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COST EFFECTIVE WATER PURIFIER

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ABSTRACT

This paper reports the potential of watermelon seeds and other cost-effective materials in purifying impure water. It is aimed at minimising the usage of alum and other polyelectrolytes in the process of purification of water while increasing the usage of watermelons seeds which is identified as a potential coagulant for water treatment. The resulting value of the purified water is observed to match the WHO recommended values.

Keywords: Watermelon, seed, alum, coagulant, Water treatment

I.INTRODUCTION

Water is a basic need for all living creatures. In fact, water is so important for the survival of humans that, if a man goes for a week without water, he would die! Many nations around the world are facing problems in obtaining treated water, owing to the fact that the financial resources are deficient.

Almost 500,000 tons of pollutants pour into lakes and other natural bodies each day, in the US alone. The river waters which are the only sources to village people is not treated, which may lead to several health problems including diarrhoea, stomach cramps and even liver cancer. It is a well known fact that a quarter of the world's population is without safe drinking water. 97% of the earth's water is salty and non-drinkable, 2% is stored in glaciers and ice caps and the rest 1% is left for humans to drink.

We must also take into consideration the fact that the cost of water purifier is increasing. Hence, it is of great importance to find a natural yet cost effective way to treat water, as safe drinking water is crucial for the welfare of a community.

This paper aims at bringing a cost effective water purifier to the reach of people who cannot afford a costlier water purifier. The paper is aimed at minimising the usage of polyelectrolytes such as alum (aluminium potassium sulphate) which is identified to lead to several health ailments, especially Alzheimer's disease. The purifier makes the use of substances such as activated carbon, porcelain sand, quartz sand etc. which are identified as effective water purifiers[3]. This paper also discusses the potential of watermelon seeds which are identified as active coagulation agents[4].

II.MATERIALS

The materials used in this procedure are: crushed granite, porcelain sand, activated carbon, watermelon seeds, quartz sand, distilled water, digital pH meter, Soxhlet extractor, weighing balance, beakers, stop watch, Filter papers, filtration tube and hopper. All the reagents used are of analytical grade.

III.PROCEDURE

3.1 WATERMELON SEEDS (COAGULANT) PREPARATION

Fresh watermelon seeds are obtained by cutting open a fresh watermelon using a laboratory knife. The seeds are cleaned with water several times and dried in the sun for about a week. They are sorted out to remove the bad ones and grounded using an electrical blender. They are packed in an air tight container. These crushed seeds are packed in 150 g thimbles and placed in a soxhlet extraction apparatus for six hours[1]. The oil from the column is extracted using 500 ml of n-hexane. The residual n-hexane is washed off, dried in an oven and then sieved[1].

3.2 FILTRATION COLUMN PREPARATION

The crushed granite, quartz sand, activated carbon, porcelain sand, alum (aluminium potassium sulphate), saleratus (sodium bicarbonate) are filled in separate filtration tubes in which clean filter papers are paved at the bottom. It would be better to fill the bigger sized granules in the upper part and the smaller sized granules in the lower part of the filtration tube. The volume of all of the filtration column reagents must be lesser than the total volume of the watermelon seed coagulant.

3.3 SAMPLE WATER (IMPURE)

The sample water for the procedure is either collected in a nearby river or a pond, or prepared by mixing 1-2 cups of sand and stone granules in 2 cups of water (artificial dirty water).

3.4 TURBIDITY

The turbidity of the water is measured using a turbidimeter both before and after the treatment.

3.5 pH AND COLOUR

The pH of the impure water is measured using a digital pH meter and the colour of the water is noted[1][2].

After measuring the turbidity, pH, colour and other parameters like temperature and conductivity, the water is subjected to the treatment process, ie. the filtration columns and the watermelon seed coagulant.

IV.OBSERVATIONS

The resulting water after subjecting it to the above procedure 4-5 times, shows difference in colour. The turbidity, colour and other parameters are tested again and the results obtained are tabulated.

4.1 TABLE

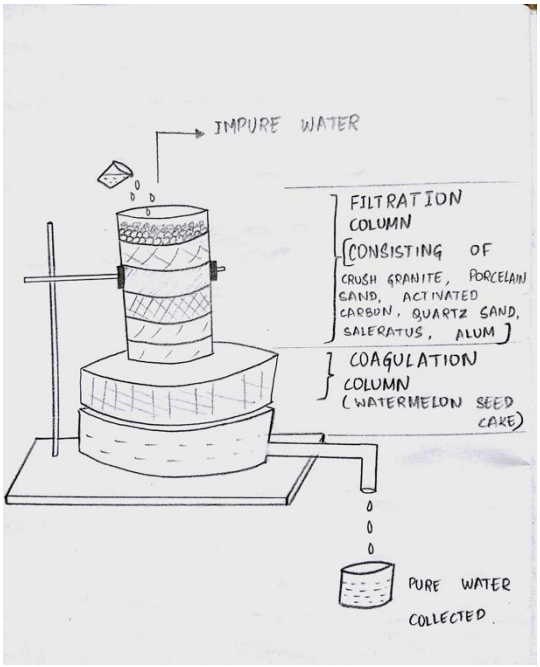
Table 1 – properties of treated water

PARAMETER	RESULTS	WHO STANDARD
Temperature (C)	26.65	25-30
pH	6.87	6.5-8.5
Conductivity	366	1400 max.

From table 1, it is seen that the pH, conductivity and temperature is as per the WHO recommended levels.

When the filtration reagents' concentration was at 40% the pH value had a shift towards the acidic region and well within the WHO recommended levels. But at concentrations of 60% and above the pH was observed to be too acidic.

When the quantity of the watermelon seed coagulant was more than the concentration of the reagents, the pH was within the WHO approved standards of 6.0 to 8.5. But this case was reversed when the reagents were either in equal quantity or more than the quantity of watermelon seed coagulant. Therefore the quantity of reagents must not exceed the quantity of coagulant ie. watermelon seed cake. A quantity of 30% reagents to 70% watermelon seed cake is acceptable.



4.2 FIGURES

V. DISCUSSIONS AND CONCLUSION

An optimum pH of 6.9, optimum temperature of 26.6 C and conductivity of 366 is obtained from the study on their effects. The watermelon seed coagulant dose at 70% and the other reagents at 30% dose is the best recommended for proper water treatment. Hence watermelon seeds are shown to be potential water coagulation agents[5].

The purifier is easy to assemble and easy to transport and can easily be transported to remote areas. The purifier is also cost effective that, using the raw materials such as the reagents and watermelon seed coagulants, anyone can assemble it easily. But the purifier may have limitations too. Water that is too impure cannot be easily purified. Also the impure water must be treated 4-5 times until it is pure enough. But these limitations are

overcome by the various advantages it contains, such as mentioned above ie. Affordability, easy transportation, easy assemblage and easy usage etc.

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