

Research Paper

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## **Biotreatment of Dairy Waste Water Using Bacterial Isolates**

**Riddhi Trivedi, Bhoomi Patel, Trivedi Goral\***

Department of Microbiology and Biotechnology, University School Sciences,  
Gujarat University, Ahmedabad, Gujarat.

\*Corresponding Author

### **Abstract**

In Developing Countries like India, the major part of dairy sector is under the coverage area of unorganized sector, which lacks adequate treatment facility. As waste water with high organic load causes many adverse effects on both flora and fauna, its discharge to the land alters physical and chemical properties of soil. This will produce harm and affect the aquatic life and make water unfit for drinking. Our present study is planned for biotreatment of dairy waste water using effective bacterial isolates. Total 15 bacterial isolates were isolated from dairy effluent collected from different local dairies using various media like Nutrient agar, MacConkey's agar and Skimmed Milk agar media. On the basis of KOH test and Gram staining test, ten bacterial isolates were Gram positive and five isolates were Gram negative. These bacterial isolates were screened for their ability to reduce the organic matter content, protein content, chloride content, pH, BOD, Hardness of the effluent. Different bacterial isolates showed different ranges of reduction like initial chloride content of waste water was 1191.12 mg/l which was reduced to 595.56 mg/l, initial total hardness was 385 mg/l which is reduced to 230 mg/l, initial pH was 10 which is reduced to 8 pH, initial BOD was 2490 mg/l which is reduced to 198 mg/l by using effective bacterial isolate after 4 to 6 days of incubation. Highly efficient bacterial isolate for reduction of organic matter was screened and identified.

### **Introduction**

The dairy industry has one of the highest consumptions of water and is one of the biggest producers of effluent per unit of production. It is the most polluting food industry in terms of large amount of water use and considering huge amount of water is used during production of milk and milk products. The waste water contains dissolved sugar, protein, fat, and chloride content which is organic in nature and biodegradable. So that waste water is considered as high concentration of organic matter and BOD. The disposal of large quantities of this wastewater with or without treatment and continuous pile of solid waste from the industrial and domestic source rapidly causes deterioration of the environment. Such untreated waste water pollutes land and river systems. So that proper treatment of waste water is necessary before disposal in the environment.

## **Materials & Methods**

### **Sampling of Dairy waste water:**

The dairy waste water used in this study were collected from local dairies of kalol. The sample was collected in plastic bottle which was pre sterilized in boiling water. Physico-chemical characteristic like pH, odor, color, chloride content, TDS were analyzed by standard method.

### **Isolation of bacteria from dairy waste water:**

Collected sample were diluted from  $10^{-1}$  to  $10^{-4}$ . Diluted samples were spreaded on various media like : Nutrient Agar, MacConkey's Agar, Skimmed Milk Agar Media. Than incubated at  $37^{\circ}\text{C}$  for 24 hour. Plates were observed for colony & morphological characteristics. Gram staining and KOH test were done for the identification of bacterial isolates. Biochemical test were done for the identification of bacterial isolates. Pure isolates were maintained on nutrient agar slant and stored at 4 degree temperature for further use.

### **Biotreatment analysis by standard methods:**

#### **pH:**

It is a term used to express the intensity of the acid or alkaline condition of a solution. It is a way of pressing the hydrogen-ion concentration or the hydrogen-ion activity. Pure water is said to be neutral, with a pH close to 7.0 at  $25^{\circ}\text{C}$  ( $77^{\circ}\text{F}$ ). Solutions with a pH less than 7 are said to be acidic and solutions with a pH greater than 7 are said to be basic or alkaline.

#### **Chloride Test:(Argentometric Method)**

Fifty times diluted 25 ml sample was taken pH was adjusted between 7.0 and 8.0 using ammonia. 1 ml of  $\text{K}_2\text{CrO}_4$  was added then sample was titrated with standard  $\text{AgNO}_3$  solution till  $\text{AgCrO}_4$  starts to precipitating (typical stable brick red colored). [K.R.(1886)]

### **Hardness Measurement**

#### **Total Hardness**

Fifty times diluted 20 ml well mixed sample was taken in 250 ml conical flask. 1-2 ml buffer solution followed by 1 ml indicator was added. Pinch of eriochrom black T indicator and titrated with standard EDTA(0.01N) till wine red color changes to blue. [BULUSU, K.R.(1989)]

#### **Ca Hardness**

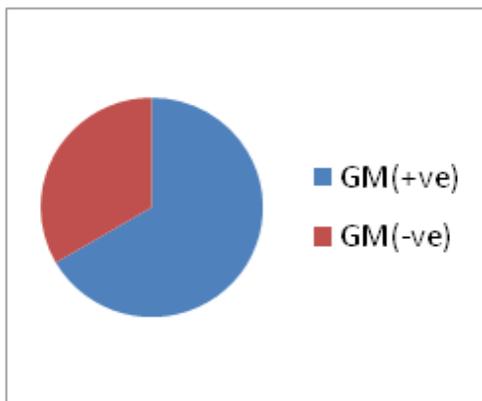
20 ml sample was taken 1 ml of 2N NAOH was added to rise the pH to 12. Pinch of murexide indicator was added. Immediately titrated with EDTA till pink turned to purple. Calculated as total hardness. Initial reading was taken at 1<sup>st</sup> day and for the biotreatment analysis different isolated culture were used for that 50 times diluted sample was taken into 250 ml flask and 2 ml fresh active culture was added and placed on shaker at 143 rpm for 10 days and reading of hardness measurement was taken after every two days by using same method mentioned as above. [BULUSU, K.R. (1989)]

#### **BOD Estimation (Biological Oxygen Demand)**

Biological oxygen demand is defined as the amount of  $\text{o}_2$  required by microorganisms while

stabilizing biologically decomposable organic matter in a waste under aerobic condition. The BOD test is widely used to determine pollution load of wastewater and to check the efficiency of wastewater treatment methods.

### Results & Discussion



Total 15 bacterial isolates were obtained from the 4 different dairy waste water sample on various media such as N. agar, MacConkey' sagar, Skimmed Milk Agar on the basis of Gram Staining and KOH test. 10 Bacterial isolates were Gram positive

5 Bacterial isolates were Gram negative

### Physico chemical properties and tests of wastewater sample:

Characteristics	Initial(mg/l)	After Treatment	Time
<b>pH</b>	10.0	8.0	After 10 days
<b>Chloride Content</b>	1191.12	595.56	After 10 days
<b>Total Hardness</b>	385.22	230	After 10 days
<b>Calcium Hardness</b>	220	97.5	After 10days
<b>BOD</b>	2490	198	After 10 days
<b>TDS</b>	4100	1200	After 10 days

After 10 days of Biotreatment different bacterial isolates shows different bacterial isolates shows different efficiency of reducing pH, Chloride Content,Hardness,BOD level and TDS.

Some of those bacteria were highly efficient.

Which are identified and used for the further study.

### Conclusion

Due to waste water from dairy industry contains high concentration of Organic matter like dissolved

sugar, protein content, chloride, fat, and BOD which Pollutes land and river system.

Hence the importance of carrying out a biotreatment as a starting point in order to optimize a simple and economic method to treat the whole dairy effluent and to meet the indian government's regulation for the effluent discharge to protect the environment.

### **References**

Kumar, R Santhosh. (2016). BIODEGRADATION OF DAIRY WASTEWATER USING BACTERIAL ISOLATES. International journal of modern trends in Engineering and science. 3. 133.

### **Acknowledgement**

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