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Reduction of Chemical oxygen demand (COD) in Stabilization of Pond water by Various Activated carbons

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Abstract: In this work the efficiency of activated carbon derived from Moringa oleifera, Coconut coir, Sugarcane bagasse and Saw dust for the reduction of COD in pond water. The process was studied in batch mode with employing different adsorbents optimizing various parameters such as adsorbent dosage, initial concentration, contact time, pH and Temperature. Saw dust was achieved at 98% removal of Chemical oxygen demand (COD) compared with other coagulants.
Key words: COD Reduction, Low cost adsorbents, various parameters, Pond water

Introduction:

Water is not only a resource it is a life source .It is well established that water is important for life. Water is useful for several purposes including agricultural industrial household recreational and environmental activities. The contamination of soil and water sources with environmentally harmful chemicals represents a problem of great concern not only in relation to the biota in the receiving environment but also to humans [(1-3)]. Much of the discharge of metals to the environment comes from mining followed by agricultural activities[(4-5)].Bio sorption is a process that utilizes inexpensive dead biomass to sequester toxic heavy metals and is particularly useful for the removal of contaminants from industrial effluents. Some adsorption methods using inorganic adsorbents are well but these methods may not be health hazardous.Chemical coagulants such as aluminium sulphate, Synthetic organic polymers, Ferric chloride used in water treatment process it induce Alzheimer's diseases, carcinogenic and neurotoxic effects. However the application of these treatment processes has been found to be sometime restricted because of expensive investment operational costs potential generation of secondary pollution and its disposal is not ecofriendly. One possible solution to these problems which are preferably extracted from natural and renewable sources such as microorganisms, animals or plants[(6-9)] .These coagulants must be safe for human health and biodegradable. In the present study various natural coagulants such as Moringa oleifera, Coconut coir, Sugarcane bagasse and Saw dust were used to remove the chemical oxygen demand from wastewater. The current article will explore the possibilities to increase performance and to minimize the concerns of residual COD by modifying the purification processes. An additional step in the purification of the coagulant from Moringa oleifera, Coconut coir, Sugarcane bagasse and Saw dust seeds were proposed. Saw dust activated carbon was highest removal of COD compared with other activated carbon.

Experimental:

Study area

Water is most important natural resource and is vital for all life on earth. The well being and the development of our society are dependent upon the availability of water. Surface water samples were collected in the pond of Thenkalavoy ooranies in Tindivanam Taluk, Villupuram district. In this areas the people takes the water for drinking purposes and other household purposes.

Reagent and Standard

Analytical grade chemicals were used throughout the study without further purification. To prepare all the reagents and calibration standards, double distilled water was used.

Experimental Methodology:

The pH and electrical conductivity were measured by using digital pH meter and conductivity meter. COD analyses were performed by the dichromate closed reflux method. Residual turbidity's were used as a basis for comparing the efficiency of coagulation which was measured by turbidity meter in nephelometric turbidity units (NTU).The procedures for COD as well as turbidity measurement conformed to those described in the standard methods for the examination of water and wastewater.

Preparation of Activated carbon

Moringa oleifera, Sugarcane bagasse, Coconut coir and saw dust were obtained locally. Before use both materials were washed thoroughly to remove any dirt and then dried. Carbonization of Moringa oleifera, Sugarcane bagasse, Coconut coir and saw dust were carried out in a muffle furnace at 200-250◦C for 2 hours. Finally this activated carbon was ground using a mortar and was kept in desiccators for use as is.

Results and Discussions:

Effect of initial concentration

The effects of initial concentration of Chemical oxygen demand from surface water are studied between concentration ranges 25 to 450 ppm. The adsorption capacity of the Chemical oxygen demand of surface water are found to increase up to 450ppm and further increase of concentration decreased the adsorption of chemical oxygen demand from surface water. The highest percentage removal of Chemical oxygen demand was achieved at saw dust.

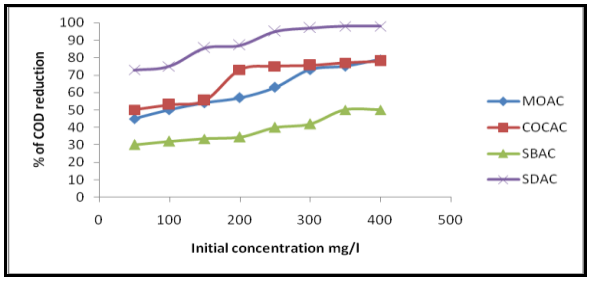

Fig.1 Effect of initial concentration

Experimental condition (Adsorbent dosage 0.4g, Initial Concentration 25-450ppm, pH-4,Stirring time 120 min)

Effect of adsorbent dosage

The effects of adsorbents dosage has been studied on Moringa oleifera, Coconut coir, Sugarcane bagasse and Saw dust were studied. The percentage removal of chemical oxygen demand is increased with increase of adsorbent dosage. 0.4g adsorbent dosage was needed to remove the highest percentage of chemical oxygen demand from surface water.

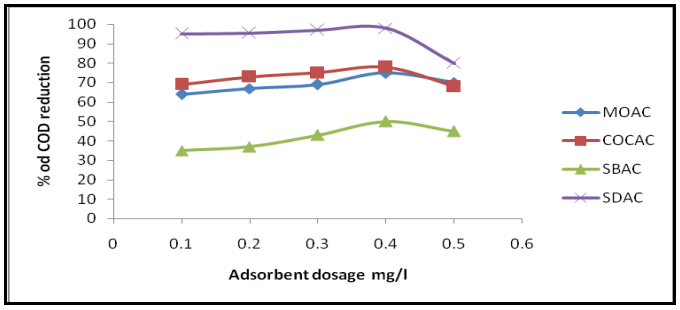

Fig.2 Effect of Adsorbent dosage

Experimental condition (Adsorbent dosage 0.1-0.5g, Initial Concentration 450ppm, pH-4,Stirring time 120 min)

Effect of pH

Solution pH is very important parameter that affects the properties of adsorb ate and adsorbent as well as the adsorption processes in aqueous solutions. From acidic pH4 to basic pH10 were studied under experimental conditions. Among this pH acidic medium is the best suitable pH for chemical oxygen demand lower pH gives good result ,neutral medium is chosen because it also gives better results and minimum cost and easy handling of the experiments .So all the experiments were done in acidic medium is shown in Fig.3. Effectively as the pH increases from the acidic to alkaline there may be an increased electrostatic repulsion or dispersion between the adsorb ate and activated carbon surface subsequently a decrease in the uptake was observed in the pH range.

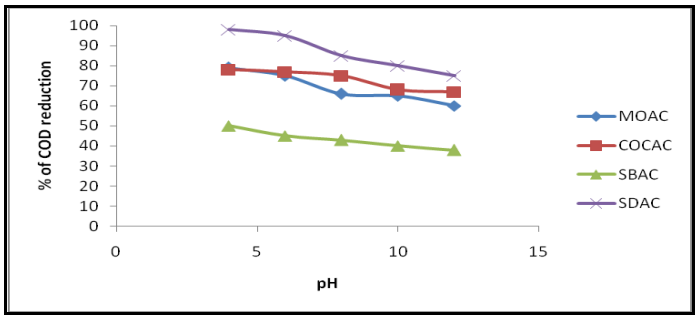

Fig.3 Effect of pH

Experimental condition (Adsorbent dosage 0.4g, Initial Concentration 450ppm, pH-4-12,Stirring time 120 min)

Effect of Stirring time

The effect of stirring time upon the percentage of COD reduction using fixed optimal adsorbent dose is shown in Fig.4. The result indicates that Moringa oleifera, Coconut coir, Sugarcane bagasse and Saw dust were achieved a high rate of COD reduction during the initial 120min.The maximum COD removal attained using Moringa oleifera, Sugarcane bagasse , Coconut coir and saw dust 120min respectively. It was also observed that the rate of COD reduction decreased as the optimal time was exceeded for Moringa oleifera and less significantly for the other material used.

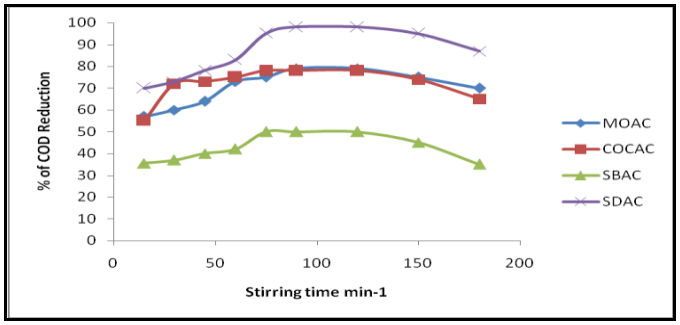

Fig.4 Effect of Stirring time

Experimental condition (Adsorbent dosage 0.4g, Initial Concentration 25-450ppm, pH-4,Stirring time 15-120 min)

Effect of Temperature

The effect of temperature on COD removal using Moringa oleifera, Sugarcane bagasse, Coconut coir and Saw dust were investigated at 300, 310, 320, 330,340K and data were represented in Fig.5. The nature of curve shows that the percentage removal was continuously increasing with increasing temperature. A straight line was observed after 340K for all coagulants. The highest removal of COD was found to be 95% when Saw dust was used. Moreover highest removal of COD found to be 75% when Coconut coir was used.45% Sugarcane bagasse and 70% of Moringa oleifera respectively.

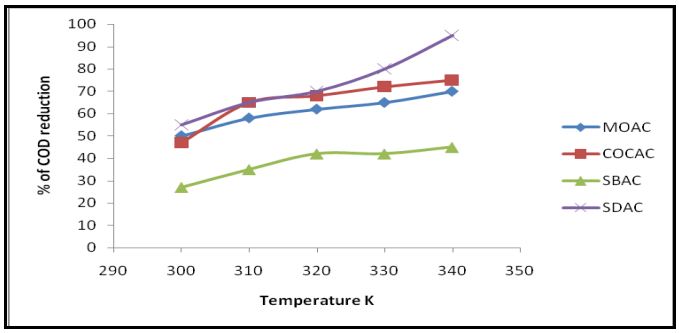

Fig.5 Effect of Temperature

Experimental condition (Adsorbent dosage 0.4g, Initial Concentration 25-450ppm, pH-4, Stirring time 120 min, Temperature 300-340K)

Bio fertilizer /Bio compost

One of the main objectives of this study has been to improve upon the quality of treated pond water activated carbon produced from abundantly available natural seeds which will in turn decrease the use of chemicals. Chemical coagulants was used in treatment process it produce the secondary contaminants. Chemical coagulants it induce Alzheimer's carcinogenic and neurotoxic effects.Natural coagulants used in water treatment process COD reduction in this wastewater has the advantage of providing an easily filterable sludge that was more eco friendly and increased its for potential for reuse. This may decrease the environmental hazards associated with the current sludge which obtained using conventional precipitation techniques. In effectsludge obtainedMoringa oleifera, Coconut coir; Sugarcane bagasse and Saw dust were easily filterable. Overall the technical applicability and cost effectiveness may be the key factors for the application of adsorbents to treat such an effluent. The sludge leftover from after water treatment it is used as a bio fertilizer (or) bio compost. As well it may increase the prospects for water reuse and sludge options for recycle (or) reuse.

Conclusion:

Fig.2 shows the effect of varying the adsorbent dose of Moringa oleifera, Sugarcane bagasse, Coconut coir and Saw dust upon the COD reduction in the investigated pond water. The results indicate in that a maximum COD reduction of 98% was obtained using Saw dust activated carbon. Therefore these optimal adsorbent doses were used for the remainder of the experimental results. In the present study have shown that the application of Moringa oleifera, Sugarcane bagasse, Coconut coir and Saw dust were used COD reduction in pond water. As well the variation in the observed adsorption capacities among four adsorbent materials may be attributed to the difference in the number of carbonaceous adsorption sites available within each. It was also noted that increasing the adsorbent dose beyond the optimum amount slight decrease was observed thereafter. Saw dust was highest removal of COD reduction 98% compared with other activated carbon.

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