Available online www.jocpr.com

Journal of Chemical and Pharmaceutical Research, 2017, 9(4):65-68

Research Article

ISSN : 0975-7384
CODEN(USA) : JCPRC5

Removal of Turbidity of Water by Banana Peel Using Adsorption Technology

Beverly John[1], Uzma Baig[1], Nazia Fathima[1*], Smita Asthana[1] and D Sirisha[2]

[1]Department of Chemistry, St. Ann's College for Women, Mehdipatnam, Hyderabd, India
[2]Head, Centre for Environment & Climate Change, School of Environmental Sciences, JNIAS, Secunderabad, India

---

ABSTRACT

Ground water has become one of the important sources of water for meeting the requirements of various sectors in the country in the last few decades. It plays a vital role in India's economic development and in ensuring its food security. The rapid pace of agricultural development, industrialization and urbanization has resulted in the over exploitation and contamination of ground water resources in parts of the country, resulting in various adverse environmental impacts and threatening its long-term sustainability. Fresh water scarcity can be overcome to an extent by using fresh water sources for drinking purposes and treated wastewater for various domestic purposes. Conventional treatment techniques are extremely expensive for developing countries like India. Therefore, an urgent need for cost effective methods of treatment and recycling of wastewater are highly desirable. Taking this factor into consideration the present paper deals with the effective removal of turbidity of waste water by using cost low cost, Banana peel as an adsorbent. The results are found to be very effective, showing 95% of the removal of turbidity. Nephelometer is used to determine the concentration of suspended particles in a sample of water by measuring the incident light scattered at right angles from the sample. Adsorption parameters such as pH, contact time, temperature, concentration, shaking time were carried out and the results were optimized. Solutions of different concentrations (10NTU - 160NTU) were prepared and dosage of banana peel powder was varied from 0.2 gms to 1.0 gm. The results are found to show effective removal of turbidity from high concentration solutions.

Keywords: Banana peel; Adsorption; Nephelometer; Concrete; pH; Temperature; Optimum dosage

---

INTRODUCTION

Water is an important constituent of life on earth. Because of latest advances in life the level of purity is degrading day by day mainly by the addition of a number of particles, ions etc. These particles represent transport vehicles for undesirable chemicals contaminants and potentially disease causing microbial pathogens. The removal of these particle materials becomes important to protect public health. The key test to water quality is to test of level of Turbidity. It is the cloudiness or haziness of a fluid caused by a large number of individual particles which are usually invisible by our naked eyes. The more is the level of turbidity of water, the less it is fit for Public use [1-4].
There are numerous methods and means to remove turbidity, but it would be quite impending and cost effective if some eco-friendly bio- waste like banana peel is used as an alternative to chemical means. India is the largest producer of banana and according to FAO sources 21.77 million metric tons of bananas are cultivated annually only in India. The peels of banana are usually discarded as waste all over the world, which are mainly composed of natural polysaccharides. They also have great medicinal value like anti-fungal and antibiotic properties [5].
Banana peel is mainly composed of fiber and lignin whose percentage value changes for stages of maturity. It also contains 6-9% dry matter of protein and 20-30% fibre (measured as NDF). Green plantain peels contain 40% starch that is transformed into sugars after ripening. Green banana peels contain much less starch (about 15%) when green than plantain peels, while ripe banana peels contain up to 30% free sugars. It also contain lots of

vitamins, minerals and fiber that has proved beneficial for skin care and healing the wound, they also have been used as a substrate for the production of fungal biomass. Besides medicinal properties it also possesses good natural adsorbent of heavy metals like Chromium, copper and some dyes from wastewater because of which it is very useful for purification and refining processes [6-8].

Morphological Study of Banana Peel (SEM Characterization)

The banana peel was observed under Scanning Electron Microscope. The peel shows irregular pores on the surface which supports the adsorption process (Figure 1).

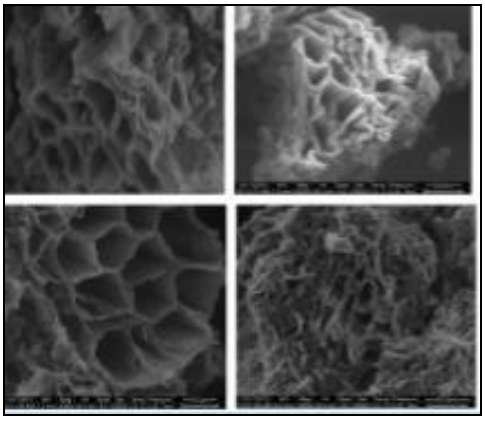

Figure 1: SEM of banana peel

We report a novel and green route to remove the level of turbidity in water. This study was initiated to study the removal of turbidity of water using banana peel by adsorption technique. The effect of adsorbent dosage, concentration, pH and stirring time were investigated.

METHODS AND RESULTS

Preparation of Synthetic Turbid Water

Turbid water was synthetically prepared by adding bentonite powder in 1 litre of distilled water. The resulting bentonite solution was suspended for 1-2 days after vigorous shaking followed by slow mixing to obtain uniform dispersion of Bentonite particles.

Bentonite is a natural coagulant which contains essential components like aluminium, iron, clay etc. It is economically available and can be easily used as a natural coagulant.

Banana Peel as Natural Adsorbent

The experiment is carried out by using banana peel, a natural adsorbent. Banana peel is sun dried and powdered thoroughly. The powdered substance is then added to the synthetic turbid water and is then shaken vigorously. Various adsorption parameters like dosage, concentration, pH were carried out and the results were optimized.

Effect of Dosage

The solution of bentonite with a concentration 186 NTU was taken into a six different conical flask each containing 100 ml of bentonite solution and is mixed with banana peel powder with varying dosage such as 0.1, 0.2, 0.4, 0.6, 0.8, and 1.0. The conical flask is shaken for a few minutes roughly and allowed to settle but not filtered. The turbidity of all the six solutions are determined and the results are tabulated as shown below.

After calculating the percentage removal, a graph is plotted between percentage removal of turbidity on y axis and dosage in grams on X axis. It has been observed that there is 96.7% of turbidity removal with an optimum dosage of 1 gram of banana peel powder.

Effect of Concentration

The optimum dosage of banana peel powder (1 gram) obtained from the above graph is efficient in removing the turbidity of waste water up to 96.7% is now considered for determining the next parameter i.e., concentration. In this parameter, solutions of different concentrations were prepared such as 20NTU,40 NTU,60 NTU,80 NTU,100 NTU,120 NTU,140 NTU,160 NTU and taken into a eight different conical flask each containing 100 ml of bentonite

solution and is mixed with the optimum dosage of banana peel powder. The conical flask is shaken for a few minutes roughly and allowed to settle but not filtered. The turbidity of all the eight solutions was determined and the results are tabulated as shown below (Figures 2 and 3).

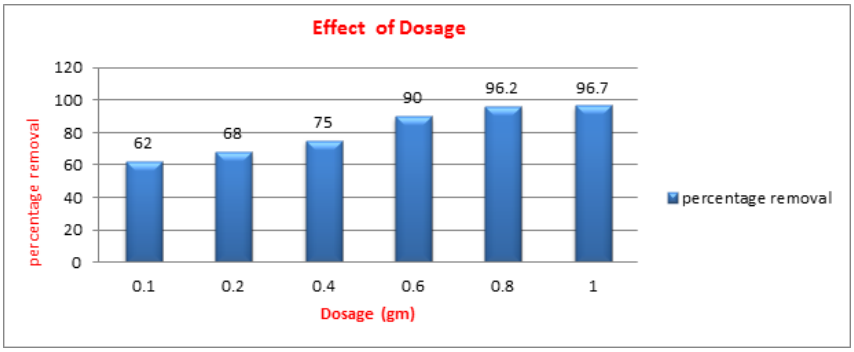

Figure 2: Effect of dosage on removal of turbidity

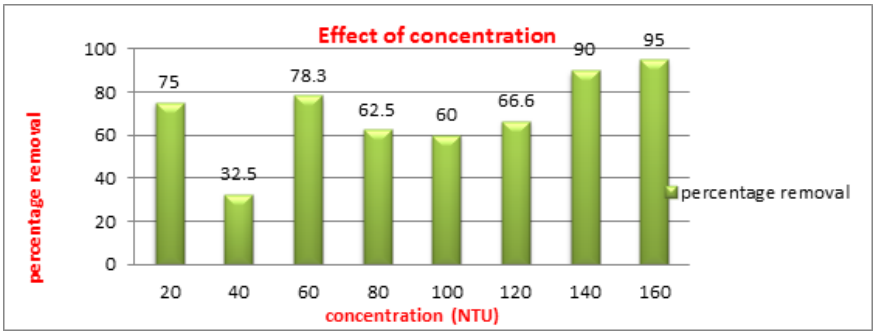

Figure 3: Effect of concentration on removal of turbidity

After calculating the percentage removal, a graph is plotted between percentage removal of turbidity on y axis and effect of concentration in NTU on X-axis. It has been observed that as the concentration of the solution increases there is an equivalent and steady increase in the percentage removal of turbidity. Since there is a maximum removal of turbidity at 160 NTU, it is considered as an optimum concentration.

Effect of pH

In this parameter solutions of different PH are utilized and the percentage removal of turbidity of the solutions is measured. The optimum pH value is determined by plotting a graph between percentage removal of turbidity on y-axis and effect of pH on X-axis (Figure 4).

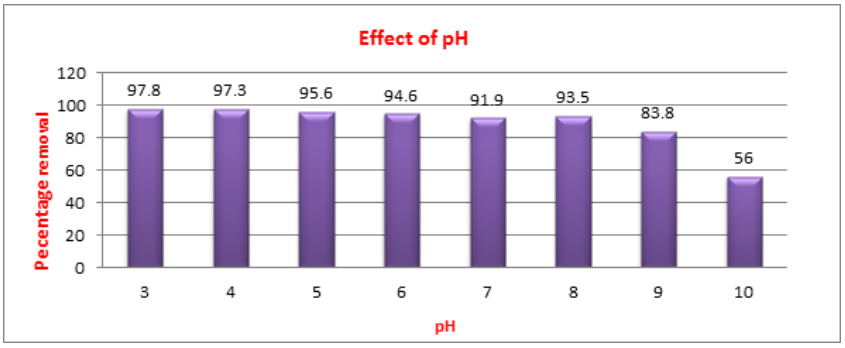

Figure 4: Effect of pH on removal of turbidity

It has been observed that maximum percentage removal of turbidity of 97.8% is seen at a lower pH of 3.

Effect of Stirring Time

In this parameter, the conical flask containing solutions of bentonite and banana peel powder are subjected to different stirring times and the percentage removal of turbidity of the solutions is measured. The optimum stirring

time value is determined by plotting a graph between percentage removal of turbidity on y- axis and effect of stirring time on X-axis (Figure 5).

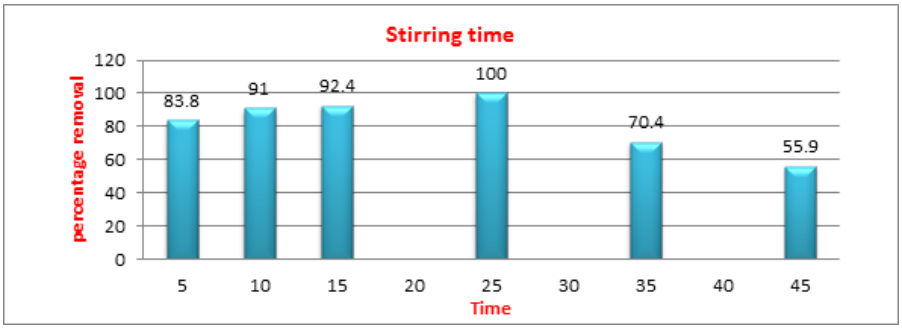

Figure 5: Effect of stirring time on removal of turbidity

It is observed that maximum percentage removal of turbidity of 100% is seen at 25 minutes of stirring.

DISCUSSION AND CONCLUSION

The present work gave us a novel and green route to remove the level of turbidity in water. The effect of adsorbent dosage, concentration, pH and stirring time were investigated using Banana Peel and it has been found that 96.7% of turbidity removal was observed at an optimum dosage of 1 gram of banana peel powder. As the concentration of the bentonite solution increases there is an equivalent and steady increase in the percentage removal of turbidity, at 160 NTU maximum removal of turbidity is observed, which is considered as an optimum concentration. Further, maximum percentage removal of turbidity of 97.8% is seen at a lower pH of 3 and maximum percentage removal of turbidity of 100% is seen at 25 minutes of stirring.

REFERENCES

[1] S Kamsonlian; C Balomajumder; S Chand. *Int J Chem Sci*. **2012**, 3, 269-275.
[2] M A Hossain; HH Ngo; WS Guo; TV Nguyen. *J Water Sustain*. **2012**, 2(1), 87-104.
[3] K Prabu; S Shankarlal; E Natarajan. *World J Fish Mar Sci*. **2012**, 4(1), 73-77.
[4] A Darge; SJ Mane. *Int J Sci Res*. **2013**, 2319-7064.
[5] S Singhal; S Agarwal; K Bahukhandi; R Sharma; N Singhal. *Int J Environ Sci Res*. **2014**, 3(1), 151-156.
[6] B Ramavandi. *Water Resour Ind*. **2014**, 6, 36-50.
[7] Z Abbasi; M Alikarami; ER Nezhad; F Moradi; V Moradi. *Universal J Chem*. **2013**, 1(3), 90-95.
[8] N Zayadi; N Othman. *Int J Integr Eng*. **2013**, 5(1), 23-29.