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Abstract:
Various industrial effluent like textile industries, water treatment plant and even sewage water too contain dyes. The dye removal from the wastes becomes very important when the environmental concerns are taken into consideration. Out of various treatments adsorption is observed to be most effective method. The current project is concerned with the use of various leaf powders used as an adsorbent for the dye removal from aqueous solutions. The potential of adsorption process for the elimination of dye molecules is studied by the analysis of various physicochemical experimental condition affecting dye adsorption such as initial dye concentration and pH of the solution. It is concluded that the adsorbents can provide a better low cost adsorption treatment for the treatment of industrial waste water. Thus the technique can be used in the designing of adsorption columns for the industrial waste water treatments.

Keywords: Adsorption; dye removal; industrial waste water; adsorbents.

Introduction:
The industrial Revolution has leads to today's development. Various industries such as Sugar industry, Dairy industry, Textile industry, Paper industry, etc. contribute to the industrial revolution. The industries produce various waste products including solid, liquid and gas products. The textile industries release waste water without treatment. Such waste water containing dyes, these are highly coloured polymers and low biodegradable in nature. Dyes being one of the important recalcitrant persist for long distances in flowing water, retards photosynthetic activity, inhibit the growth of dissolved oxygen and also decrease the recreation value of stream. Various industrial effluents like textile industries, waste water treatment plants and even sewage water too contain dyes. The dyes have been found affect adversely the organisms exposed to it. To prevent this, the waste water needs to be treated. Various methods such as Microbial degradation, Chemical treatment methods, Filtration method, Adsorption methods, etc. The adsorbent material such as Ash, Charcoal and Various leaf powders are used to absorb the dyes from waste water solution and is observed to be better treatment of such waste water. The removal of such coloured compounds from waste effluent becomes environmentally important because even a small amount of dye water can be toxic and highly visible. Various parameters affect the adsorption process.

Materials and Methods:

A) Preparation of dye solution dilutions:

The dye is diluted in different percentages by the addition of water in it. The dye concentration is prepared as 10%, 20%, 50%, and 100% by dissolving respective grams of dye powder in 100 ml water. Congo red and Methylene Blue are used. The O.D. of each dilution at 530 nm was measured by using Colorimeter.

B) Preparation of Adsorbent:

Various adsorbents require various pre-treatment for the activation for the adsorption of dye molecules. The Ash and Charcoal are treated with heat. The heat is provided for the Charcoal and Ash in Hot air oven at 60°C for 12 hrs. The leaf powders such as Tamarind (Tamarindus Indica) and Neem (Azadirachta Indica) are used. These leaves are taken freshly, washed with tap water and then with distilled water and dried in Hot air oven at 60°C for 12 hrs or in the sunlight for 3 - 4 days and ground the leaves. These leaf powders are then treated with 50% Formaldehyde for 3 hrs for the treatment of Chlorophyll pigments and then wash the powder with distilled water, then the powder is treated with 4N H₂SO₄ for 5 hrs for the removal of excess formaldehyde. After the treatment of H₂SO₄ the powder is dried in Hot air oven at 60°C for 12 hrs without washing.
Procedure:

1) Collection of Adsorbent Sample:
   The sample i.e. Ash and Charcoal is collected from Solapur, Maharashtra, India.

2) Preparation of Adsorbent Column:
   The adsorbent is prepared in the column by addition of glass wool at bottom of the column and then the various adsorbents are added after the glass wool in respective columns such as - Ash, Charcoal, Tamarind and Neem.

3) Running the dye solution through column:
   The diluted solution is pass through the column continuously and slowly.

4) Measurement of Adsorption:
   The dye solution after passed through the column was measured for O.D. at 530 nm.

5) Parameters Analysis:
   Different Parameters such as concentration of dye waste water i.e. dye dilutions and the length of the column are studied.

Observation:

   The Fig 1 displays that the arrangement of the column and the adsorption. The dye solution passing through the column drop wise.

   ![Fig.1: Adsorption of dyes by Adsorbents](image)

   The Fig 2 shows that the dye containing Industrial waste water is before passing through the column and after passing through the column.

   ![Fig.2: Before and After Adsorption of dye](image)
Results and Discussion:

Graphs showing the Adsorption by different Parameter analysis:

Dye dilutions:

The dye is diluted and passed through the column and the results are observed that as the concentration of dye in the solution increases, the adsorption decreases.

![Graph 1: Concentration of Dye at 530nm.](image)

Discussion:

The Graph 1 shows that as the concentration of dye increases the Adsorption is seemed to be decreased. In the graph on X - axis shown the different concentrations of the dye and on Y -axis the Optical Density (i.e. O.D.) at 530 nm. The maximum adsorption is seen at nearly equals to 98% - 99% removal of dye.

The Graph 2 shows that as the Length of the column is increases the Adsorption also increases. In this Graph on X - axis the Length of Column is considered and at the same time on Y - axis the Optical Density (O.D.) at 530nm is shown. In this Graph the maximum adsorption is observed when the Length of column is maximum and the adsorption is minimum at the Length of column is minimum.

![Graph 2: Length of the Column in cm.](image)
Conclusion:

It is concluded that the adsorption is a better method for the Dye Removal Treatment for Industrial waste water. From the results that Charcoal, Ash, Neem and Tamarind leaf powders are used for the adsorption. The adsorbents can provide a better low cost adsorption for dye removal. The column method which is mostly used for chromatography purpose but in this work the column method is used for the designing of adsorption columns for the Dye Removal during Industrial waste water treatment. Thus, the industrial waste water can be recycled in more efficient way.

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References -


