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Corn cobs as Low Cost Bio-Adsorbent for Water and Waste Water Treatment

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ABSTRACT: This project deals with the filtration of waste water using corn cobs 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. Thus, a matter of primary concern is the economical and efficient utilization of these corn cobs for a purpose. As they are porous, they can be used as water filtrates.

This project discusses about a low cost water filtration system which uses corn cobs as filter materials in its various forms. 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.

KEYWORDS: Corn cobs, filtration, industrial wastewater, BOD, cost effective, bio-adsorbent

I. INTRODUCTION

The world is not running out of water. The real challenge is to provide enough clean water to a rapidly growing global population (and the attendant demands that come with growth: more energy, more food, more industry, and more consumption). Increasingly irregular weather patterns and natural disasters only exacerbate the situation. In the next 40 years, India's population is expected to grow by nearly half a billion. In the next two decades alone, 225 million more people will be living in Indian cities. The water required to serve this population today is 740bn cubic metres per year. By 2030, this number is expected to grow by approximately 200%, to nearly 1.5tn cubic metres per year. Lack of treatment options lead to two problems: not treating wastewater (i.e., sewage) before discharging it into waterways pollutes the source, often rendering the water unusable for drinking. The water intended for drinking is withdrawn from this same source, and again not adequately treated, creating significant public health problems: 21% of communicable diseases in India stem from unsafe water. According to India's Central Pollution Control Board, the country has an installed capacity to treat only about 30% of the household waste it generates – the rest is released into open drains or straight into the ground. And just two cities, Delhi and Mumbai, which generate around 17% of the country's sewage, have nearly 40% of its installed capacity.

In India, there are 234-Sewage Water Treatment plants (STPs). Most of these were developed under various river action plans (from 1978-79 onwards) and are located in (just 5% of) cities/ towns along the banks of major rivers (CPCB, 2005a). In class-I cities, oxidation pond or Activated sludge process is the most commonly employed technology, covering 26% of total installed capacity. Series of Waste Stabilization Ponds technology is also employed in 28% of the plants, though its combined capacity is only 5.6%. A recent World Bank Report (1986) came out strongly in favour of stabilization ponds as the most suitable wastewater treatment system in developing countries, where land is often available at reasonable opportunity cost and skilled labour is in short supply.

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 cob. In this project, an attempt was made to utilize this less-utilized plant part to clean one of the most precious natural resources, water.

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II. METHODOLOGY

1. Identification of the problem:-

- We concentrate on the main objective of the project i.e. reducing the cost of filtration of water and waste water by utilizing farm waste of corn.
- Need of the hour is to clean natural water bodies.

2. Collection of the data and raw materials:-

- Collect the raw materials required
- The corn cobs were collected from local farmers, washed thoroughly with water, sun dried, cut into long and small pieces, and ground to powder and burnt in suitable conditions to form activated charcoal.



Figure 1: Corn cobs



Figure 2: Longitudinal section of corn-cobs

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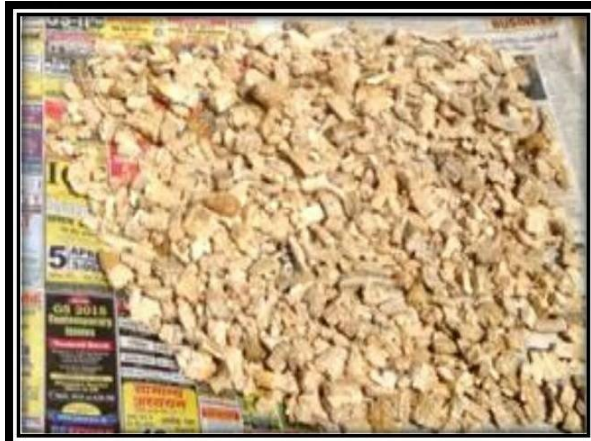


Figure 3: Smaller pieces of corn cobs



Figure 4: Powdered form of corn-cob



Figure 5: corn-cobs charcoal

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3. Preliminary Investigation:-

- A cob was taken whose pith was removed carefully from the top to make a hole at the centre of the cob without piercing the other end for the pilot experiment.
- Then, 50 ml of domestic effluent collected from kitchen drain pipe was allowed to pass slowly through the central hole of the cob and the filtrate was collected.
- The filtrate was subjected to several qualitative tests like the presence and absence of oxides of salts, detergents, oils, colored dyes, suspended particles, etc.

4. Testing of various samples of waters:-

- Physical and chemical tests viz., determination of pH, BOD, COD, TSS, turbidity, chloride contain performed and results noted.

5. Preparing filter setup:-

- Corn cobs were washed thoroughly and then dried for one month.
- Then, corn cobs were cut into longitudinal sections, smaller sections, powdered form and charcoal was also prepared.
- Further these different forms of corn cobs were arranged in a sequence in arranged manner.

6. Testing of water after passing through filter:-

- The filtrate was subjected to several qualitative tests like the presence and absence of oxides of salts, detergents, oils, colored dyes, suspended particles, etc.
- Test for detergent was done by hand shaking the filtrate to mark foam.
- Visual observation was made to find out the presence of colored dyes.
- Chemical tests were conducted in college chemistry laboratory to find out their presence or absence in the test material.

III. RESULTS AND DISCUSSION

The results and discussion may be combined into a common section or obtainable separately. They may also be broken into subsets with short, revealing captions.

Table 1: Showing the results of Presence/Absence of contaminants in waste water before and after the in sample 1(sugar mill, Basti)

NAME OF THE WASTE	BEFORE TREATMENT	AFTER TREATMENT
BOD	410 mg/l	139 mg/l
COD	402 mg/l	136 mg/l
detergents	Present	Absent
Suspended solid particles	564 mg/l	264 mg/l
Oil and grease	Present	ABSENT
Coloured dyes	Present	Absent
Turbidity	28 NTU	12 TU

IV. APPLICATIONS

- As an effective absorbent for removal of Ni (II) from aqueous solution.
- For cleaner production of carbon adsorbents.
- For removal of hexavalent chromium from aqueous solution by agriculture waste biomass.

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- Preparation of activated carbons from corncobs catalyzed by potassium salts and subsequent gasification with carbon dioxide.

V. CONCLUSION

It was observed that most of the coloured substances present in the effluents are adsorbed in the charcoal layers. The suspended particles are adsorbed in the chaff layers of both long sections and pieces of corn cobs. Maximum adsorption of gasoline waste was found in the powdered corn cob layers. The rate of adsorption was directly proportional to the surface area of the adsorbents.

This study reveals a novel and 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 cob. In this project an attempt was made to utilize this less-utilized plant part to clean one of the most precious natural resources, water.

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