Evaluating the Role of Neem in Improving the Coagulation Efficiency in Dairy Wastewater Management

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Abstract- The global demand for dairy products is considerably high, which contributes to the increasing accumulation of waste. The wastewater released from dairy industries is characterized by a high concentration of organic materials. This type of wastewater is treated with a variety of coagulants. Coagulants are categorized into two types: organic and inorganic. Among these, the chemical coagulant, specifically the organic-based coagulant, is also known as a natural coagulant. In recent times, there has been heightened interest in the exploration of natural coagulants. Neem (Azadirachta Indica) has been identified as a natural coagulant for experimental studies. Initially, tests are conducted to evaluate different characteristics of dairy wastewater, such as pH, turbidity, total dissolved solids, etc. A jar test is utilized to ascertain the dosage. Neem leaf powder is incorporated into the wastewater as a natural coagulant. Experimental findings reveal that varying dosages of Azadirachta Indica are effective as an absorbent in the treatment of dairy wastewater.

***Key Words*:** pH, Turbidity, neem leaves.

1.INTRODUCTION :

The dairy industry is a vital component of the global food processing landscape. It has the potential to contribute to global food security in a sustainable manner by adeptly converting milk into various dairy products and ingredients. Nonetheless, the dairy sector generates a diverse array of waste materials, both qualitatively and quantitatively, which can pose significant pollution risks. The wastewater produced by dairy facilities primarily arises from the cleaning and washing activities associated with milk processing. The elevated concentration of organic matter found in dairy wastewater leads to pollution challenges for the surrounding environment. As a result, wastewater from dairy plants cannot be discharged directly into lakes, rivers, or other bodies of water for further use. There is an increasing emphasis on sustainable water management, particularly in the quest to develop effective processes within the dairy wastewater industry. It can play a pivotal role in supporting global food security sustainably by efficiently converting milk into dairy products and ingredients.

Present investigative work was undertaken to evaluate the feasibility of both physical and chemical processes, specifically focusing on coagulation with herbal coagulants for dairy wastewater. In this research, neem leaf powder is employed as a coagulant for the treatment of dairy wastewater. The wastewater sample was collected from a dairy located in the mid-district of Maharashtra. This sample is utilized for experimental studies to investigate the application of natural coagulants in treating dairy wastewater, aiming to make the water suitable for further treatments and to facilitate safe wastewater management by discharging it onto land and into rivers, lakes, etc.

2. OBJECTIVE:

1. The preparation entails converting neem leaves into a powdered form suitable for coagulation purposes.
2. To analyze the performance of neem leaf powder as a natural coagulant.
3. Utilizing distinct amounts of natural coagulants in the treatment process of dairy wastewater to effectively decrease pH, turbidity, and TDS levels.
4. To investigate the usability of treated water for a range of applications

3. SCOPE:

1. is essential to evaluate alternative treatment approaches for wastewater.
2. Ensuring the industry's processes are well-maintained is vital for checking loopholes.
3. The industry utilizes a higher volume of water for each unit of milk processed under stable conditions.

4. LITERATURE REVIEW:

4.1. Ranjeeta Wadhwani, L.K. Murdia, Sunil Paliwal (2005).The various waste handling and treatment systems employed in India's dairy industry are discussed. Whey fermentation for ethanol, single-cell protein, galactosidase, baker's yeast, lactic acid, ammonium lactate, propionic acid, and methane, as well as waste water treatment and biomass engineering, are all discussed. This study also discusses the management of air and noise pollution. each product in dairy industry produces waste butter, cheese, yogurt, condensed

milk, dried milk (milk powder), ice cream, indigenous dairy separation us chilling. pasteurization, homogenization condensation, desiccation. fermentation, coagulation, drying freening, etc. Typical by products include buttermilk, whey. and their donatives Waste is generated at each of different quality and quantity. The determined by environmental factors and they cause pollution. The government of India has promulgated the Environmental Protection Art- 1986, sn is bligatury for the processors in pre treas the effluents before discharge in inland water of rivers.

4.2 Devang Jani (2009).Every process in this paper generates some undesirable by-products with products. India is the world's largest producer of milk. About 2-3 lit of waste is used for every lit of milk processed, resulting in biodegradable effluent with a high BOD value. Global environmental concern has sparked a worldwide awakening to the importance of environmental protection, and industrial waste disposal standards are becoming more stringent.

4.3 Robert G. Yeck, US Department of Agriculture, (1981). Waste from milk houses and milk rooms will continue to be a problem. They'll presumably be diluted and disposed of with dairy dung for the most part. However, public pressure is likely to prevent the same treatment of toilet waste as dairy manure. Dairy manure undergoes chemical changes during handling and storage. Nitrogen losses of 50% are not uncommon. Ammonia is released, which does not appear to cause any hazards in dairy barns, but it adds to the corrosiveness and odor nuisances of dairy manure. The pH of fresh dairy manure is usually about 7.0, but it can range from 5 to 9.

5.1. METHODOLOGY:

1.Collection of material
2.Preliminary test on dairy wastewater
3.Jar test
4.Result and discussion
5. Test after adding neem leaf powder
6.Conclusion

5.2 MATERIAL USED:

1.Dairy wastewater
2.Neem leaf powder

Neem leaf powder:

Neem leaves were collected from a local neem tree and washed with tap water. The leaves are then dried under the sunlight for a five to six days. Then grinded using a household food processor normally use in kitchen and make a fine neem leaf powder. Neem leaf powder of 500 grams was made organically.

Fig 1:Neem leaf powder

5.3 Test on dairy wastewater:

1.pH
2.Turbidity
3.TDS

Table1: preliminary test results on wastewater

1.	PH	9.12
2.	Turbidity	185NTU
3.	TDS	3000

5.4 Jar test apparatus:

Jar Test Apparatus, commonly known as flocculators or flocculation testers. *Jar test apparatus* allows efficient and economical flocculation, jar Test Flocculator are used for a uniform stirring of samples in a water testing laboratory. It simulates the coagulation/flocculation process in a water treatment plant and helps operators determine if they are using the right amount of treatment chemicals or not.

Fig 2: Jar test apparatus

5.5. Results and discussion:

The coagulation process is essential for wastewater treatment. It is used to remove solids from water by manipulating the electrostatic charges of suspended particles. In this study, dairy wastewater is used for coagulation experiments with neem leaf powder. Five doses of neem leaf coagulant, including 0.2g, 0.4g, 0.6g, 0.8g, and 1.0g, were applied to the wastewater. A considerable reduction in turbidity was achieved with the application of neem leaf powder as a coagulant.

Table2.Test result after adding neem leaf powder in dairy wastewater

Dosage (g/l)	0.2	0.4	0.6	0.8	1.0
pH	6.71	6.02	6.45	7.2	6.97
Turbidity (NTU)	40	36	25	15	4
TDS (g)	2000	3000	2000	4000	2000

6. Conclusion

This experiment was conducted to investigate the effectiveness of neem leaf powder as a coagulant in the treatment of dairy wastewater. The current experimental findings indicated a significant reduction in turbidity and pH levels when neem leaf powder was utilized. The use of neem leaf powder as a coagulant resulted in a turbidity reduction of approximately 98%. The turbidity decreased from 185 to 4 NTU. The pH levels were found to range from 5.5 to 7.5, which are the standard values recommended for water intended for irrigation purposes. Therefore, it can be concluded that neem serves as an effective natural coagulant in the treatment of dairy wastewater. The treated wastewater can be utilized for various applications such as irrigation, industrial cooling, and aquaculture

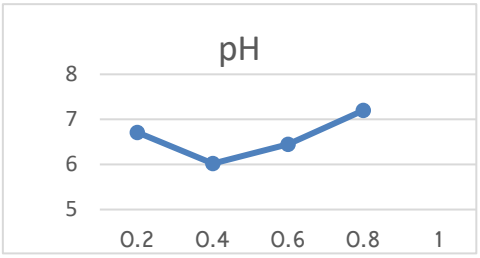

Fig3: variation of pH

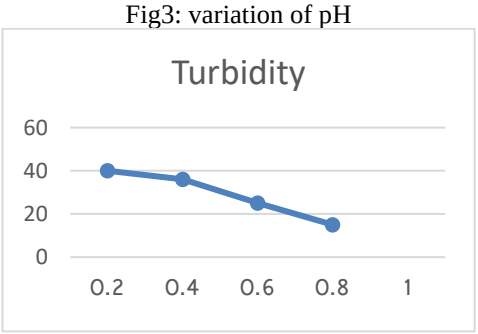

Fig4: variation of turbidity

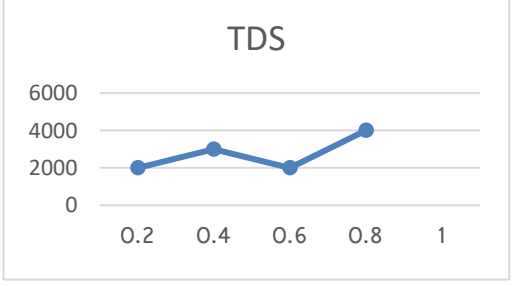

Fig5: variation of TDS

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