

Comparative Study of Removal of Dairy Waste Characteristics by Using Natural and Chemical Coagulants

Chaitali Bangar , Pooja Mhaske, Vanita Parasur, Sonali Pawar

Abstract— In world dairy is largest source of food processing industry. Also the dairy industry effluent is the second most important single source of pollution in streams. These dairy Wastewater contains High COD, BOD, TSS, TDS, Turbidity, pH etc. Such untreated dairy wastewater if discharge into natural resources, then it pollute the water resources. So there is high potential risk for environment. Natural coagulant consider safe and more economical for treatments of dairy waste water. The present study is undertaken to compared, under the same analytical conditions, the efficiency of Chemical Coagulant (alum) and Natural coagulant (moringa oleifera). There is reduction the value of pH of 7.4-7.1 and removes turbidity-69.985%, TDS-70.03%, COD-53.38%, BOD-85.98%, respectively by moringa oleifera and reduce the value of pH of (moringa oleifera 7.4-7 and removes turbidity-65.85%, TDS-68.88%, COD-50.52%, BOD-80.70%, respectively by the chemical coagulant alum. Hence the alum is more effective than moringa oleifera.

Index Terms-Moringa oleifera seeds, Natural coagulant, Turbidity, jar test.

I. INTRODUCTION

Dairy industry is place which produced harmful wastewater through cleaning and sanitizing process on milk which contain organic pollutant like fat, proteins and various chemicals. These dairies collect the milk from the produces and then it is bottled for marketing or preparing various milk product according to their capacities [4]. In dairy waste high amount of fat, nutrient, lactose as well as detergent and sanitizing agent. The dairy industry discharges large amount of untreated wastewater due to which there is creation of serious environmental problem. These dairy waste badly affect on water and land and it also effect on human being ,causes disease like chicken guniya dengue fever, yellow fever through mosquitoes. However, the Indian government has maked very strict rules and regulation for effluent discharge to protect the environment [3]. We used various conventional methods like trickling filter, activated sludge process, and aerated lagoon etc. to treat dairy wastewater but this method is very costly. The principal aim of investigation presented in this publication is to verify the efficiency of moringa oleifera, C.arietinum, T.foenum-graecum as a low cost natural coagulant for treatment of dairy wastewater.

II. LITERATURE REVIEW

Submit your manuscript electronically for review. Significant amount of research work has been carried out on treatment of Dairy Industry Wastewater by using different Natural & Chemical coagulants some of this is listed below.

Kokila Parmar [2011].The present study was undertaken to compare of farrous sulphate and aluminum sulphate used as coagulant is treatment of dairy waste.

Rinku Patel,[2012].They concluded that the MO seeds have the potential to be used in the dairy waste water in an effective way and with low cost.

Mrs. BharatiS. Shete, [2013]. They work on comparative study of various treatments for dairy industry waste water. Also they discussed various recent advancement in the treatment of dairy wastewater and stress is given on the lowest cost of the best possible treatments.

Prof.Chidanand Patil, [2015].has studied three natural coagulants the maximum reduction in turbidity and COD is found to be 78.33% and 83% with cicer arietinum.

P.Geetha priya, [2016]. In this present study, an attempt has been made to evaluate the comparative effectiveness of chemical coagulant Alum with Natural Coagulant such as Moringa Oleifera, Cicer Arietinum and T.foenum, for reduction of Turbidity in dairy effluent.

T. Ramesh [2012] has studied a Fixed Film and Fixed Bed Anaerobic Reactor for treating Dairy Waste Water and found that COD reduction is a maximum of 80.88% for a varying influent COD from 1500 to 4700 mg/lit. for the OLR of 0.004 kg COD/ m²/day and HLR of 0.003 m³/m².day. The maximum gas conversion ratio is 0.265 m³ of biogas per kg of COD removed.

Sathyamoorthy G.L [2012] have studied the performance of the anaerobic hybrid reactor (AHR) which is a combination of Upflow anaerobic sludge blanket reactor (UASBR) (suspended biomass) at bottom and Anaerobic Filter Reactor (AFR) (attached biomass) at top to treat dairy wastewater. He used the Bioflow® 30 shape PolyPropylene (PP) inert media as the reactor filter media and revealed that the Anaerobic Hybrid Reactors (AHRs) were effective in the treatment of low-strength dairy wash-water giving 85% COD removal for an OLR of about 4.2 g COD/L.d and HRT of 0.9 d. in BOD , COD and VSS of dairy wastewater in batch and repeated batch cultivation systems. He found that the efficiency of COD removal is associated with the nature and properties of support material. Eventually, the maximum percentage removal of COD, BOD and VSS turned out to be as 96%, 93% and 90%, respectively, with the application of 21 Kg COD/m³/d loading in batch reactor filled with gravels.

Deshpande D.P. et. al. [8] [2012], have used the Upflow anaerobic packed bed bioreactor (UAPB) with an internal diameter of 20cm and a height of 45 cm using seashell as a packing material for dairy wastewater treatment. He used the

UAPB not only for treatment but he proved that with the help of UAPB dairy industry effluent is very good raw material for production of methane gas, commercially known as BIO-GAS, which can be use as a fuel and can replace the other fuel and COD value also decreases from 71526 mg/lit to 42200mg/lit as the time increases from first day to the 56th day of the experiment.

COD/m³/d loading in batch reactor filled with gravels.

Monali Gotmare, [2011] has studied a UASB reactor treating dairy wastewater. And found that reactor achieved COD, BOD, TSS removal efficiency was observed 87.06%, 94.50%, and 56.54% respectively. The average gas production and methane gas conversion at optimum conditions was observed to be 179.35 m³/day and 125.55m³/day, respectively.

III. METHODOLOGY

A. Collection of natural and chemicals coagulants

a) Natural coagulants

The natural coagulants used are as follows

1. Moringa Oleifera

b) Chemicals Coagulants

1. Aluminium sulphate

B. Procedure For Natural Coagulation

Preparation of natural coagulant:-

Moringa oleifera seeds were dried in oven at 40°C temp. Seeds were powdered and sieved through a 150 µm sieve. Two gram of powder was soaked in distilled water, blended and the volume was made up to 100 ml. As a preservative, 0.5 ml HCl was added per 100 ml solution. This suspension was used for the coagulation study

Procedure of natural Coagulation Process:-

- [1] Take 100ml of sample in each of the 6 beakers.
- [2] Add varying doses of coagulants (natural and chemical) of 0.01 to 1 mg/l in different beakers simultaneously.
- [3] Switch on the motor and adjust the speed of paddles to about 100rpm and rapid mixing is done for 1-2 minutes.
- [4] Reduce the speed of paddles to about 30 to 40 rpm and continue slow mixing for 20 minutes. This corresponds to process of flocculation.
- [5] Switch off the motors and allow it to settle for 20-60 minutes. This corresponds to sedimentation or settling of impurities.
- [6] Collect the supernatant from each beaker with the help of pipette, without disturbing the sediment and measure the percentage of turbidity removal using Turbidity meter.
- [7] Turbidity removal corresponding to various doses of natural coagulant measured and the least dose producing maximum removal was designated as optimum coagulant dose.
- [8] The optimum system pH was found by adding optimum coagulant dose Moringa oleifera and the pH of the sample was varied from 5 to 9 and the pH value producing maximum turbidity removal (optimum pH) was determined.

A. Procedure Of chemical Coagulation Process

- [1] The wastewater samples were prepared for 10, 20, 30 g/l concentration as per above mentioned procedure.
- [2] Selected 50mg/lit of alum was added to the wastewater samples as per the optimal dose.
- [3] Coagulant was added to 1lit beakers containing waste water PH was adjusted using 0.1 H₂SO₄.
- [4] The solution was mixed rapidly using magnetic stirrers at 200rpm for 2 min and stirring period was adjusted to 60rpm for 30min, the liquid was clarified for 1 h, then.
- [5] As supernatant was collected and analysed for C.O.D, B.O.D, Turbidity pH & TDS.

IV. RESULT

a. For Natural coagulation

Sr.no	Parameter	Initial value	Final value
1	PH	7.4	7.1
2	Turbidity	29	20
3	TDS	3800	2650
4	COD	2100	1100
5	BOD	1700	1450

b. For chemical coagulation

Sr.no	Parameter	Initial value	Final value
1	PH	7.4	7
2	Turbidity	29	22
3	TDS	3800	2800
4	COD	2100	1250
5	BOD	1700	1550

V. CONCLUSION

The characteristics of influent dairy waste water are pH value 7.4, turbidity-29 NTU, TDS-3800mg/lit, COD-2100mg/lit, BOD-1700mg/lit. From the present study, it clearly shows that natural coagulant like moringa oleifera reduce the value of pH of 7.4-7.1 and removes turbidity- 65.85%, TDS-68.88%, COD-50.52%, BOD-80.70%, respectively.

The chemical coagulant alum reduce the value of pH of 7.4-7 and removes turbidity-69.985%, TDS-70.03%, COD-53.38%, BOD-85.98%, respectively.

From the comparative study we have conclude that the chemical coagulant like alum is more superior than natural coagulant.

REFERENCES

- [1] Kokila Parmar, Sarju Prajapati, Rinku Patel, Yogesh Dabhi, "Effective use of ferrous sulphate and aluminium as a coagulant in treatment of dairy industry wastewater", *Asian journal of environmental science*. volume 6/issue2 [2012] ISSN 1819-6608.
- [2] Kokila Parmar, Sarju Prajapati, Rinku Patel, Yogesh Dabhi, "Effectiveness of moringa oleifera as natural coagulants aid for waste water treatment of dairy industry", *ARPN journal of engineering applied science* [2011].
- [3] Mrs Bharati S. Shete, Dr. N. P. Shinkar, "Comparative study of various treatment for dairy wastewater", *IOSR journal engineering* vol. 3, issue 8, e-ISSN:2250-3021, p-ISSN:2278-8719
- [4] Prof. Chidanand Patil, Ms. Manika Hugar, "Treatment of dairy wastewater natural coagulants", *International research journal of*

engg and technology (IRJET) Vol.2, issue 4,e-ISSN;2395-0056,
p-ISSN:2395-0072, July 2015.

- [5] P.Geetha priya, J. Sharpudhin."Comparative study of removal of turbidity from waste water by using chemical and natural coagulants", *International Journal of Science, Engineering and Technology Research (IJSETR)* Volume 5, Issue 5, May 2016 ,ISSN:S2278-7798
- [6] T.Ramesh, V.Nehru kumar, G .Srinivasan, "Kinetic Evaluation of Fixed Film Fixed Bed Anaerobic Reactor by Using Dairy WasteWater", *International Journal of Pharmaceutical & Biological Archives*, 2012; 3(4):835-837 .
- [7] Sathyamoorthy G.L. and Saseetharan M.K., "Dairy Wastewater Treatment by Anaerobic Hybrid Reactor a study on the Reactor Performance and Optimum Percentage of Inert Media Fill inside Reactor", Vol.16 (1) March (2012) Res. J. Chem. Environ
- [8] Deshpande D.P., Patil P.J. and Anekar S.V.," Biomethanation of Dairy Waste", *Research Journal of Chemical Sciences*, ISSN 2231-606X Vol. 2(4), 35-39, April (2012).
- [9] Monali Gotmare, R.M.Dhoble,A.P.Pittule , "Biomethanation of Dairy Waste Water Through UASB at Mesophilic Temperature Range", (*IJAEST*) @ 2011, Vol.8 Issue 1, 001-009.