Asian Journal of Chemistry; Vol. 31, No. 5 (2019), 1013-1016

ASIAN JOURNAL OF CHEMISTRY

https://doi.org/10.14233/ajchem.2019.21739

Study of Blended Waste Organic Extracts in Wastewater Treatment

J.B. Veeramalini*, B. Bharathiraja, S. Raghu Vinayak, R. Vignesh and S.K. Raghul

Department of Chemical Engineering, Vel Tech High Tech Dr.Rangarajan Dr. Sakunthala Engineering College, Chennai-600062, India

*Corresponding author: E-mail: Veeramalini@gmail.com

Received: 3 October 2018; *Accepted*: 1 December 2018; *Published online*: 28 March 2019; AJC-19322

In present work, water treatment processes is carried out by an affordable, readily usable and non-chemical method. This study involved the process of water may reduce the concentration of particulate matter that includes suspended particles, micro organisms, a range of dissolved and particulate material derived from the surfaces. The substances used in this work were coarsely blended with each other and a special composite fibre filter was made. Several processes variables of quality of waste are also measured before and after the treatment. Results show that the water quality has been enriched in several ways such as reduction in the dissolved solids, pH has been controlled, deodorization and prevention of microbial growth. Hence use of this work has been utilized as a "Homemaker Model" and act as an alternative method for wastewater treatment in a cost effective way.

Keywords: Wastewater treatment, Eco-friendly, Filtration process, Pine fruit peel, papaya bark, Hybrid clay.

INTRODUCTION

Each and every living species uses water in their day to day life that too for human population requires large quantity of the water. Drinking water is a major crisis in today's world, not everyone in this world has the access to drink clean water. The last 20 years have witnessed a growing awareness of the fragile state of most of the planets' drinking water resources. Thousands of organic, inorganic and biological pollutants have been reported as water contaminants [1]. Over the past few decades, multidisciplinary research has been carried out to treat the wastewater [2].

One of the largest and most complicated industrial chains in manufacturing industry is textile industry [3]. These emit wastewater, solid waste, emissions to air and noise pollution. The main environmental concerns in the textile industry are about the amount of water discharged and chemical load it carries [4]. The wastewater produced during the production of yarns and fabrics contains a diverse range of chemicals and dyes [5]. The textile industry is water intensive. Water is used for cleaning the raw materials and for many flushing steps during the whole process of production [6]. About 200 L of water are used to produce 1 Kg of textile. In fact, it has been found that 38 % of water is used during process of bleaching, 16 % in dyeing, 8 % in printing, 14 % in boiler and 24 % for other uses [7]. Its biggest impact on the environment is related to primary water consumption (80-100 m^3/Ton of finished textile) and wastewater discharge (115-175 Kg of COD/Ton of finished textile, a large range of organic chemical, low biodegradability, colour, salinity) [8,9]. In India alone, the textile industry uses 425,000,000 gallons of water daily and approximately 500 gallons of water are used in production of just one pair of jeans [10-12]. Larger mills can discharge more than 2 million gallons of wastewater of this kind per day [13].

Major pollutants in textile wastewater are high suspended solids, chemical oxygen demand (COD), heat, colour, acidity and other soluble substances [14]. The pollution load is characterized by high colour content, suspended solids, salts, nutrients and toxic substances such as heavy metal and chlorinated organic compounds [15]. As a result, most of the wastewater produced by the textile industry is coloured. It is likely that coloured wastewater is a feature of the first practices of textile dyeing. However, treatment to remove this colour is not considered until the early natural dyestuffs were replaced by synthetic dyes and the persistence of such synthetic dyes in the environment was recognized. Most of the BOD/COD ratios are found to be around 1:4, indicating the presence of non-biodegradable substances [16]. The textile effluents contain trace metals like Cr, As, Cu and Zn, which are capable of harming the environment [17]. Dyes in water give out a bad colour and can cause diseases like haemorrhage, ulceration of skin, nausea, severe irritation of skin and dermatitis [18]. The water consumed (L/1000Kg of products) during the wet process contain Sizing is 500-8200, de-sizing is 2500-21000, scouring is 20000-45000, bleaching is 2500-25000, mercerizing is 17000-32000, dyeing is 10000-300000, printing is 8000-16000 [19].

The textile producers frequently dump wastewater directly into water ways. This water contains hormone – alternating chemicals, colour dyes and cleaning solvents that alter the pH, oxygen, nitrogen and phosphorous levels in rivers. This contamination has been linked with increased rate of cancer, asthma and workers have experienced second and third degree burns from the handling of chemical [20]. As a result of various process, considerable amounts of polluted are released. The fact is that the water let out after the production of textiles is well beyond the standard and contains a large amount of dyes and other chemicals, which are harmful to the environment [21]. This paper assesses the treatment and purification of wastewater using blended organic extract as a filter. Portable homemaker model has been developed, in order to access the clean water in biological way [22]. Thereby large quantities of water contaminants and their effluents are treated in an ecological way. Special organic filters have been used in this research work and it has been strongly confines that no such filters was used any of the literature for water purification [23]. This research work strongly confines the treatment of textile water in an ease economical and environmental benign way to clean water. Further this work claims and evaluates the process of water purifications by using spiral wound thin film of composite membrane elements by using papaya fibres. In add up with the research work it could lower the cost of providing clean water to several millions of peoples in developing countries. The sustainability and affordability of pawpaw bark had been used separately in water purification but until now they had not been combined the effectiveness of the materials along with the organic blended activated charcoal. The present study used a coagulation followed composite membrane filtration to treat the synthetic wastewater and to examine the quality of water. The main proposal and outcome of the method is to develop the instant homemaker model by using blended organic waste extract in developing countries.

EXPERIMENTAL

Four sand filter layer

Gravels: The bottom, a 5 cm layer of 6-15 mm gravel, followed by a second 5 cm layer of 1-6 mm coarse sand. The first layer is sufficiently deep to cover the inlet to the pipe and should be large enough to keep the openings in the filter bottom free for the flow of water out of the filter and the upper layer fine enough that the overlying filter sand will not sink into its pores. For drum filters, due to the configuration of the outlet pipe, the size of the gravel around the outlet needs to be greater than 15 mm to prevent it clogging. Alternatively, mosquito mesh can be used. In larger-scale slow sand filters, an underdrain of some kind is built into the base of the filter. To prevent the filter material from entering into bed. The primary role of the gravel in the bio-sand filter is to prevent clogging of the poly vinyl chloride pipes with sand [24,25]. Similarly this layer is also been used for household intermittent sand filters, two layers gravels are usually employed on locking the underdrain a series of graded gravel layers is used. For stacked bricks with open joints 10 mm wide, four layers are suggested, each 10 cm thick with the coarsest layers at the bottom: 0.4-0.6 mm, 1.5-2 mm, 5-8 mm, 15-25 mm.

Pebbles: Filter gravel is an extremely effective filter media because of its ability to hold back all the precipitates as exist in the form of contained impurities. Filter sand size, angularity and hardness are the important filter sand characteristics to ensure proper filtering [26]. This kind of filters retains large size of particles and it allows the clean water to pass through the next level of filter. Efficiency of the filtration process is maximized in this level to obtain the clean water in huge rate.

River soil: Capturing water is one of the most important roles that soils play in our ecosystem. This happens through the pores in the soil. The pores of a soil are important in determining if water will move into the soil and through to groundwater. Pores can be any size from small, microscopic holes in the soil to large worm-like holes and prairie dog tunnels. Soil with lots of small pores will slow down how quickly rain enters, resulting in the potential for runoff and flooding. However, soil with lots of large pores will allow water to move through quickly. An ideal soil has both large and small pores so that some water moves through but some is stored for plants [27]. Through this filter and its active pores enhances the purity of wastewater in huge level in a maximum rate. Further the reduction of impurities and removal of solids in a large size is works out in this stage.

Hybrid clay: Laterite soil samples have been studied and analyzed precisely in order to remove arsenic from contaminated water by adsorption filtration method. The abundant availability of local laterite is in high range of low-grade bauxite rich in iron and aluminium. This soil is mainly used to remove phosphorus and heavy metals at several sewage treatment facilities. In addition to the laterite soil together with seeds of papaya has been mixed in the 1:2 ratios thereby the process of removing dirt, turbidity and desalination of water has been enhanced. Calcium, iron and aluminium-rich solid media are recommended for phosphorus removal [28]. A study, using both laboratory tests and pilot-scale constructed wetlands, reports the effectiveness of granular laterite in removing phosphorus and heavy metals from landfill leachate. In this work the initial laboratory studies show that laterite is capable of 99 % removal of phosphorus from solution. Furthermore in the pilot plant scale removal of aluminium and iron is optimized in the level of 85 and 98 % removal respectively. In addition to percolating level of the column of laterite removed enough cadmium, chromium and lead to undetectable concentrations for a possible application of this low-cost, low-technology, visually unobtrusive, efficient system for rural areas with dispersed point sources of pollution [29].

Activated adsorbents: In wastewater treatment, we have used three types of naturally activated adsorbents they include *Moringa oleifera* seeds, jamun seeds, *Cocos nucifera*. The good quality of seeds from all the types has been selected and the main kernel is ground to fine powder using an ordinary electric blender [30]. The active component from the each coagulant is extracted and studied for several trials under various calculations for every day treatment. The fresh stock of adsorbent has been prepared daily in minimum of 24 h basis. Further the suspension of the wastewater is filtered by using Whatman filter paper.

Active moringa seeds : Moringa seeds (*Moringa oleifera*) is an economically important tree and vegetable and preliminary evidence suggests that it has a remarkable antioxidant and anti-inflammatory potency. It contains compounds structurally similar to sulforaphane and appears to be protective when orally ingested. This seed is used for the coagulation purpose and these seeds and pods contain: 20-30 % proteins, 35-45 % fatty acids which are odourless and colourless and mostly contain 73 % oleic acid with less than 1 % polyunsaturated fatty acids, which gives the oil good oxidative stability [31]. Through this treatment the coagulation process of the *Moringa oleifera* seeds helps to remove solid particles and other unwanted particles that affect the purity of the water. The dried seeds of *Moringa oleifera* has sieved through 550 μm sieve.

Active jamun seeds: Jamun, also popularly known as Jambul (*Syzygium cumini*) is a nutritious seasonal fruit. Seeds of Jambul have medicinal properties. Jamun is loaded with antioxidants and flavonoids essential for a human body. Seeds of jamun are used by Ayurvedic practitioners, herbalists and traditional healers in various formulations. The seeds are usually dried and powdered [32]. Jamun seeds can be used to remove excess fluoride from wastewater. The jamun seed powder is converted into activated adsorbent of minimum size of 600 μm through sieve.

Active *Cocos nucifera*: Coconut is one of the important perennial crops from the family Arecaceae (palm family) and the only species of the genus name Cocos. Botanically, it is known as *Cocos nucifera*. Leaves are pinnate and are called “fronds”. The coconut leaves can be used as an adsorbent. Coconut leaves have been chosen as raw material to produce natural adsorbent and activated charcoal [33]. The dried leaves have been dried in natural drying of minimum 1 h processes with 400 μm sieves.

Preparation of natural activated adsorbents: The activated charcoal is a form of carbon processed to have small, low-volume pores that increase the surface area available for adsorption or chemical reactions. For preparing natural activated carbon, 30 g of size reduced samples of (*M. olifera* seeds, jamun seeds, *Cocos nucifera*) are taken and soaked in phosphoric acid at 1:1 ratio for 24 h and filtered. After soaking is done, the sample is taken in a pot covered with clay and carbonized in muffled furnace at a range of about 140-160 °C for 90 min. If the pH is in a high acidic range (pH 1-3) washing is carried out with weak sodium bicarbonate solution. Washing is done till the wash water pH reaches 7. Neutralized sample is dried in hot air oven at 80 °C for 4 h [33].

***Carica papaya* fibers:** The unconventional natural fibre composites help to understand the fibre extraction processes. Further the possibility of reinforcement arrangement of polymer matrices helps to absorb the large quantities of turbidity from the effluents [31].

RESULTS AND DISCUSSION

A new method of treating dye wastewater with blended organic extracts has been examined and reported. It not only possesses the advantages of both oxidation and adsorption processes, but can also increase the amount of dissolved oxygen in water. Consequently, it is expected that the method could effectively decolourize all dyes and metals embedded in synthetic wastewater and could be ecologically safe. So this method can be expected to be more economically efficient in treating wastewater than others.

Analysis of parameter of wastewater: The physiochemical analyses of test values of synthetic wastewater and standard methods in examine of water are listed in Table-1.

TABLE-1
PHYSICO-CHEMICAL PARAMETER
OF SYNTHETIC WASTEWATER

Parameters	Initial level
pH	2.4
TDS (mg/L)	187
Electrical conductivity (ms/cm^2)	18750
Odour	Highly objectionable
Colour	Magenta
Turbidity (mg/L)	400
Total hardness (mg/L)	1534
Halides	Limited
DO (mg/L)	17.6
BOD (mg/L)	350
Chromium (mg/L)	0.05
Copper (mg/L)	0.02

Effect of adsorbent dosage and composite fibre: In this adsorbent dosage bed where three different beds of adsorbent have been chosen remove the turbidity in an optimum conditions. The effects of variable adsorbents are poured and examined warily into the process, where the treatment of synthetic wastewater at constant time. The results show that using variable beds of adsorbents reveals a dramatic increase in the effects clarity of water, but while increasing the beds of the adsorbents to greater extents shows reverse effects and hence it would intensify the water turbidity to a larger portion. The optimum results obtained that, water clarity increased from 15.6 to 96.5 % with no coloured water, chemical oxygen demand (COD) decreased from 17.6 to 7.7 mg/L, suspended solids from decreased from 187 to 5.9 mg/L, pH increased from 2.4 to 8.7. Finally as expected, the heavy metals and sulphates decreased from to a minimum degree due to the increasing colour removal [30]. The results obtained in Fig. 1 is almost seems to be good and agreed one with significant increase in clarity of water and without any traces of existence of colour.

Effect of time over the synthetic wastewater at constant beds of 6 mg/L at constant room temperature: To investigate the influence of time, with respect to the presence of adsorbent beds and the composite fibre usage over the treatment of syn-

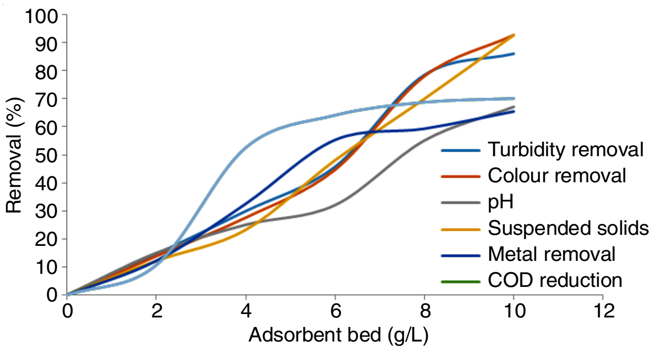

Fig. 1. Effect of adsorbent beds *vs.* % removal of substance

thetic wastewater as conventional way. However the many advantages are specially augmented if the blended extract and its usage are indigenous and widespread in optimal dose [33]. The optimal dosage, concentration and variable time limit is depended on its origin, water composition and pH. Further the dosage of adsorbents beds are quite enough in the removal of the removal of fluoride, arsenic, heavy metals increases with a decrease in pH, with maximum adsorption found at pH 3.5. The activated jamun seeds, *Cocos nucifera* and *Moringa olifera* acquires a positive charge at low pH and the positive charge attracts the fluoride ions, heavy metals while the negative charge in an alkaline medium repulses the fluoride ions, heavy metals as indicated in Fig. 2.

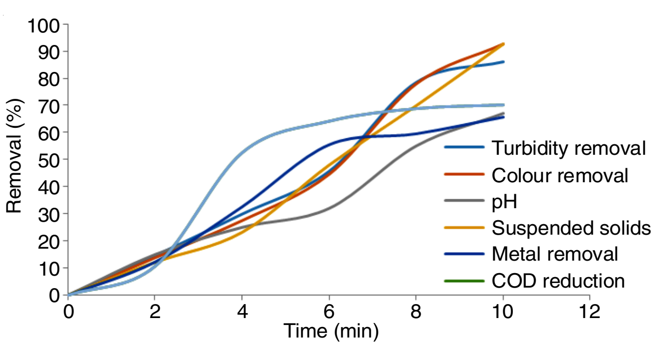

Fig. 2. Effect of time *vs.* % removal substances

Conclusion

The conducted research shows an excellent scope for the development of blended organic extracts in water treatment and also with the analysis of several parameters. Conventional technologies which have been ignored by late off, hence present technologies have created the foundation of traditional practices and source availability is innate. *Carcia papaya* fibres are excellent removal of metals and their efficiency is also presented with suitable analysis. The implementation of this homemaker model can be gainfully used as an alternative water treatment method with maximum removal efficiency. The physico-chemical parameters are removed off and highly effective with blended organic extracts. Organic blended treatment of waste-water paved the way for zero discharge effects. Application of conventional come traditional treatment of organic blended extract is quite significant and also more advantages by using natural material. Synthetic wastewater purification represents an important progress in sustainable and affordability of environmental technology. The sequential treatment and good scope for the purpose of colour removal has been done in efficacy way of maximum of colour removal 97.56 %.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interests regarding the publication of this article.

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