Waste Water Treatment using Bio Materials

S.M.K.S. Siriwardana *and* D.T. Udagedara
Uva Wellassa University, Badulla, Sri Lanka

Introduction

Inadequate water services together with poor sanitation are among the most serious challenges faced by the developing countries. There are potential health effects caused by high Total Dissolved Solids (TDS) content in drinking water. The hard water will taste bitter, salty, or metallic and may have unpleasant odor. High TDS water is less thirst quenching. High TDS interferes with the taste of foods and beverages, and makes them less desirable to consume. Some of the individual mineral salts such as Nitrates, Sodium, Sulfates, Barium, Cadmium, Copper, and Fluoride that make up TDS pose in the joints, hardening of the arteries, kidney stones, gall stones and blockages of arteries, microscopic capillaries and other passages in which liquids flow through the entire body. Therefore this research aims at examining the capacity of bio materials on removing TDS in water.Bio materials can be used for the purpose of removing turbidity from drinking water as an adsorption agent. Selected bio material should have comparatively less time for purification, the wide distribution and availability to find materials as adsorption materials.

Methodology

According to the Sri Lankan environmental conditions following bio materials can easily be applied for turbidity removal. *Moringa oleifera*, *Elettaria cardamomum*, *Osbeckia aspera*, *Phyllanthus emblica*, *Strychnos potatorum* (Bina, et al, 2009; Vikashni et al, 2012).Collected plant materials were separately washed and dried in direct sunlight making them easy to crush into small pieces. Crushed plant materials were separated by using sieve shaker into series of different mesh sizes. Water with high TDS was prepared with kaolinite as a controller.

The plant parts were washed, dried, crushed and separated into three grain sizes which could be loaded into separate glass column. Column has a capacity of 100mL and air dried before use. The 5 separate glass columns were packed with crushed plant parts separately. Prepared water was allowed to pass slowly through the columns at a rate of 10mL/min. The TDS of the eluted water sample was measured using TDS meter.

Result and Discussion

The percentage decrease of TDS in 1.18 mm mesh size can be ordered as *Strychno spotatorum* (93.53) >*Moringa oleifera* (84.98) >*Elettaria cardamomum* (81.24) >*Phyllanthus emblica* (78.14) >*Osbeckia aspera* (77.64). The decrease percentage can be calculated as follows.

%decrease (in TDS) =100*(initial reading-final reading) /initial reading

Thus the *Strychnos potatorum* seeds show high TDS reduction in water sample. *Moringa oleifera* seeds and *Elettaria cardamomum* seeds coats show nearly equal results and *Osbeckia aspera* flowers show less reduction of TDS in 1.18 mm mesh size. The percentage decrease of TDS in 0.6 mm mesh size can be ordered as *Strychno spotatorum* (98.78) >*Elettaria cardamomum* (97.06)>*Moringa oleifera* (96.83) >*Phyllanthus emblica* (96.35) >*Osbeckia aspera* (85.19).

This shows when the particle size decreases the TDS removal efficiency of the bio materials increases. *Moringa oleifera, Elettaria cardamomum, Strychnos potatorum* show great efficiency in reducing TDS.0.3 mm mesh size results are different from the general trend. *Strychnos potatorum* shows negative result because it forms gelatin in finer particle size and blocks the

water filtering process through the column. Other bio materials also show less efficiency in 0.3 mm mesh size. In the filtering process bio materials have high tendency to add their natural acid to the water sample in smaller mesh size. The most effective mesh size is 0.6 mm mesh size. All the materials effectively work under the 0.6 mm mesh size.

Conclusions

This study proves that the local substances used do not have toxic effects. They aided in improving the water quality for drinking purposes. The mechanism of coagulation with the seeds of *Moringaoleifera* consists of adsorption and neutralization of the colloidal positive charges that attract the negatively charged impurities and metals in water. The reduction of TDS by using herbal plant parts proves to be effective and can be implemented in water purification systems.

The use of *Moringa oleifera* in reducing the TDS in the water thus made it potable for domestic use. The other plant materialswere also found to be effective in reducingthe TDS. Column reuse can help in removing excess solids from the same water samples. Thus plants such as *Strychnos potatorum ,Elettaria cardamomum, Moringa oleifera, Phyllanthus emblica, Osbeckia aspera* have the potential in the treatment of waste water into water potable for domestic use.

References

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