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Optimizing Dairy Waste Water with the Help of Natural Coagulant

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ABSTRACT: This research paper examines the effectiveness of using natural coagulants to optimize the treatment of dairy wastewater. Milk processing generates significant volumes of wastewater laden with organic matter and suspended solids, posing a challenge to the environment. Through experimental analysis, this study aims to assess the effectiveness of different natural coagulants in facilitating the removal of pollutants from dairy wastewater. Research focuses on evaluating the coagulation efficiency, cost-effectiveness and environmental sustainability natural coagulants derived from plant extracts or microbial sources. The results obtained from this study will contribute valuable insights to the development of sustainable solutions for dairy wastewater treatment, potentially reducing environmental pollution and promoting resource efficiency in dairy industry practice.

KEYWORDS: Dairy waste water, Moringa olifera, custard apple seeds, neem leaf powder, orange peel powder, cod, turbidity, total solids, chloride test, pH test.

I. INTRODUCTION

The dairy industry, while essential for providing dairy products, faces a significant environmental challenge in the form of wastewater management. The discharge of wastewater from dairy processing facilities contains high levels of organic matter, nutrients, and suspended solids, posing a threat to ecosystems if not treated adequately. Traditional wastewater treatment methods often rely on chemical coagulants, contributing to environmental degradation and escalating operational costs.

To address these challenges, our project aims to optimize dairy wastewater treatment using natural coagulants. Natural plant-based coagulants sources and seafood industry byproducts, offer a sustainable and eco-friendly alternative to chemical coagulants. This approach aligns with the growing global commitment to environmentally responsible industrial practices and circular economies.

In summary, our project seeks to revolutionize dairy wastewater treatment by introducing natural coagulants as a sustainable, cost-effective, and environmentally responsible solution. By doing so, we aim to set a precedent for the dairy industry, promoting practices which not only meet regulatory standards but also contribute to a healthier planet.



A. Collection Of Dairy Natural Coagulant

The collection of natural coagulants to optimize the treatment of dairy wastewater involves the acquisition of specific plant materials with coagulation properties. Here are some commonly used natural coagulants

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- i. Moringa oleifera seed
- ii. Custard Apple Seed
- iii. Neem Leaves Powder
- iv. orange peel Powder

B. Collection Of Dairy Waste Water

Efficient collection of dairy waste water is a crucial step in optimizing its treatment with natural coagulants. This process provides representative samples for laboratory analysis and subsequent treatment design. The following factors are decisive for the correct collection of waste water from dairy products.

C. Testing Of Waste Water

Test materials for optimizing the treatment of dairy wastewater with natural coagulants include a comprehensive evaluation of the effectiveness of various substances in coagulation and removal of pollutants from wastewater. These tests are performed before and after the application of the natural coagulant. This testing usually includes test

- i. Turbidity Test
- ii. Total Suspended Solid Test
- iii. Biochemical oxygen demand
- iv. Chemical oxygen Demand
- v. Chloride Test

D. Application Of Natural Coagulant

The application of natural coagulants to optimize the treatment of dairy wastewater involves several key steps to effectively utilize these substances in the coagulation and removal of pollutants from wastewater.

1) Moringa oleifera seed

- i. **Preparation of Moringa oleifera seed coagulant solution:** The seeds are crushed and mixed with water to extract the coagulant compounds. The solution is then filtered to remove any solid particles
- ii. Addition of the prepared solution to the waste water: Add the coagulation solution of Moringa oleifera seeds to the collected dairy waste sample. The coagulant works by binding with suspended particles, causing them to clump together and settle to the bottom of the container.
- iii. **Allowing to Settle:** Allow sufficient time for suspended particles to settle. This settling time can vary depending on factors such as suspended solids concentration and coagulant effectiveness.

> Test Performed:

- A. Ph test
- B. Turbidity Test
- C. Total Suspended Solid Test
- D. Biochemical oxygen demand
- E. Chemical oxygen Demand
- F. Chloride Test



2) Custard Apple Seed

- i. **Preparation Of Custard Apple Seed Coagulant Solution:** The seeds are crushed and mixed with water to extract the coagulant compounds. The solution is then filtered to remove any solid particles
- ii. Addition of the prepared solution to the waste water: Add the coagulation solution of Custard Apple Seed to the collected dairy waste sample. The coagulant works by binding with suspended particles, causing them to clump together and settle to the bottom of the container.
- iii. **Allowing to Settle:** Allow sufficient time for suspended particles to settle. This settling time can vary depending on factors such as suspended solids concentration and coagulant effectiveness.
 - > Test Performed:

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- A. Ph test
- B. Turbidity Test
- C. Total Suspended Solid Test
- D. Biochemical oxygen demand
- E. Chemical oxygen Demand
- F. Chloride Test

3) Neem Leaves Powder

i. **Preparation Of Neem Leaves Powder Coagulant Solution:** The seeds are crushed and mixed with water to extract the coagulant compounds. The solution is then filtered to remove any solid particles



- ii. Addition of the prepared solution to the waste water: Add the coagulation solution of Neem Leaves Powder to the collected dairy waste sample. The coagulant works by binding with suspended particles, causing them to clump together and settle to the bottom of the container.
- iii. Allowing to Settle: Allow sufficient time for suspended particles to settle. This settling time can vary depending on factors such as suspended solids concentration and coagulant effectiveness

> Test Performed:

- A. Ph test
- B. Turbidity Test
- C. Total Suspended Solid Test
- D. Biochemical oxygen demand
- E. Chemical oxygen Demand
- F. Chloride Test

4) Orange Peel Powder

i. Preparation Of Orange Peel Powder Coagulant Solution: The seeds are crushed and mixed with water to extract the coagulant compounds. The solution is then filtered to remove any solid particles





- ii. **Addition of the prepared solution to the waste water:** Add the coagulation solution of Orange Peel Powder to the collected dairy waste sample. The coagulant works by binding with suspended particles, causing them to clump together and settle to the bottom of the container.
- iii. Allowing to Settle: Allow sufficient time for suspended particles to settle. This settling time can vary depending on factors such as suspended solids concentration and coagulant effectiveness

> Test Performed:

- A. Ph test
- B. Turbidity Test
- C. Total Suspended Solid Test
- D. Biochemical oxygen demand
- E. Chemical oxygen Demand
- F. Chloride Test



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III.EXPERIMENTAL RESULTS

TESTRESULT ON UNTREATED DAIRY WASTE:

Sr.no	Parameters	Units	Value (Untreated)	
1	Ph	-	9.5	
2	Turbidity	NTU	310	
3	Colour	Hazen	White	
4	Cod	mg/L	2000	
5	Bod	mg/L	2475	
6	Total Solid	mg/L	2365	
7	Total Dissolved Solid	mg/L	1883	
8	Total Suspended Solid	mg/L	482	
9	Hardness	mg/L	390]

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RESULT:

Dosage in gm/ml	Moringa	Neem leaves	Custard apple	Orange Peel
	oleifera			Powder
2	4.96	5.01	7.24	7.32
4	3.61	4.31	7.19	7.15
6	3.90	4.43	7.01	6.81
8	4.39	3.70	6.83	6.66

TURBIDITY TEST RESULT:

Dosage in gm/ml	Moringa oleifera	Neem leaves	Custard apple	Orange Peel Powder
2	220.84	78.32	49.42	113.02
4	198.32	53.26	35.00	117.87
6	190.25	30.10	20.65	105.16
8	195.31	16.35	13.9	80.90

TSS TEST RESULT:

Dosage in gm/ml	Moringa	Neem leaves	Custard apple	Orange Peel
	oleifera			Powder
2	320.91	317.87	319.64	300.91
4	318.34	309.08	334.27	313.05
6	297.31	305.57	314.71	291.21
8	292.17	297.43	309.32	305.61

COD & BOD TEST RESULT:

	Moringa oleifera	Neem Leaves Powder	Orange Peel Powder
Cod	734.31	725.07	730.54
Bod	564.07	530.54	545.36

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IV.CONCLUSION

Moringa Oleifera shows excellent performance in pH adjustment and turbidity reduction, making it a promising natural coagulant for dairy wastewater treatment.

Custard Apple Seed shows remarkable efficiency in removing TSS, indicating its potential as a sustainable coagulant.

Neem Leaves Powder and orange peel powder show significant reductions in BOD, COD and chloride, indicating their effectiveness in removing organics and pollutants.

Overall, each natural coagulant offers unique advantages in dairy wastewater treatment and highlights the potential of using natural resources for sustainable wastewater management practices. Further research is warranted to optimize dosage and application methods for practical implementation

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