

# International Journal of Innovative Research in Science, Engineering and Technology

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## Experimental Study on Treating Waste Water Using Natural Adsorbents

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**ABSTRACT:** The dairy industry is one of the major source of food processing. These industries produce a huge amount of wastewater. Such wastewater is to be treated before discharging into the water bodies but treatment of such wastewater in actual treatment plant requires more capital hence these wastewater can be treated economically by using naturally and easily available coagulants such as sugarcane bagasse and ground nut shell.

Firstly the dairy waste water sample is taken and then for various dosages of ground nut shell powder and sugarcane bagasse powder the solid reduction of various parameter has been obtained. The optimum coagulant dosage obtained using ground nut shell is 0.8g/l and sugarcane bagasse is 0.2g/l when combination of above coagulants are used to treat dairy wastewater the optimum coagulant dosage obtained is 0.56g/l.

**KEYWORDS:** Sugarcane bagasse, groundnut shell, Optimum dosage.

### 1. INTRODUCTION

Due to rapid increase in industrialization, there is a major impact on the environment. In order to reduce rapid degradation, it is necessary to adopt developed technologies. Pollution refers to contamination of the environment by harmful and waste materials, which brings about a significant change in the quality of the surrounding atmosphere. Environmental pollution can be classified as air pollution, water pollution and noise pollution. Water pollution also signifies contamination of water bodies, which make them unfit for drinking and other uses. The dairies collect the milk from the farmers, and then either simply bottle it for marketing, or produce different milk foods according to their capacities. Large quantity of waste water originates due to their different operations. The organic substances in the waste comes either in the form in which they were present in milk, or in a degraded form due to their processing. As such, the dairy wastes, though biodegradable, are very strong in nature.

Approximately 65% of dairy factory losses enter wastewater discharge streams and these can have a major impact on the environment.

The main sources of dairy processing plant wastewater are:

- Raw material (predominantly milk) and Product losses from leaking equipment and pipelines, and spills caused by equipment overflows and malfunctions and by poor handling procedures
- Materials used for cleaning and sanitizing
- By-products such as whey from the manufacture of cheese and casein.

### II. MATERIALS AND METHODOLOGY

#### MATERIALS

##### 1. Sugar cane bagasse

It is the fibrous matter that remains after sugarcane is crushed to extract their juice. It is dry pulpy residue left after the extraction of juice from sugar cane.

Sugar cane bagasse is collected and then grind in a flour mill and then sieved in a 75 micron sieve to get a fine

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powder of it



Fig 1: sugarcane bagasse



Fig 2: sugarcane bagasse powder

### 2. Ground nut shell

Groundnut Shells is the by-product of Peanuts or an outer layer of the peanuts which is called as shell.

Ground nut shell is collected and then grind in a flour mill and then sieved in a 75 micron sieve to get a fine powder of it



Fig 3: Groundnut shells



Fig 4: Groundnut shell powder

### METHODOLOGY

#### Batch Method:

Firstly the waste water is subjected to sedimentation process. The suspended particles are trapped down in this process. The study of coagulation jar apparatus will be used. The jar apparatus has the six beakers and six steel paddles which helps in the agitation process. Colour, Turbidity, pH, COD, BOD, Total dissolved solids, Total suspended solids are determined initially for waste water taken into consideration. Then it is treated with optimum coagulant dosage to have maximum efficiency of removal water. Final concentration of the above parameters is determined and maximum efficiency attained with optimum dosage is calculated.

#### Jar test Apparatus:

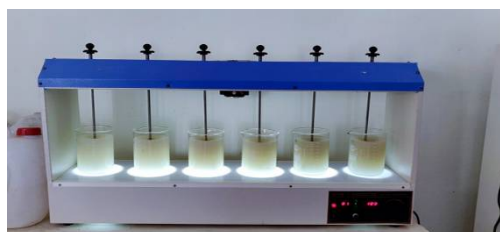


Fig 5: Jar test apparatus

Coagulation and flocculation are the most common method used for turbidity, color, suspended matters, microorganisms and other odor producing substances. It involves the addition of coagulants that brings together the small de-stabilized particles to form large flocs so that they settle under the force of gravity and can be easily separated from the water

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### Parameters to Be Considered:

The different test to be performed is:

- 1 pH
- 2 Turbidity
- 3 Total Dissolved Solid
- 4 Total Suspended Solid
- 5 Dissolved oxygen (DO)
- 6 Biological oxygen demand (BOD)
- 7 Alkalinity
- 8 Acidity

### III. RESULTS AND DISCUSSIONS

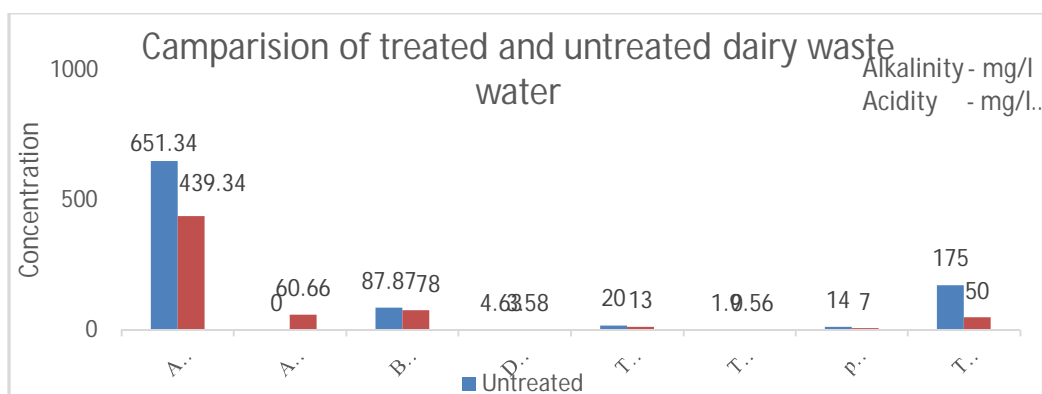
Results of experimentation carried out under varied condition of experimentation are tabulated and represented by graphs and are documented

#### INITIAL VALUES OF PARAMETERS FOR UNTREATED AND TREATED DAIRY WASTEWATER

Sl. No	Parameters	Untreated dairy wastewater	Treated dairy wastewater
1.	pH	14	8
2.	Alkalinity	651.34mg/l	439.34mg/l
3.	Total dissolved solid	20mg/l	13mg/l
4.	Suspended solid	1.9mg/l	0.56mg/l
5.	BOD	87.87mg/l	78mg/l
6.	Turbidity	175NTU	50NTU
7.	Dissolved oxygen	4.63 mg/l	3.58 mg/l
8.	Acidity	0	60.66 mg/l

Above table shows the values of different parameter obtained by testing untreated dairy wastewater and treated dairy wastewater which treated in the actual treatment plant.

#### Graphical Comparison of Untreated and Treated wastewater in Dairy Industry



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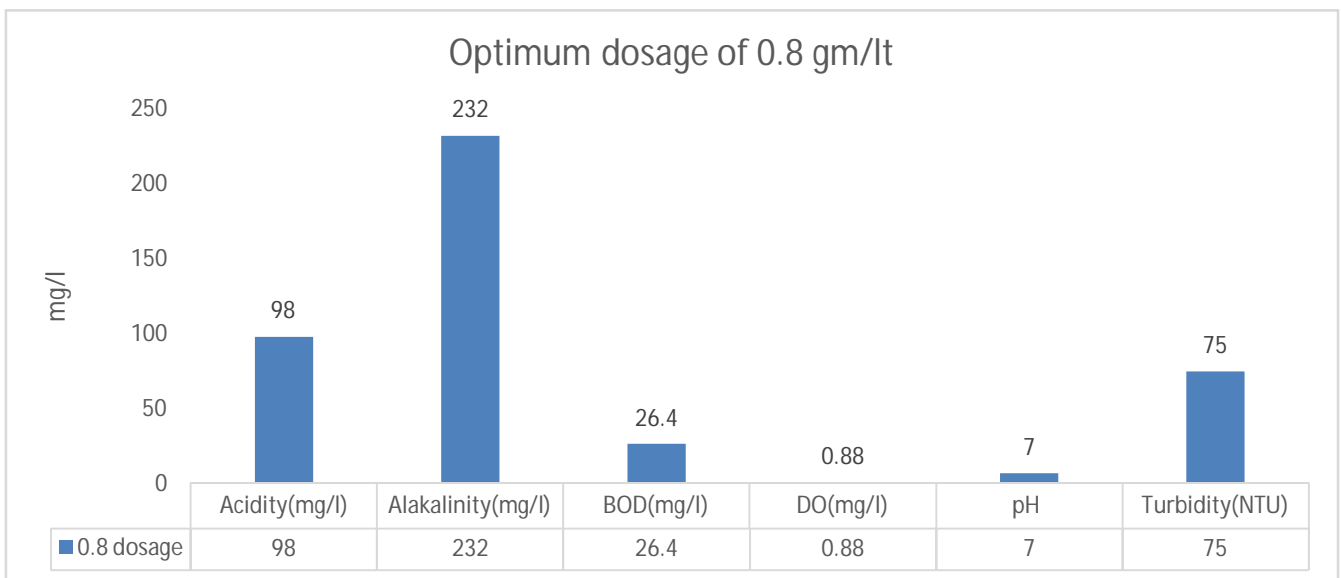
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### GROUND NUT SHELL POWDER AS A COAGULANT

#### Results of Experimentation of ground nut shell powder as a coagulant at pH=14

Dosage (mg)	pH	Acidity mg/l	Alkalinity	Turbidity NTU	DO Mg/l	BOD Mg/l
0.2	7	120	272	134	1.08	25.92
0.4	7	130	264	113	1.4	31.5
0.6	7	130	234	102	1.18	30.6
0.8	7	98	232	75	0.88	26.4
1.0	7	140	264	106	0.98	29.4
1.2	7	130	260	95	1.08	27.9

#### Graphical representation of effect of Ground nut shell on reduction of various parameter of dairy waste water



#### For Optimum dosages reduction efficiency of different parameters are as follows:

For dosage of 0.8 gm., the reduction efficiencies of 50 % in pH, 58.33% in Turbidity, 64.07% in Alkalinity, 69.9% in BOD, 80.99% in DO have been observed.

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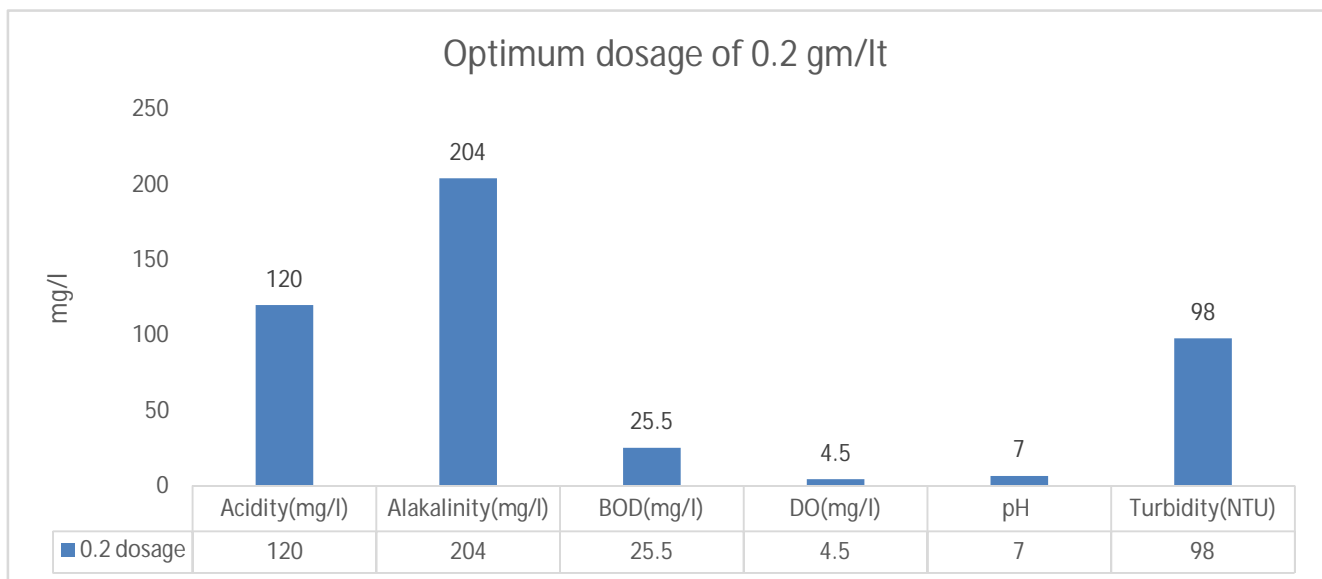
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### SUGAR CANE BAGASSE POWDER AS A COAGULANT

**Results of Experimentation of sugar cane bagasse powder as a coagulant at pH=14**

Dosage (mg)	pH	Acidity mg/l	Alkalinity	Turbidity NTU	DO mg/l	BOD mg/l
0.2	7	120	204	98	4.5	25.5
0.4	7	138	216	155	2.76	37.8
0.6	7	182	240	108	3.55	49.5
0.8	7	220	220	170	3.45	35.1
1.0	7	162	210	136	1.67	48
1.2	7	204	240	165	4.34	47.1

**Graphical representation of effect of Sugarcane Bagasse on reduction of various parameter of dairy waste water**



**For various dosages reduction efficiency of different parameters are as follows:**

1. For dosage of 0.2 gm., the reduction efficiencies of 50 % in pH, 45.55 % in Turbidity, 68.67% in Alkalinity, 2.8% in BOD, 70.9% in DO have been observed.

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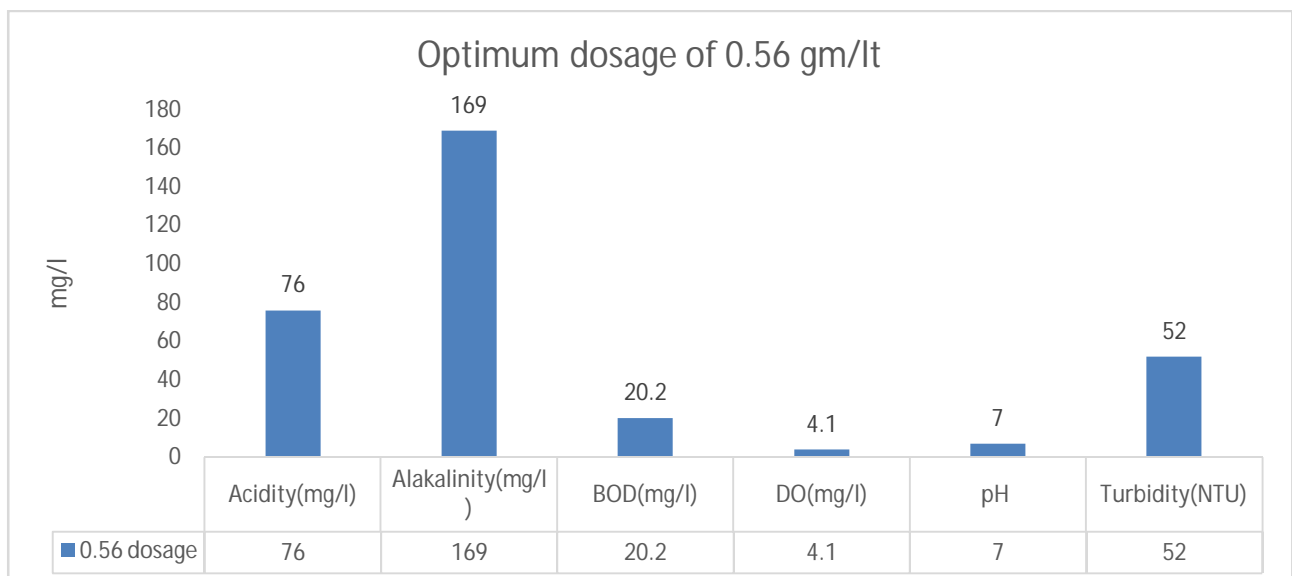
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### COMBINATION OF GROUND NUT SHELL POWDER AND SUGARCANE BAGASSE AS A COAGULANT

#### Results of Experimentation of combination of coagulants at PH=14

Proportion		Dosage (mg)	pH	Acidity mg/l	Alkalinity	Turbidity NTU	DO mg/l	BOD mg/l
GS	SB							
10%	90%	0.74	7	83	172	79	2.1	36.8
20%	80%	0.68	7	103	186	82	1.19	48.5
30%	70%	0.62	7	92	178	74	3.25	25.7
40%	60%	0.56	7	76	169	52	4.1	20.2
50%	50%	0.5	7	98	181	87	4.43	18.6
60%	40%	0.44	7	120	205	98	3.65	23.4

**Graphical representation of effect of combination of sugar cane bagasse and ground nut shell on reduction of various parameter of dairy waste water**



For various dosages reduction efficiency of different parameters are as follows:

For dosage of 0.56 gm., the reduction efficiencies of 50 % in pH, 71.1% in Turbidity, 74.05% in Alkalinity, 77.01% in BOD, 11.44% in DO have been observed.

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## IV. CONCLUSION

Based on results of experiment carried out under varied experimental conditions and the analysis of the same there by the following conclusion has been drawn,

1. It can be concluded that Ground nut shell and sugar cane bagasse is an efficient and economical viable coagulant to purify dairy waste water
2. Ground nut shell and sugarcane bagasse is capable in removal of certain parameter hence the combination of can be done for better efficiency
3. It is concluded that it is efficient in removal of Acidity, Alkalinity, Turbidity, and BOD.
4. By using ground nut shell powder as an adsorbent, for optimum dosage of 0.8 gm., the reduction efficiencies of 50 % in pH, 58.33% in Turbidity, 64.07% in Alkalinity, 69.9% in BOD, 80.99% in DO have been observed.
5. By using sugar cane bagasse as an adsorbent, for optimum dosage of 0.2 gm., the reduction efficiencies of 50 % in pH, 45.55 % in Turbidity, 68.67% in Alkalinity, 2.8% in BOD, 70.9% in DO have been observed.
6. By using combination of both the adsorbent at different proportions, for optimum dosage of 0.56 gm., the reduction efficiencies of 50 % in pH, 71.1% in Turbidity, 74.05% in Alkalinity, 77.01% in BOD, 11.44% in DO have been observed.

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