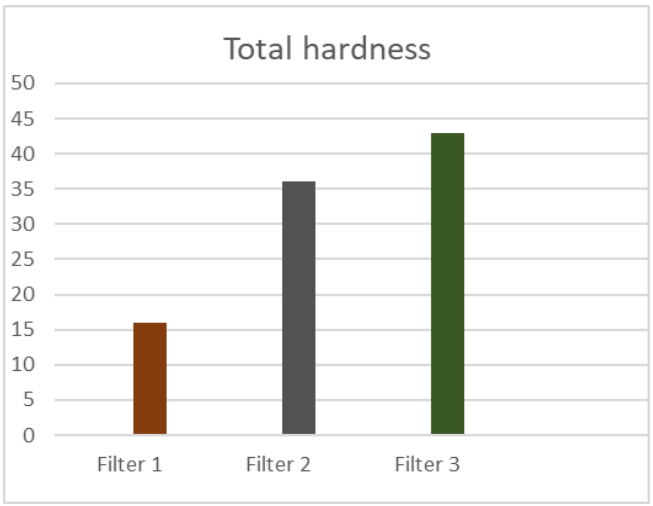
pH – The variation of pH value various with different filter bed F1, F2 and F3 found 7.1,6.8 and 6.5 respectively.



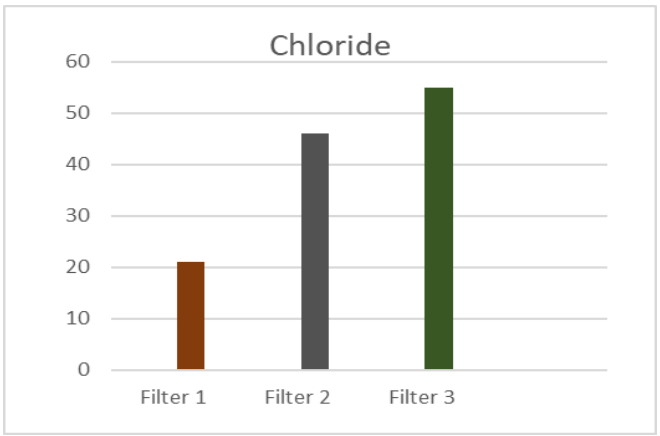
Turbidity is the measure of clarity of water. Lesser the value of turbidity more is the clarity of water. The combined efficiency of filter bed F1 F2 and F3 is obtained as 22%, 33%, and 56%. Pine bark and coarse aggregate (Laterite soil) materials are capable of reducing turbidity. The better removal efficiency in turbidity is found F3.



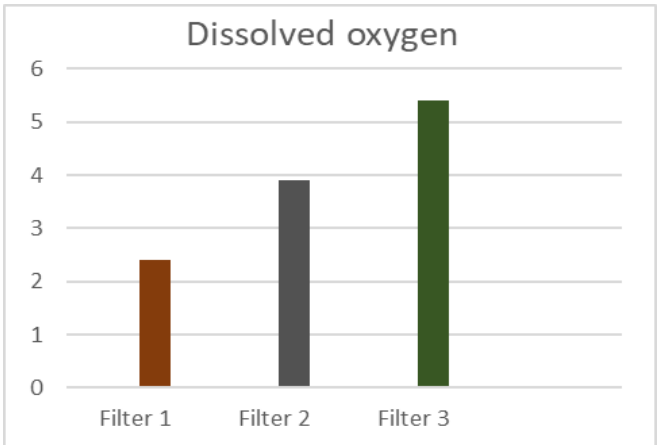
Alkalinity varies in different filter bed F1, F2, and F3 was found 27% 37% and 48%. The most effective filter bed in removal of Alkalinity is F3



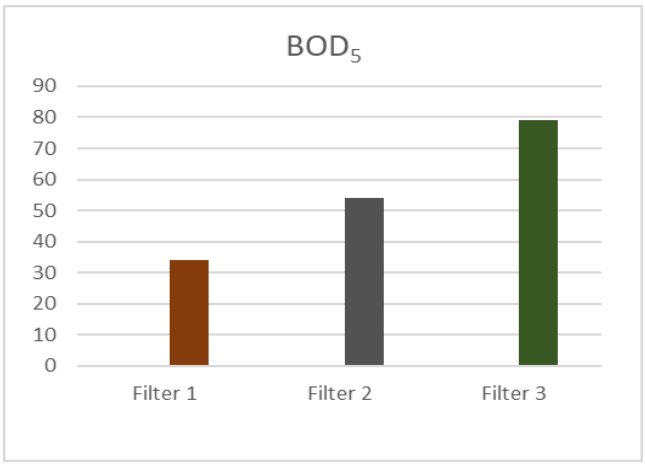
Hardness; Calcium and magnesium dissolved in water are the two most common minerals that make water "hard". The hardness was reduced when passed through fine powdered cactus. Variation of hardness in different bed F1 F2 and F3 found 16%, 36%, and 43% respectively. The most effective filter bed was F3.



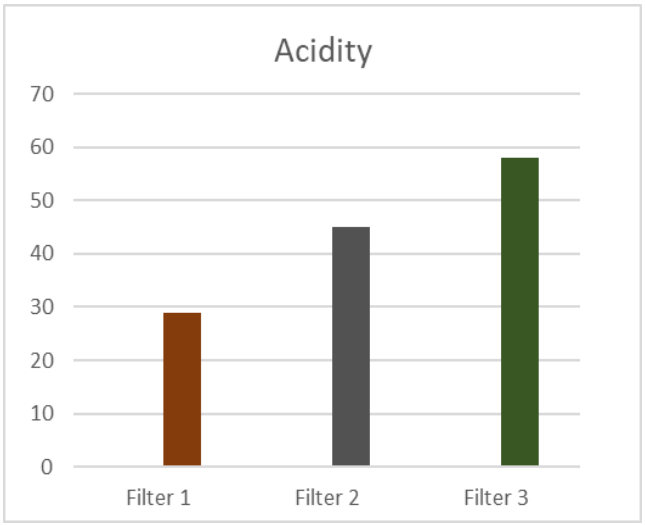
Chloride increases with different filter bed F1 F2 and F3 was found to be 21%, 46%, and 55% respectively. The most effective case was found to be F3



Dissolved oxygen increases with different filter bed F1 F2 and F3 was found to be 2.4mg/l, 3.9mg/l, and 5.4mg/l respectively. The most effective case was found to be F3



BOD$_5$ varies with different filter bed F1 F2 and F3 was found to be 34% 54% and 79% respectively. The most effective case removal of BOD5 was found to be F3



Acidity varies with different filter bed F1 F2 and F3 found to be 29% 45% and 58%respectively. The most effective filter bed was F3

CONCLUSION

1. Considerable reduction in BOD, Turbidity, Alkalinity, Acidity, Chloride, Hardness was achieved.
2. The removal efficiency of turbidity, alkalinity, hardness, BOD, Chloride and Acidity using was found to be 33%, 37% 36% 54% 46% and 45% is higher than the filter media F1 which was found to be 22%, 27%, 16% 34% 21% and 29% Respectively.
3. The removal efficiency of turbidity Alkalinity, Hardness, BOD, Chloride and Acidity using F3 was found to be 56% 48% 43% 79% 55% and 58% Respectively is higher than other than two filter media F1and F2.

4. The most effective filter medial was found to be F3 which is reduction BOD & Turbidity with the thickness of 5cm of pine bark, 5cm of cactus powder.
5. In the above study it can be concluded that as depth of filter medial increases the treatment efficiency increases.

REFRENCE

[I] Ahmadapur, A.; Do, D.D. 96/02594 - Characterization of modified activated carbons: Equilibra and dynamic studies. Fuel & Energy abstracts, Vol 37 (3),1996,184.

[II] Akbar Baghvand, Ali Daryabeigi Z and, Nasser Mehrdadi and AbdolrezaKarbassi, "Optimizing Coagulation Process for Low to High Turbidity Waters Using Aluminum and Iron Salts", American Journal of Environmental Sciences 6, 2010.

[III] Bhatnagar A, Sillanpaa M (2011) A review of emerging adsorbents for nitrate removal from water. Chem. Engin. J. 168:493-504.

[IV] Camachoa LM, Parrab RR, DengaSh (2011) Arsenic removal from groundwater by MnO2- modified natural clinoptilolite zeolite: Effects of pH and initial feed concentration. J.Hazard.Mater. 189:286–293.

[V] Farías T, Ruiz -Salvador AR, Velazco L, Charles de Ménorval L, Rivera A (2009) Preparation of natural zeolitic supports for potential biomedical applications. Mater.Chem.Phy.118:322-328.