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Analytical study of use of corn-cob as an adsorbent for treating textile waste-water

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ABSTRACT

The current research deals with the filtration of waste water using corncobs as low cost water filtration systems which are generally used as fuel which creates air pollution and global warming. Corn cobs are one of the most plentiful and important agricultural wastes in maize cultivation. As they are porous, they can be used as water filtrates. As we know before disposing of waste water from industry, the industrial water has to undergo various chemical process which uses large amount of money, which can be reduced to a large extent when replaced by these filters at the source where industrial waste water is produced. With the increasing industrialization, amount of waste water generated is increasing at alarming rate, so with the help of this cost efficient technology, the waste water generated in the industries can be decreased to a large extent at the source itself. The Corn cob is the least utilized part of the maize plant. Having high mechanical strength, rigidity and porosity, corn cob is a suitable absorbent. This enables contaminants like oxides of salts, detergent, suspended particles, colored dyes, oil, grease and some heavy metals to be absorbed on the surface of the corn cobs. Chemical and physical examinations are necessary to make a marketable product out of corn cob and its charcoal to adsorb contaminants from the domestic and industrial effluents.

1. Introduction

Nonstop monetary advancement and development of created and creating nation around the globe prompts a significant increment of water request. The overall interest for top notch water asset will be hard to meet soon due to waning supply. The unevenness in the request and supply of water assets will turn into a noteworthy issue defying each nation in the approaching couple of decades. The genuine test is to give enough clean water to a quickly developing worldwide populace (and the chaperon requests that accompany development: more vitality, more nourishment, more industry, and more utilization). Progressively sporadic climate examples and cataclysmic events just worsen the circumstance. Absence of treatment alternatives prompt two issues: not treating wastewater (i.e., sewage) before releasing it into conduits dirties the source, frequently rendering the water unusable for drinking [2].Textile industry which is described by its high water utilization and one of the biggest modern makers of wastewater with high shading and broke down natural mixes. The nearness of little measure of colors in material gushing wastewater is profoundly obvious and unwanted. The colors are lethal and even cancer-causing and these represent a genuine peril to amphibian living beings. High toxins in material waste waters are high suspended solids, concoction oxygen request, warm, shading, acridity and other dissolvable substances. Shading is conferred to material effluents as a result of different colors and shades utilized. Numerous procedures have been connected for water treatment from wastewater including natural, physical and compound process, for example, adsorption, coagulation, particle trade, anaerobic absorption, chlorination, oxidation, layer detachment, switch osmosis, electro dialysis, and so on. Every technique has specific advantages and disadvantages. Out of these procedures, adsorption is one of the promising methods for treating colors wastewater. The most broadly utilized adsorbent is carbon due to its high adsorption capacity. Be that as it may, industrially accessible carbons are costly and more noteworthy the cost. The current study shows the utilization of low-cost and agricultural waste materials like palm shell, rattan and mangos teen peel as adsorbent. Corn is a huge yield all around the globe. The yearly creation worldwide is around 520 x 109 kg. Asia is the second real generation locale. The corn cob is the waste created amid preparing corn. Since the proportion between corn grain and corn cob may achieve 100:18, an extensive amount of corn cob was created. It is proposed to change over corn cob into enacted carbon, which is exceptionally valuable to treat the color emanating from wastewater. The main objective of our project is to search for a cheap method of cleaning waste water from domestic and industrial sources by utilizing one of the most under-utilized agricultural wastes. The present study is based on the scientific principles of adsorption by immobilizing the contaminants with the help of corn cobs. Corn is a major crop plant, every part of which is utilized except the seeds.

2. Methodology

This experiment is conducted into three steps.

Step – 1: Preparation of adsorbent

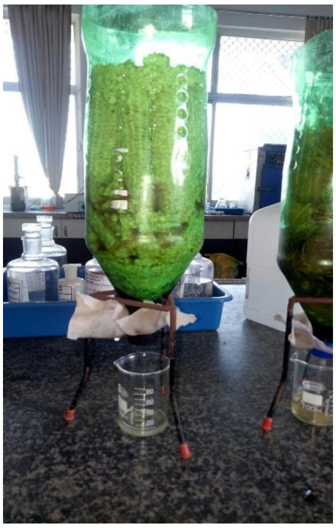
The corn cobs were collected from local farmers, washed thoroughly with water, sun dried until crisp, cut into long and small pieces, ground to powder, sieved it and used as adsorbent. Further, prepared adsorbent is burnt at 400 – 500 ^{o}C to form charcoal. Charcoal is also used as adsorbent in this study.

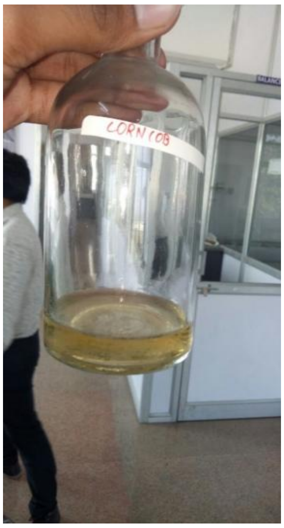
Step – 2: Collection of textile wastewater:

The textile wastewater is collected from well known textile industry located at Pandesara near Surat (Gujarat). This wastewater is characterized by pH, COD, BOD, color and oil and grease.

Step – 3: Filtration using corn cob:

The filtration unit contains the plastic bottle, in which first it is filled with charcoal prepared from corn cob and thereafter layer of corn cob powder. Subsequently, small and large pieces of corn cob are also kept in bottle. Now, textile wastewater is passed through the corn cob and thereafter, its charcoal to remove COD, BOD, color and oil and grease. The parameters COD, BOD and oil and grease is conducted as per APHA ().Visual observation was made to find out the presence of colored dyes.





3. MATERIALS

The corn cobs were gathered from nearby agriculturists, washed completely with water, sun dried, cut into long and little pieces, and ground to powder and consumed in appropriate conditions to frame initiated charcoal.

4. RESULTS AND DISCUSSION

Following results are derived from column adsorption experiments and their respective discussions are also mentioned.

4.1. Chemical Oxygen Demand (COD):

Chemical Oxygen Demand (COD) test is the method for organic matter estimation and rapid test for the determination of total oxygen demand by organic matter present in the sample. The average value of COD was 1825 ppm which is beyond the permissible limit. This study showed a high level of COD, 1933 ppm in the untreated effluent. Increased amount of COD may be due to the high amount of organic compounds which are not affected by the bacterial decomposition. COD was reduced to 210 ppm when treated with corn cob filtration column. The method adapted for analysis of COD content is as per the IS 3025.

4.2. Biological Oxygen Demand (BOD):

BOD is the amount of dissolved oxygen needed by aerobic biological organisms to break down organic material Present in the water sample at certain temperature over a specific time period. Therefore, if effluent with a high oxygen demand is discharged directly into the surface water, the sensitive balance maintained in the water becomes overloaded. Oxygen is stripped from the water causing oxygen dependent plants, bacteria, fish as well as the river or stream itself to die. The outcome is an environment populated by anaerobic bacteria leading to toxic water conditions and there is an indispensable need to bring back the BOD into normal level. In table 1 shows BOD of untreated effluent which is very high, i.e., 310 ppm. The increase in BOD which is a reflection of microbiological oxygen demand leads to depletion of Dissolved Oxygen (DO) which may cause hypoxia conditions with consequent adverse effects on aquatic life. BOD reduced to 270 ppm in the effluent treated with corn cob filtration column. The method adapted for analysis of BOD content is as per the IS 3025.

4.3. Oil and Grease:

Floating grease and fatty particles may agglomerate to form 'mats' which then bind other materials will cause a Potential blockage problem especially in effluent treatment systems. If the surface waters are contaminated with grease or thin layers of oil, oxygen transfer from the atmosphere is reduced. If these fatty substances emulate, they create a very high oxygen demand on account of their biodegradability. Untreated effluent had 12.5 ppm of oil and grease, which was totally removed after letting the water filtered from the corn cob filtration assembly. The method adapted for analysis of oil and grease content is as per the IS 3025.

Table 1: Results of column adsorption study of textile wastewater

Parameter	Before treatment	After treatment	Percentage removal
BOD	310 ppm	270 ppm	12.90%
COD	1933 ppm	1200 ppm	37.92%
Oil and grease	12.5 ppm	NIL	100%
Colour	Present	Absent	-

Therefore, it is well evident that utilization of plant left outs like corn cob is a promising method for treating textile effluent, which can be further enhanced by treating with particular water treatment scheme responsible for effluent treatment and this study can be hopefully extended further.

5. CONCLUSION

With the help of present research, it can be concluded that bio wastes are a good alternatives for treating the waste water and thereby decreasing the pollution load. Optimizing the use of corn cob to minimize the crucial parameters like BOD, COD, Oil & Grease and colour has been successfully achieved by this research. The future prospect of this research is that corn cob can be clubbed with other bio-waste to attain maximum decrement in the crucial parameters to decrease the pollution load. This can even prove to be low cost filteration systems.

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