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Comparative Study of COD Removal by Adsorption using Orange, Lemon and Banana Peels

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Abstract: ***Dairy industry consumes huge amount of water during production of milk and its products. The wastewater discharged contains organic matter, oils and grease, proteins, high chemical oxygen demand (COD) etc. The untreated wastewater causes land and water pollution, therefore necessary treatments should be done before releasing into the environment. As per the standard norms of pollution control board for milk diary effluents the desirable limit of COD should not exceed 250 mg/l. The present study aims at the comparison of the adsorbents used. The study was conducted using adsorption method. In order to reduce the COD content in the diary effluent the peels of orange, lemon and banana are used. They act as good adsorbents. The effect of pH and adsorbent dosage was evaluated for each peel separately. The percentage removal of organic matter from dairy effluent was evaluated.***

Keywords: Adsorbents, peels of banana, orange and lemon, diary wastewater, Chemical Oxygen Demand.

I. INTRODUCTION

The demand of water for daily consumption was increasing day by day. So it is important to find alternative ways for water sources. Treatment and reuse of wastewater technique can be used to reduce water pollution. Dairy industries are one of the most polluting industries. Nowadays the wastewater production from dairy industry is very high. They use large amount of water in its processing stages and therefore produce a huge amount of wastewater. The wastewater contains minerals, grease, carbohydrates, proteins and fats which are not so easily degradable. The cleaning process of the industry also generates wastewater which contains detergents and other chemicals. This increases the level of COD present in the wastewater. The higher COD shows that it reduces the dissolved oxygen level, promotes eutrophication, generates foul smell, etc. That leads to anaerobic condition in the environment. The existing techniques used for the removal of COD contains heavy equipments, large number of operations, high cost etc. Large amount of fruit peels are send to the garbage daily. They had adsorption properties to attract molecular substance. Thus we can use these for treating wastewater. They are low cost, environmental friendly and non-hazardous.

II. OBJECTIVES

A. To find the suitability of various adsorbents.
B. To estimate the concentration of COD in the effluent.
C. To prevent the contamination of the land and water bodies.
D. To study characteristics of dairy effluent.
E. To optimise the various operating parameters.
F. To identify low cost, locally available adsorbents.

III. METHODOLOGY

A. Collection of wastewater from dairy industry

The wastewater was collected from Jeeva Milk Plant, Kothamangalam, Kerala. The characteristics of dairy wastewater was studied and shown in Table 1.



Fig -1: Wastewater collection tank

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Table 1: Characteristics of raw wastewater

CHARACTERISTICS	VALUES
pH	8.3
Alkalinity	500 mg/L
Turbidity	268 NTU
COD	1173 mg/L
TSS	1180 mg/L
TDS	384.6 µs/ppm

According to general effluent standards as per Kerala pollution control board the permissible value of COD in wastewater should be less than 250mg/L. Based on the character study of dairy effluent the COD value is more than the permissible limit. So the dairy wastewater must be treated before discharge.

B. Preparation of synthetic wastewater

0.5gm of milk powder was added into 100ml of water for making the synthetic wastewater

C. Preparation of bio-adsorbents

The peels where collected and cut into small pieces. The collected peels where washed to remove the dirt and impurities. The peels were oven dried at 100˚C for 24hrs. The peels were powdered and washed several times with distilled water to remove coloring matters. Again the peels were oven dried at 100˚C for 5hrs. The powder which passes through 300µm and retained on 150µm were collected.



Fig -2: Oven drying



Fig- 3: Sieving the dried peels

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D. Adsorption process

Adsorption is a process of deposition of molecular substance on a surface. The surface which attracts the molecular substance is called adsorbent. Here the adsorbents used are the powdered peels of orange, lemon and banana.

The adsorption process was carried out with the help of a magnetic stirrer. The COD test was repeated by varying the parameters such as

1) pH

2) Adsorbent dosage

The percentage removal of COD from the synthetic wastewater was calculated.



Fig -4: Magnetic stirrer

IV. RESULTS AND DISCUSSIONS

A. Effect of pH

Adsorption studies were carried at different pH values in the range of 5 to 10. Other parameters are kept constant. The pH of the synthetic solution was adjusted by using 0.1N NaOH and 0.05N HCl reagents. From figure 5, it was observed that the removal of COD increases with increase in pH up to optimum pH values of various peels. The optimum pH value of banana and lemon peel was obtained as 7 and the maximum percentage removal was 55 .01% and 58.44% respectively. Whereas the optimum pH value of orange peel was 8 and the corresponding percentage removal was found to be 70.5%.

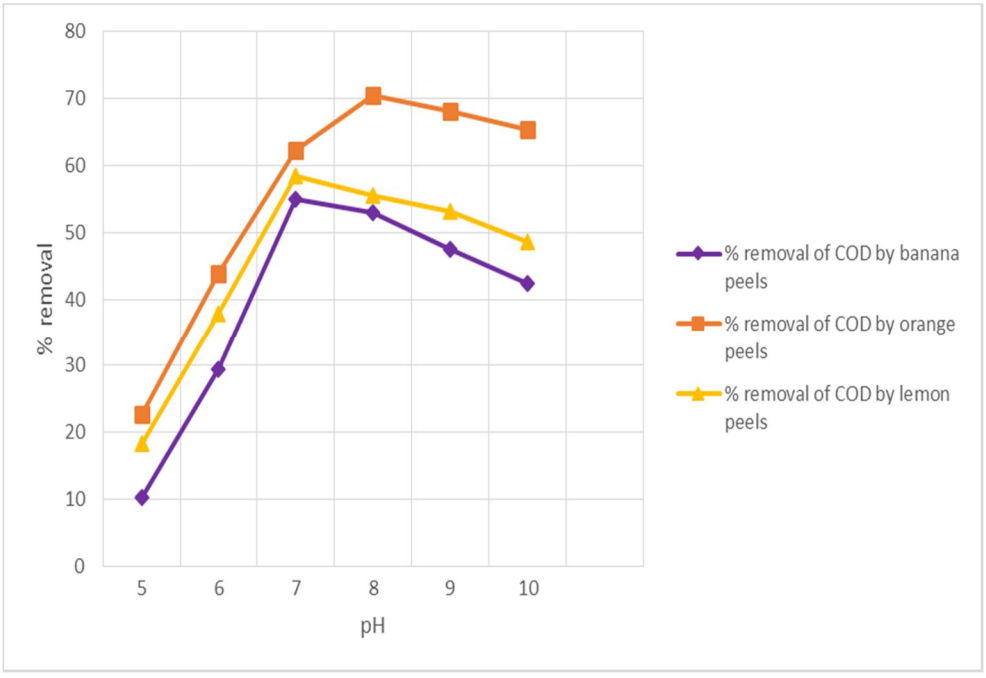


Fig-5: Effect of pH on adsorption onto banana, orange and lemon peels.

Conditions: contact time: 30 minutes; concentration of adsorbent: 0.2g/L; agitation: 200rpm.

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B. Effect Of Concentration Of Adsorbent

In this case the concentration of adsorbent as varied between 0.05 to 0.25g/L keeping all other parameters constant. From the figure 6, it was found that the adsorption rate of COD increases with increase in concentration of adsorbent. This is due to the reason that, as concentration of adsorbent increases, the surface area increases and the number of active sites available for the adsorption of organic matters also increases. The optimum concentration of banana peel was found to be 0.2g/L and the maximum removal was 55.93%. Similarly the optimum concentration of orange and lemon peel was obtained at 0.15g/L and corresponding percentage removal was 74.6% and 60.44% respectively.

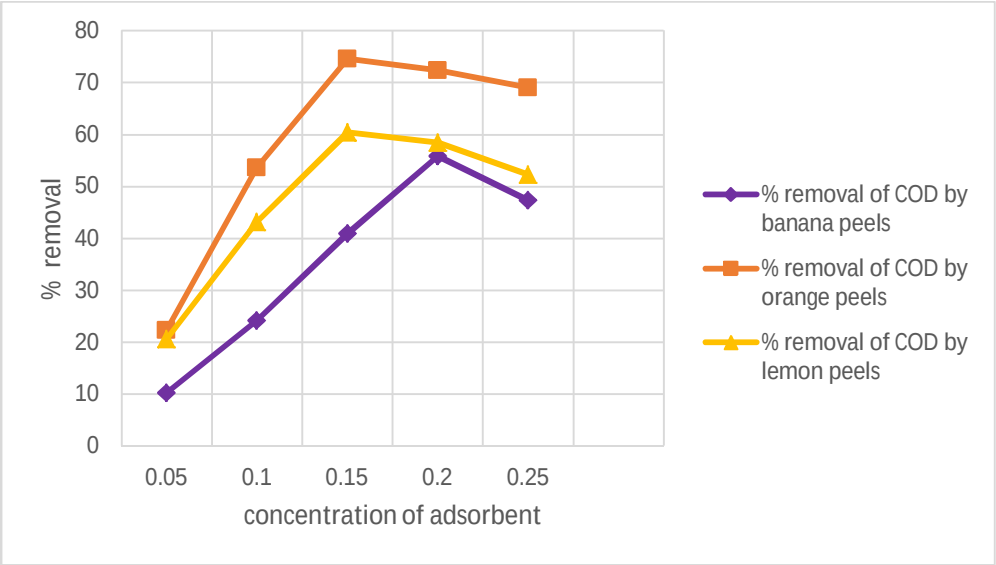


Fig-6: Effect of concentration of adsorbent on adsorption onto banana, orange and lemon peels.
Conditions: pH 7; contact time: 30 minutes; agitation: 200 rpm.

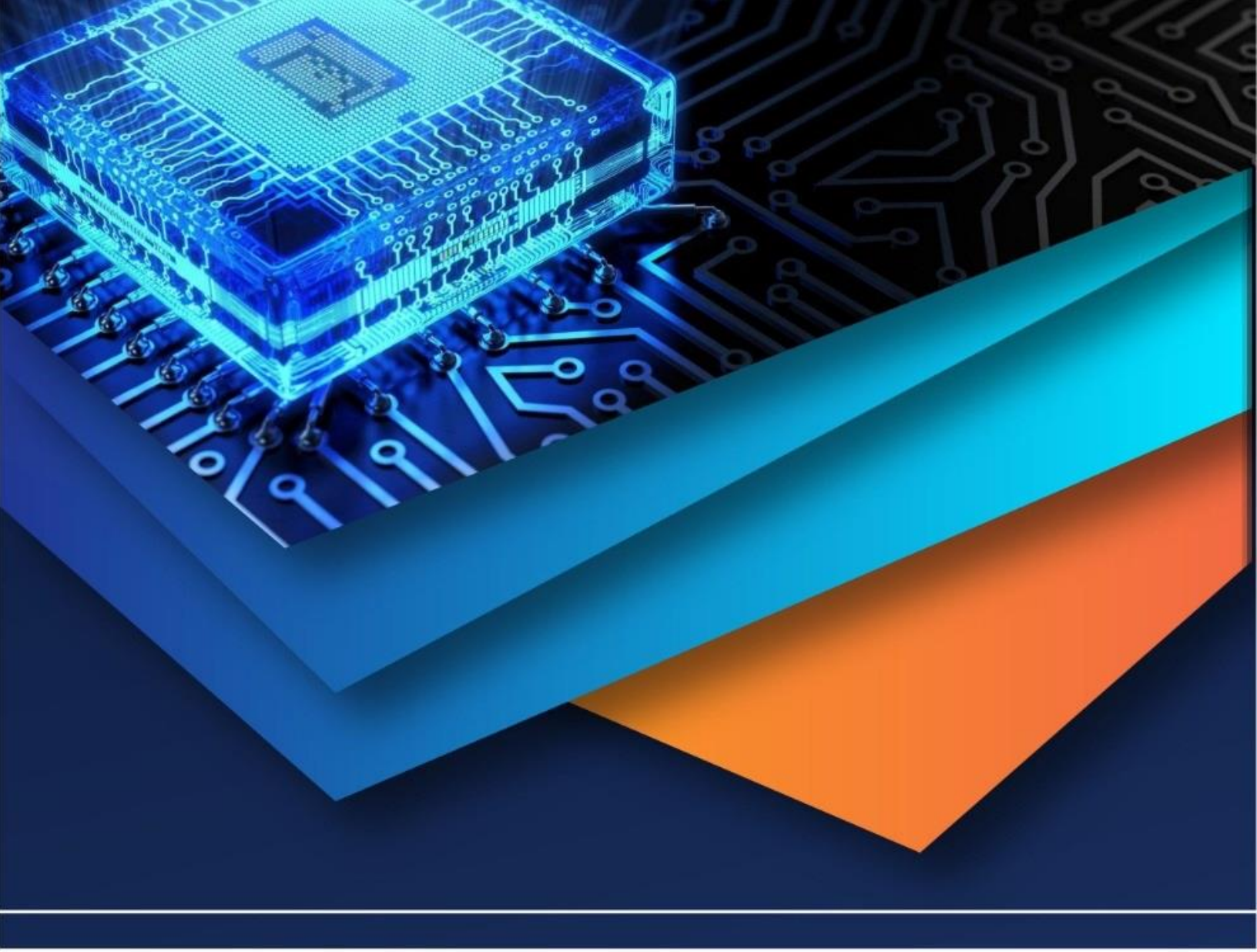
V. CONCLUSIONS

The wastewater from diary industry can cause land and water bodies polluted. By adopting a method of adding adsorbents like peels of banana, lemon and orange into the wastewater can reduce the amount of organic matters present in the diary effluent. The process is done through bio adsorption method. The results obtained from the project gives a suitable peel that can be used for the adsorption process. The maximum % removal 65.33% for lemon was obtained at an optimum dosage of 0.15g and optimum pH of 7. The maximum % removal 80.4% for orange was obtained at an optimum dosage of 0.15g and optimum pH of 8. The maximum % removal 57.63% for banana was obtained at an optimum dosage of 0.2g and optimum pH of 7. From the results obtained by the comparison study the orange peel shows maximum % removal. Therefore orange peel can be selected as a suitable adsorbent for the removal of organic matter from diary effluent.

REFERENCES

[1] Anju S and K Mophin - Kani (2016): 'Exploring the use of orange peel and neem leaf powder as alternative coagulant in treatment of diary wastewater', International Journal of Science and Research (IJSR), Volume 7 Issue 4, April 2016.
[2] JanakiSundaram S, Shankar, Sivakumar, (2016) 'Treating dairy industry effluent using orange peel powder', Journal of Chemical and Pharmaceutical Research (JCPS), Volume 9, Issue3 July 2016.
[3] Manika H, (2015) 'Treatment of dairy wastewater by natural coagulants'. International Research Journal of Engineering and Technology 2:1120-11252.
[4] R Subashree, N. Surya Praba, Dr.G.Anusha (2017): 'Treatment of Wastewater using Banana and Lemon Peels as Adsorbents'. International Journal of Engineering Technology Science and Research (IJETSR), Volume 4, Issue 9 September 2017.
[5] ThuraiyaMahir Al Khusaibi, Joefel Jessica Dumaran, M. Geetha Devi, L. Nageswara Rao and S. Feroz (2015): 'Treatment of Dairy Wastewater using Orange and Banana peels', Journal of Chemical and Pharmaceutical Research (JOCPR),7(4):1385-1391.
[6] V. Mutheeswari, Ms.P.Sasirekha, S. Sivapackiam, S. Soundharya, J. Ragheljebamariyal (2017): 'Treatment of Industrial WasteWater by Using Orange Peels & Fish Scales', International Journal for Scientific Research & Development (IJSRD), Vol. 5, Issue 01, 2017.

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