



## Milk Dairy Waste Water Treatment by Using Natural Coagulants

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# ***MILK DAIRY WASTE WATER TREATMENT BY USING NATURAL COAGULANTS***

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**Abstract**— The dairy industry uses massive amounts of water to process raw milk for dairy products and generates roughly 3L of waste water per 1L of processed milk. The waste water discharge from this dairy industry contains a high concentration of organic material such as fats, carbohydrates, grease, protein, etc. Due to pollutants available in dairy waste water, if it is not properly treated then it may cause serious environmental issues. The present study focuses to treat Dairy Waste water with environment friendly natural coagulants like Moringa Oleifera, Neem leaves, Saw dust, Custard Apple seeds powdered form, resulting in an effective natural clarification agent for highly turbid and untreated pathogenic water. Various doses of natural coagulants are evaluated for efficiency in treatment of dairy waste water. On comparison various parameters like of TDS, chloride, pH, turbidity obtained for each coagulant. It was observed that moringa Oleifera seed powder showed best results with effect of pH varies as 9.08 – 4.42, TDS varies from 5.02 – 4.38 ppm, turbidity varies from 162 – 44.6 NTU are experimental found out with the extension. Therefore, low cost Moringa Oleifera seed is recommended as eco-friendly, nontoxic, simplified coagulants for dairy waste water treatment by varying the dosage of coagulants.

**Keywords:**- Dairy Waste, Moringa Oleifera, Neem leaves, Saw dust, Custard Apple etc.

## **1.INTRODUCTION**

Water is key substance for natural and human activities. Water is tasteless, odorless and nearly colorless chemical substance which is the main constituent of earth's streams, lakes and oceans. Which are used for drinking, industrial water supply, irrigation, water recreation for many other uses including being safety returned to environment.

Dairy market volume world wide USD 489.74 billion. Global Cow milk production volume per year 600 million metric tonnes. With 60% of the world population, Asia accounts for only 22% of global milk production. The total world production is more than 530 million tonnes for a population of about 400 billion amounts to an average annual per capita availability of 100Kg.

India is ranked 1<sup>st</sup> in milk production contribution 23 per cent of global milk production. Milk production in the country has grown at a compound annual growth rate of about 6.2 percent reach 209.96 million tonnes in 2020-21 from 146.31 million tonnes in 2014-15. However, over 3% close to 5 million tonnes of milk get wasted due to unreliable electricity supply.

Karnataka daily produces of an estimated milk of 1.6 crore liters of milk, of which about 1.2 crore liters is "marketable supply". KMF procures about 80 lakh liters, which translates to almost 70% of the milk produced. Before the introduction of the incentive scheme, KMF procured roughly 50% of the milk products in the state such as ice-cream, peda, ghee, butter, and so on. With the lock down in place, barring ghee and butter, there is no market for the rest of its bouquet of products, resulting in stocking up of unconverted milk. At present, 13484 dairy co-operative societies are functioning, with in the limit of 14 district milk federations, 23.78 lakh farmers are enrolled as members, out of which 8.37 lakh farmers are active members. The first of the dairy co-operatives that make up KMF started in 1955 in kudige, Kodagu district. KMF was founded in 1974 has Karnataka dairy development co-operation (KDDC) to implement a dairy development project run by the World Bank.

## 2. OBJECTIVES

1. To study the characteristics of dairy waste water.
2. Preparation of natural coagulants like Moringa Oleifera seeds, Custard Apple, Neem Leaves, Saw Dust into powder form.
3. Using different dosage of natural coagulants for dairy waste water treatment for removal of pH, turbidity, Chloride, TDS test.
4. Determination of optimum dosage of coagulants.
5. To check the suitability of treated water for irrigation and used for other purposes.

## 3. MATERIALS AND METHODOLOGY

Dairy waste water collected from the Bhati dairy industry in Davanagere. The physio - chemical characteristics of samples were analyzed. Samples of dairy effluent were collected in clean containers of 5 liters of capacity and precautions will be taken for collection of wastewater. We collected the effluent from a wastewater collection tank in dairy industry.

### 3.1 MATERIALS USED

#### 3.1.1 Moringa oleifera

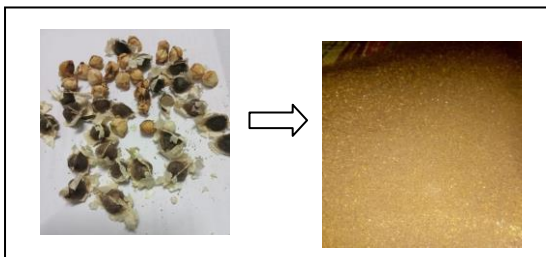


Fig 1: Moringa Oleifera seeds to powder form

Moringa oleifera has been frequently reported for its wide use as a vegetable, functional food, and medicinal plant with a rich nutritional composition and diverse pharmacological activities. Moringa Oleifera works as a coagulant due to positively charged, water soluble proteins, which bind with negatively charged particles (slit, clay, bacteria, toxin etc) allowing the resulting “flocs” to settle to the bottom or be removed by filtration. That act as an effective coagulant for water and waste water treatment.

#### 3.1.2 Neem leaves powder

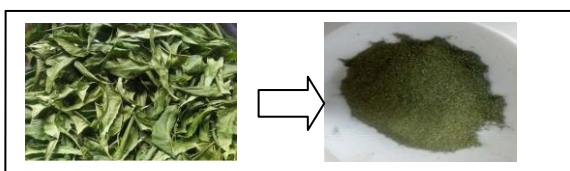


Fig 2: Neem leaves to powder form

Neem leaf powder (*Azadirachta indica*) has shown high efficiency for the removal of heavy metal ions from waste water. Thus the studies on its adsorptive capacity make it acceptable to be used as bio adsorbent to decrease the traces of oil from produced water.

#### 3.1.3 Saw dust



Fig 3: Saw mill wood to powder form

Sawdust, a relatively abundant and inexpensive material is currently being investigated as an adsorbent to remove contaminants from water. Chemical substances including dyes, oil, toxic salts and heavy metals can be removed very effectively with the organic material.

#### 3.1.4 Custard apple

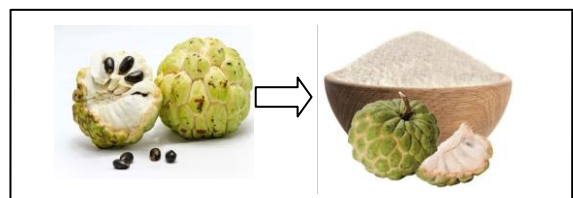


Fig 4: Custard apple seeds to powder form

Custard apple (*Annona Reticulata* tree) is an evergreen plant which is largely available and cultivated in India. The tree itself is known as an air purifier and different parts of the tree such as leaves, fruits and seeds have been reported to possess a variety of medicinal and germicidal properties. In the present work finely ground custard apple seed powder (CASP) was used as an adsorbent for dyes.

#### 3.1.5 Dairy waste water

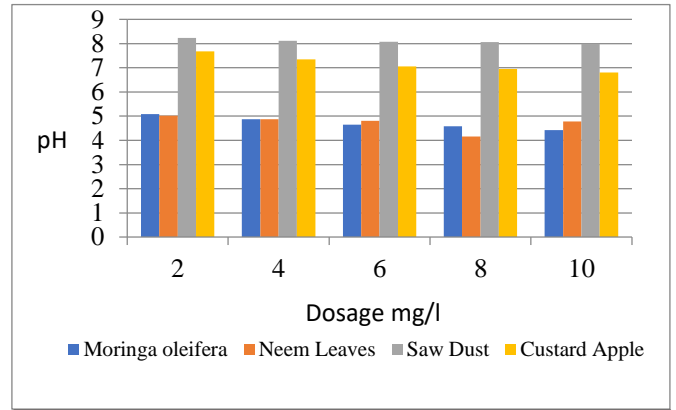


Fig 5: Source of collection of dairy waste water

The above figure indicates the source of dairy waste water used for the project, bhati dairy industry. Bhati dairy industry is located on Karnataka SH- 76 Dodda Bhati Davangere district .In this industry the land area is 25.35 acres its capacity is 0.60 Lakh LPD and MSL 602.5m .The main branch is in “SHIMOGA MILK UNION”

**Test Conducted For Dairy Wastewater Samples:**

- 3.1 Biochemical Oxygen Demand
- 3.2 Chemical Oxygen Demand
- 3.3 pH Test
- 3.4 Total dissolved solid
- 3.5 Turbidity
- 3.6 Chloride test

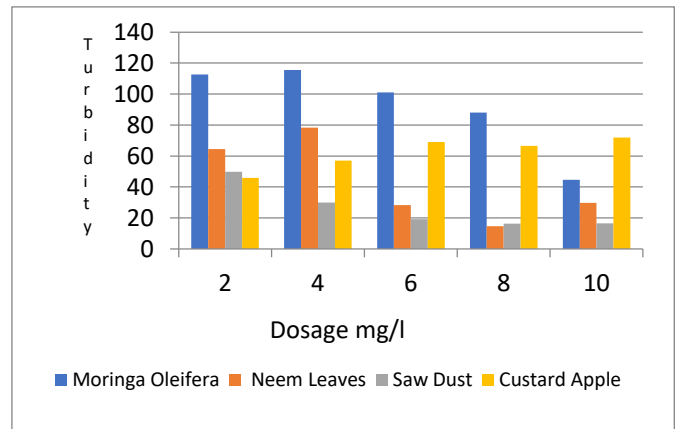


Graph 1: pH reduction by different doses for different coagulantes

**4.2 Turbidity Test**

Table 2: Change in Turbidity values

Dosage in gm/ml	Moringa oleifera	Neem leaves	Saw dust	Custard apple
2	112.16	64.5	49.8	45.8
4	115.5	78.4	30.0	57
6	101.1	28.3	19.3	69
8	88.1	14.7	16.3	66.5
10	44.6	29.8	16.5	72



Graph 2: Turbidity reduction by different doses for different coagulantes

**4. OBSERVATION AND RESULTS**

The treated dairy water was analyzed for various parameters such as pH, Turbidity, Chloride, Total dissolved solids. As per IS 10500, 2012, the permissible limit of pH for drinking purpose is 6.5 to 8.5, and as per IS 2292, 1992 for irrigation purpose is 5.5 to 9.0. Table shows the water quality parameters of treated dairy water.

**4.1 pH TEST**

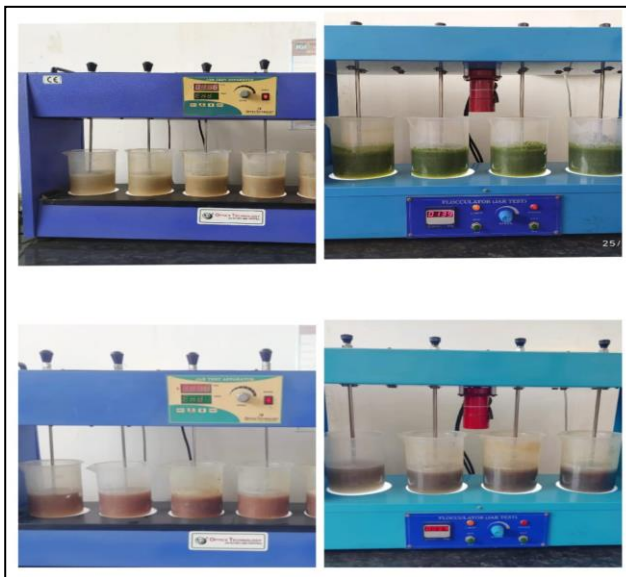
Table 1: Change in pH value

Dosage in gm/ml	Moringa oleifera	Neem leaves	Saw dust	Custard apple
2	5.08	5.02	8.24	7.68
4	4.88	4.87	8.12	7.35
6	4.65	4.81	8.08	7.06
8	4.58	4.16	8.06	6.95
10	4.42	4.78	8.0	6.80

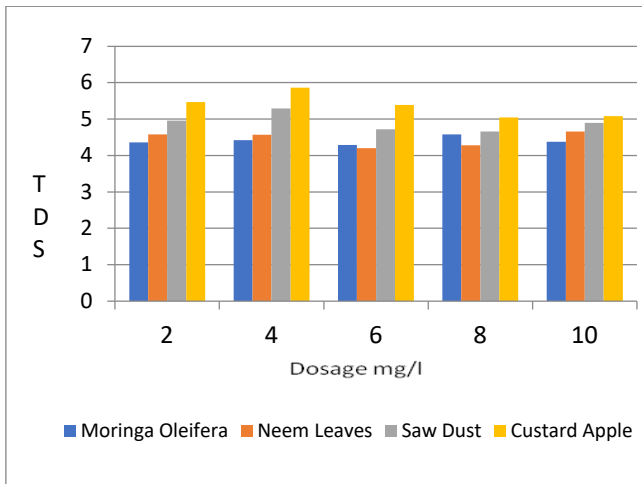
**4.3 TDS Test**

Table 3: Change in TDS value

Dosage in gm/ml	Moringa oleifera	Neem leaves	Saw dust	Custard apple
2	4.36	4.58	4.96	5.47
4	4.42	4.57	5.29	5.86
6	4.29	4.2	4.72	5.39
8	4.58	4.28	4.66	5.05
10	4.38	4.66	4.90	5.08



JAR TEST CONDUCTION



Graph 3: TDS reduction by different doses for different coagulants

Table 4 – Standard values of water

Parameters	pH	Turbidity	TDS
BIS irrigation water standards As per IS 10500 2012	6.0-7.5	-	-
BIS drinking water standards As per is 10500 2012	6.5-8.5	5	500
Treated dairy waste water by <u>Moringa Olifera seeds</u>	9.08-4.42	44.6	4.38
Treated dairy waste water by <u>Neem Leaves</u>	9.08-4.78	29.8	4.66
Treated dairy waste water by <u>Saw dust</u>	9.08-8.0	16.5	4.90
Treated dairy waste water by <u>Custard Apple seeds</u>	9.08-6.80	72	5.08

## CONCLUSION:

The dairy industry is one of the important industry. But the waste water generated in dairy industries is proven to have the problems like turbidity ,oil and organic content so it is very important to treat dairy waste water to prevent hazardous on environment and human health .This project we used on economical way to treatment to treat dairy waste is by using natural materials such as

Moringa Oleifera, Neem Leaves, Saw Dust, Custard Apple. So we carried out the treatment process by varying dosages as well as coagulants on comparison with the performance of each coagulant in removal of effluent is studied. Moringa Oleifera showed better coagulation and turbidity removal for dairy waste water. Effect of pH varies as 9.08 – 4.42, TDS varies from 5.02 – 4.38ppm, turbidity varies from 162 – 44.6 NTU are experimental found out with the extension of current study. Since we collected the dairy wastewater in a very small quantity from a dairy: we suggest that, by using Moringa oleifera as a coagulant instead of commercial alum, for treatment process, we can restrict the treatment expenses in a significant scale.

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