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# Low-Cost Water Filtration Process

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**Abstract:** *Water purification has been a necessity since the beginning of civilization. Purification is necessary to reduce the risk of toxins from recharging runoff rain water and to avoid a variety of illnesses. In India, sand filters are often used to remove suspended and colloidal particles from water more quickly during the filtering process by laying down different sand beds. It's commonly used in industry to remove contaminants from water and waste water. The filtration process weakens at the start and end, lowering the filtrate's initial quality after back washing. However, scientists believe that the quality of water will deteriorate inthe near future as a result of major increases in global warming, and that we must address this issue with appropriate solutions. The goal of this study is to present a variety of low-cost water filtration materials that are both effective and efficient at purifying waterwithout being too expensive. These filtering materials can be used to replace sand filters, which take up more space, time, and maintenance, with filters that take up less space, time, and maintenance.*

**Keywords:** Low-cost, Low-cost filter materials, Sand Filter, Water quality**,** Charcoal, Cactus, Moring oleifera**,**.

## I. INTRODUCTION

In India, the application of sand filtration approaches is limited due to the scarcity of filter materials other than sand. Capping existing rapid sand filters is a viable approach to enhancing rapid sand filter performance. Capping entails removing a portion of thesand and replacing it with appropriate caps. Although inferior to the originally intended dual media filter, this enhanced filter outperforms ordinary Rapid Sand Filters in terms of both filtration rate and total filter run. The purpose of the proposed research wasto evaluate the utilization of low-cost filtration materials to be used in sand filters.

As of now, according to a 2019 NITI Aayog report, India is experiencing its biggest water crisis in history, with nearly 600 million people without access to clean water. According to the survey, 21 cities, including Bangalore, Delhi, Hyderabad, and Chennai, are likely to have depleted their groundwater resources by 2021. In many places of India, the ground water table is depleting and thequality of ground water is degrading, posing a threat to the long-term viability of both urban and rural water supplies. Pollution, growing water scarcity, and user conflicts are all threatening the supply of cities that rely on surface water. From its current level of680 billion cubic meters, overall water consumption will rise by 22% and 32% by 2025 and 2050, respectively. By 2050, 85 percentof the new demand will come from the industrial and residential sectors. To overcome this future situation, it is necessary to implement proper purification systems.

## II. MATERIALS

Following are some low-cost, naturally available materials which can be used to filter water,

- Charcoal - Charcoal derived from bamboo, wood, coconut shell, etc. can be used as filtering media in sand filters for removalof many contaminants such as chlorine, pesticides, chloroform, etc. This charcoal/carbon can be obtained after burning woodor shells until they are completely burnt and then crushing them to a uniform powder.
- Brick Powder - Bricks are usually used in construction to build things but sometimes the half broken or burnt bricks get thrownaway in garbage since they are of no use. These thrown bricks, if turned into coarse powder can act a filter media in sand filtersas they tend to remove turbidity and other suspended solids in water.

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- Coconut Shells - Coconut shells are usually get thrown away after getting coconut water, but these shells can act a good water filter in sand filters. Coconut shells tends to remove turbidity as well as increase filtration rate of filter significantly. Italso easily available, have negligible cost and recyclable.
- Cactus Powder - Cactus which found in nature can be used as coagulant to filter water. With the contaminants present in the water sample, the cactus powder creates big flocs, which aid in settling and result in the development of clear supernatant.
- Moring oleifera (Drumstick) seeds – These seeds extract have unique property to separate unwanted particulates from water, also they have potential to sediment microbial contaminants like bacteria up to 90% from raw water.
- Calyx of Hibiscus sabdariffa – The seeds of the Hibiscus sabdariffa plant can be used to clean waste water. It acts as acoagulant in the filtration process, reducing COD and turbidity.
- Leaves of Corchorus tridens – These leaves act as a water coagulant to reduce the solids present in water. Seeds need to besun dried and then turned into fine powder to mix with water during the coagulation process.

Usually, the raw water is first sedimented so that the solids would settle down the bottom. After that, the water is filtered. Gravel and sand are the most common materials used to make sand filters. These two materials are commonly employed in sand filters in various quantities depending on their sizes and thickness. Gravel that retains on a 4.75mm IS sieve is utilized, while sand that is fine in size, i.e., 0.3mm and 0.6mm, is most commonly used. Coconut shells, charcoal, brick powder, wood powder, cactus powder, pine bark powder, seeds of Moringa oleifera plant, calyx of hibiscus sabdariffa, leaves of Corchorustridens, and other low-cost filtration materials provide additional filtration to water, allowing it to be treated with greater purity and usable water to be obtained at a lower cost.

## III. ADVANTAGES

- Higher rate of filtration is possible.
- Can be made with recyclable materials.
- Filters water with significant purification.
- Simplicity of use and acceptability.
- Reduce the cost of overall filtration of water.
- Effective in removal of contaminants.

## IV. DISADVANTNGES

- To utilize these natural materials for water filtration on an industrial scale, more research needs to be done.

## V. TESTS TO BE CONDUCTED

The following tests are required to determine whether or not the filtered water is safe to use.

- Color – this test indicates efficacy of the water treatment system.
- Turbidity test – test is done to determine reduction of solids present in water.
- pH test – to know whether water is between consumable pH level.
- Hardness test – is done to determine the amount of minerals present in water
- BOD test – test is done to determine amount of dissolved oxygen present in water, drinking water should have BOD lessthan 1 mg/l after 5 days of time period.
- COD test – It is required to chemically oxidize organic compounds in water.

## VI. CONCLUSION

According to studies, these low-cost filtering media can be used to filter water with the same efficiency as the chemical ones. Theuse of these materials could be simple, environmentally friendly, cost-effective, and recyclable as well. These natural filtering materials may be used to remove unwanted impurities, turbidity, pH regulation, hardness, BOD, COD, and other contaminants.

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## REFERENCES

**[1].** Hemath Kumar,R. Sivasubramani (2012) - Experimental Study and Performance of Rapid Sand Filter by Using Turmeric-Root, Coconut-Shell and Charcoal

**[2].** Pragati Bodhke, Tejas Marathe, Hrushikesh, Dipalee V., Dhanashree Shinde (2018) – Modified Rapid Sand Filtration withCapping.

**[3].** Ranjeet Sabale, Sahil Mujawar,(2014) - Improved Rapid Sand Filter for Performance Improvement, Vol. 3 Issue 10

**[4].** Joel Chebor, Mwamburi A. Lizzy, Ezkiel K. Kiprop, Use of slow sand filtration technique to improve wastewater effluentfor crop irrigation, doi: 10.4081/mr.2018.7269

**[5].** Mr. Manoj H Mota, Dr. P S Patil, Dr. V D Salkar(2019) - Improving the performance of rapid sand filter using coarser andmore uniform media with poly -aluminum chloride as filter AI .

**[6].** Sheena Sibartie, Nurhazwani Ismail (2018) – Potential of *Hibiscus sabdariffa* and *Jatropha curcas* as Natural coagulants inthe Treatement of wastewater.

**[7].** Jodi L., Birnin A, Yahaya Y (2012) – The use of some plants in water purification

**[8].** Praveen Dathan, Kavitha S, Annantha Krishnan (2018) – Water filer using Natural Materials