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TREATMENT OF DAIRY WASTE WATER BY USING GROUNDNUT SHELL AS LOW COST ADSORBANT

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ABSTRACT

The dairy industry involves processing raw milk into products including milk, butter, cheese, yogurt, using processes such as chilling, pasteurization, and homogenization. An experimental investigation was carried out for the treatment of dairy wastewater using low cost adsorbents which is ground nut shells. Generally dairy waste water contains lactose, fat, casein, inorganic salts, detergents, sanitizers etc. These all contribute largely towards their high biological oxygen demand (BOD), chemical oxygen demand (COD) and oil and grease much higher than the permissible limits. Which affect and disturb the environment in this regard's aimed to study. In this paper the waste water from dairy is passing through the grounut shell medium particle size passing through is sieve 4.75mm. & retain on 2.36 mm. By using low cost adsorbent minimize the hazardous effect which is harmful to the environment to considerable extent.

Keywords: Dairy Waste Water, Ground Nut Shell, pH, COD , BOD, TSS.

I. INTRODUCTION

The dairy industry is generally considered to be the largest source of food processing wastewater in many countries. With increase in demand for milk and milk products, many dairies of different sizes have come up in different places. These dairies collect the milk from the produces, and then either simply bottle it for marketing, or produce different milk foods according to their capacities. Large quantity of wastewater originates due to their different operations. The organic substances in the wastes comes either in the form in which they were present in milk, or in a degraded form due to their processing. Milk is an important component of food all over the world Particularly in India milk and milk product are considered to be essential constituent of food. Hence Dairy industry is an essential part of every human community. The effluents coming out of Dairy Industry needs to be treated properly prior to disposal in the prescribed limits so as to control any possible environmental hazards.

Characteristics of waste from dairy industy-

i) High dissolved solids
ii) High suspended solids
iii) High BOD
iv) Phosphorus

v) Nitrogen

vi) Oil and grease

Apart from the traditional methods for treatment of wastewater, dairy industry needs special treatment techniques as it has contents having higher proteins. Enormous studies were conducted to treat dairy effluents and many sophisticated techniques were developed. The proteins contained in the dairy wastewater serves as food to many microbes. Hence biological treatment enhances the effluent quality to much extent.Dehydration and carbonization methods were used to prepare the adsorbents from these peels and the effect of contact time, pH, dosage and particle size in removal of pollutants from the dairy wastewater was evaluated.

Present study focuses on using groundnut shells, which are basically the waste usually fed to cattle's, as absorbents for dairy industry effluent. Water is one of the universal substances, which is used alike by all the living species to sustain life. Clean and plentiful water provides the foundation for prosperous life and communities. We rely on clean water to survive, but now we are heading towards a water crisis. The changes in climatic patterns are threatening lakes and rivers, and also the key sources that we tap for drinking water, which are being overdrawn or tainted with pollution. Moreover, Industrialization activities for the development of nation contribute to global environmental deterioration as these activities caused depletion, degradation and deterioration of natural resources and biodiversity. Additionally, these industrial activities indirectly overload water body with thousands of water pollutant and subsequently polluting the environment. Basic domestic water quantity needs can be divided into categories including water for drinking, cooking, hygiene, and other domestic purposes, including productive uses.

Sr.No.	Parameters	Value
1	pH	5.5 – 9.0
2	Total Dissolved Solids	Not exceed 2100 mg/lit
3	Suspended solids	Not exceed 100 mg/lit
4	BOD	Not exceed 30 mg/lit
5	COD	Not exceed 250 mg/lit
6	Oil and greases	Not exceed 10 mg/lit
7	Chlorides as cl	Not exceed 600 mg/lit

Table No 1. Standards Norms of Maharashtra Pollution Control Board for Milk Dairy effluents

II. LITERATURE REVIEW:

Sheetal S. karale [1] – investigate on dairy wastewater treatment using coconut shell activated Carbon & laterite as low cost adsorbents. The main aim of this is the assessments of reduction of chemical oxygen demand (COD) & biological oxygen demand (BOD) from dairy wastewater using low cost adsorbents like coconut Shell Activated Carbon (CSAC) & laterite in Fix Bed Stationary Phase. The result of before and after treatment is compared & optimum operating conditions were determined for maximum reduction. The mixed bed stationary phase Coconut Shell Activated Carbon (CSAC) & laterite reduced COD upto 72.85% & BOD reduces upto 76.75% in 1:1 ratio & 2:1ratio of CSAC to laterite, COD reduces upto 75.3% & BOD reduces upto 79.69% & finally 1:2 ratio of CSAC to laterite, COD reduces upto 80.65% & BOD reduces upto 81.09%, this is the maximum reduction in the COD & BOD concentration from effluent of dairy processing plant. It could be lucrative technique for treatment of dairy wastewater generated in different sectors.

Neena Sunny [2] – investigate on treatment of dairy waste. The dairy industry involves processing raw milk into products including milk, butter, cheese, yogurt, using processes such as chilling, pasteurization, and homogenization. This paper consequently focuses on how the various constituents of waste water vary with aeration. Diffused fine bubble aeration was done in a circular tank at various flow rates (1.5 l/min., 3 l/min., 4 l/min.) at a detention period of 24hrs.3 l/min. was found to be optimum rate of flow at an optimum time period of 72hrs with a reduction of 88% ,90.37% and 70% in COD, BOD and Turbidity respectively. Treatment using natural coagulant *Moringa oleifera* (MO) was also carried out at optimum air rate and optimum time period. Optimum reduction in turbidity was obtained as 76.67%. 6gm/l MO was found to be optimum dosage.

Mohammad Ajmal [3] – investigate on The Use of Testa of Groundnut Shell *(Arachis hypogea)* for the Adsorption of Ni(II) from the Aqueous System. This paper presents the use of testa of groundnut shell for the removal of nickel from dilute aqueous solutions at laboratory scale. The experimental adsorption data obtained followed both Langmuir as well as Freundlich isotherms. Maximum adsorption (85%) was observed at pH 6. The monolayer adsorption capacity was found to be 18.79 mg/g, which is greater than most of the low-cost adsorbents reported.

Prof. Chidanand Patil [4] –investigate on Treatment of dairy wastewater by natural coagulants. The dairy industry is generally considered to be largest source of food processing. Natural coagulants to be used are Moringa Oleifera seeds, Trigonella foenum-graecum, Dolichos lablab and Cicer arietinum. The efficiency of reduction of turbidity by M.oleifera, Dolichos lablab, T.foenum-graecum and Cicer arietinum are 61.60%, 71.74%, 58.20% and 78.33% respectively. The efficiency of reduction of COD from M.oleifera, Dolichos lablab, T.foenum-graecum and Cicer arietinum are 65.0%, 75%, 62.5% and 83% respectively. For variation of doses of these natural coagulants the reduction of solids takes place. There is not much change in pH and conductivity due to natural coagulants. The efficiency of Cicer arietinum is more compared to other three; this depends on the protein content which is present in the natural coagulant. The increase of dosage causes the increase of turbidity.

Ashutosh Tripathi [5] – investigate on Heavy Metal Removal from Wastewater Using Low Cost Adsorbents. With the onset of industrialization mankind has witnessed various environmental issues in the society. The conventional methods of treatment of heavy metal contamination includes chemical precipitation, chemical oxidation, ion exchange, membrane separation, reverse osmosis, electro dialysis etc. These methods are costly,

energy intensive and often associated with generation of toxic byproducts. Thus, the adsorption has been investigated as a cost effective method of removal of heavy metals from wastewater. In the present study various low cost adsorbent has been reviewed as an abatement of heavy metal pollution from wastewater. These adsorbent includes materials of natural origin like zeolites, clay, peat moss and chitin are found to be an effective agent for removal of toxic heavy metals like Pb, Cd, Zn, Cu, Ni, Hg, Cr etc. Apart from these various agricultural wastes like rice husk, neem bark, black gram, waste tea; Turkish coffee, walnut shell etc. were also established as a potent adsorbent for heavy metal removal. Beside that low cost industrial by products like fly ash, blast furnace sludge, waste slurry, lignin, iron (III) hydroxide and red mud, coffee husks, Areca waste, tea factory waste, sugar beet pulp, battery industry waste, sea nodule residue and grape stalk wastes have been explored for their technical feasibility to remove toxic heavy metals from contaminated water.

Prabha R.T.[6] – investigate on Removal of heavy metal from synthetic wastewater using Rice husk and Groundnut shell as adsorbents. The industrial activities and technology development lead to a significant release of important quantities of heavy metal ions to the environment. Batch experiments were conducted to know the influence of various parameters of adsorption on removal of lead metal ions by agricultural byproducts (Groundnut shell, Rice husk and combined adsorbents). It has been found that the percentage of adsorption increases with increase in pH (in acidic range) and decreases with the increase in metal ions concentration. Equilibrium time required for the adsorption of lead by agricultural byproducts was found to be 2 hrs. The obtained results showed that the adsorption of lead by rice husk and Groundnut shell are of second order reaction.

Nammam Ali Azadi[7] – investigate on Dairy wastewater treatment plant in removal of organic pollution: a case study in Sanandaj, Iran. Wastewater produced by a dairy in Sanandaj is a major source of environmental pollution threatening the city. The statistical sign test was used to assess the standards.The results showed that the average BOD, COD and TSS in the input wastewater was 292.25, 422.92, and 198.33 mg/l, respectively. The ratio of BOD/COD was 0.69, which indicates the capacity of biological treatment was high. The BOD decreased to 64.22 mg/l (92% removal), COD to 33.74 mg/l (92% removal), and TSS to 43.11 mg/l (94% removal) in the effluent, indicating significant removal of water contaminants. The statistical sign test showed that TSS ($P < 0.0001$) and BOD ($P = 0.031$) were incompliance with national standards, but COD exceeded standard threshold ($P = 0.076$).Activated sludge treatment showed a good performance for TSS removal, but was not reliable for removal of BOD and COD pollutants.

Isah U. A.[8] – investigate on Adsorption of lead ions on groundnut shell activated carbon. This work focuses on the utilization of activated carbon prepared from groundnut shell for the removal of lead from water. The effects of temperature, contact time, and initial concentration of lead on the adsorption process have been investigated. Groundnut shell activated carbon is proven to be capable of removing lead from water with a very high efficiency under ambient conditions. Adsorption of lead onto groundnut shell activated carbon is best described by the pseudo second order kinetic model and the Langmuir adsorption isotherm model.

S. Idris[9] – investigate on Kinetic Study of Utilizing Groundnut Shell as an Adsorbent in Removing Chromium and Nickel from Dye Effluent. To determine the adsorption of nickel and chromium in dye effluents using activated carbon prepared from groundnut shell and to determine the adsorption capacity at different contact time. Activated carbon was prepared from groundnut shell using two step processes with H2SO4 as an

activating agent. Three different activated carbon was produced at different residual time of 5, 10 and 15 minutes which are GS/H2SO4/5 (AC1), GS/H2SO4/10 (AC2) and GS/H2SO4/15 (AC3). Chromium and nickel batch adsorption was carried out at various contact time (30 to 150 minutes).The result indicated the maximum chromium and nickel adsorption at the contacttime of 120 minutes and 150 minutes which implies that increase in contact time lead toincrease in the adsorption of the heavy metals.

Uttarini Pathak[10] –investigate on Treatment of Wastewater from a Dairy Industry Using Rice Husk as Adsorbent: Treatment Efficiency, Isotherm, Thermodynamics, and Kinetics Modelling. Effluent from milk processing unit contains soluble organics, suspended solids, and trace organics releasing gases, causing taste and odor, and imparting colour and turbidity produced as a result of high consumption of water from the manufacturing process, utilities and service section, chemicals, and residues of technological additives used in individual operations whichmakes it crucial matter to be treated for preserving the aesthetics of the environment. In this experimental study after determination of the initial parameters of the raw wastewater it was subjected to batch adsorption study using rice husk.

Thuraiya Mahir Al Khusaibi[11] - investigation for the treatment of dairy wastewater using low cost adsorbents. The peels of orange and banana were used as adsorbents in this study by carbonization and dehydration (biosorption) methods and the effect of pH, contact time, adsorbent dosage, and adsorbent particle size in removal of pollutants present in dairy wastewater was evaluated. The studies showed that the orange peels are more effective than the banana peels in the removal of pollutants from the dairy wastewater.

Abdul Sattar Ali Khan[12] - Investigate On Adsorption equilibria were analyzed on the basis of general equilibrium constant expression for the development of fundamental adsorption equations (Freundlich, Langmuir, and BET) in connection with the establishment of a general approach towards physical interpretations of adsorption parameters. Theoretically it was proved that Freundlich plot analysis cannot be used to find useful parameters such as the monolayer adsorption capacity of an adsorbent. The present theory also indicated that the adsorption process with known value of monolayer adsorption capacity can be studied for finding various equilibrium constants on the basis of the Fronaeus equation, which is commonly used in the complexation process.

III. NEED OF STUDY

Water is a valued natural resource for the existence of all living organisms. Indian rivers are polluted due to the discharge of untreated sewage and industrial effluents. Management of the quality of this precious resource is, therefore, of special importance. Disposing different kinds of wastewater such as domestic, industrial and agricultural effluent into environment, especially to surface water, can cause heavy pollution of this body sources. With regard to increasing wastewater disposed standards to the environment, high considerations should be made when selecting proper treatment processes. Any of chemical, biological and physical treatment processes have its own advantages and disadvantages. It should be kept in mind that economical aspects are important, too. In addition, employing environment friendly methods for treatment is emphasized much more these days .

In this study, dairy effluent is collected and analysed for different parameters such as pH, TSS, BOD and COD. After checking such parameters groundnut shell are use for reuce their concentration and purification, which has property to reduce or to absorb the impurities.

IV. OBJECTIVES OF STUDY

- ✓ To check the feasibility of use of groundnut husk as adsorbant for dairy waste water.
- ✓ To determine various parameter of treated & untreated dairy waste water as pH, B.O.D., C.O.D, T.S.S.
- ✓ Environmental pollution control due to dairy waste water.
- ✓ Removing of organic matter by adsorption techniques & reduction of B.O.D., C.O.D., and increase of pH of natural water.
- ✓ To protect the aquatic life from adverse effect of untreated wastewater mixed with natural stream.
- ✓ To protect salination of land
- ✓ To achieve the sustainable development of environment
- ✓ To avoid the pollution of river or natural stream
- ✓ To reuse the waste water for various quality.eg. gardening, flushing sewer , cleaning, farming.

V. METHODOLOGY

- ✓ **Step no 1 –** collection of dairy waste water sample**.**
- ✓ **Step no 2 –**treat the effulent in skimming tank
- ✓ **Step no 3-** to check actual quality of various parameter like pH, COD, BOD, TS
- ✓ **Step no 4-** compare the actual result with permissible parameter**.**
- ✓ **Step no 5-** treat a dairy waste water with groundnut shells rusk **.**
- ✓ **Step no 6- t**esting of treated dairy waste water for various quality parameters like pH, COD, BOD& T.S.
- ✓ **Step no 7-** compare the treated waste water readings with untreated waste water parameters.
- ✓ **Step no 8-**graphical analysis of results.
- ✓ **Step no 9-** result and discussion.
- ✓ **Step no 10-** conclusion.

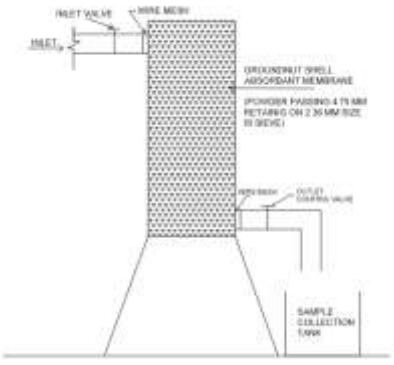

Figure No 1. Assembly Of Experiment

VI. EXPECTED OUTCOME:

- ✓ Environmental pollution control due to dairy waste water.
- ✓ Removing of organic matter by adsorption techniques & reduction of B.O.D.,
- ✓ C.O.D. and increase of pH of natural water by using low cost adsorbent like Groundnut shells husk.
- ✓ To protect the aquatic life from adverse effect of untreated wastewater mixed With natural stream.
- ✓ To protect salination of land.
- ✓ To prepare compost manure from ground shells rusk.
- ✓ To avoid the pollution of river or natural stream.
- ✓ To reuse the waste water for various quality.eg. Gardening, flushing sewer,Cleaning, farming.

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