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Abattoir wastewater treatment using *Cicer arentinum* seed powder as natural coagulant

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ABSTRACT

The coagulation process comes under primary treatment which is followed by sedimentation. The process can aid the reduction of turbidity, BOD, COD, suspended and dissolved solids. The present study is to assess the efficiency of Chick pea seed as coagulant in pollutant removal from Slaughterhouse wastewater. Slaughterhouse wastewater contains blood, feces, hair, remnants of food. The jar test apparatus was employed to treat the waste water using Neem seed powder in laboratory conditions. Water samples were analysed before and after treatment with Neem seed powder as a coagulant. The coagulation process was carried out in batch mode with a constant contact time and varying dosages. The maximum reduction percentages of turbidity, TDS, BOD and COD were 68.3%, 82.2%, 83.3% and 84.2% respectively. This study can pave a way for development of sustainable coagulant for water treatment.

KEY WORDS: Coagulation, Jar test apparatus, Turbidity, BOD, COD.

1. INTRODUCTION

Effluent from slaughterhouse has a larger amount of organic constituents. The rise in meat production causes depletion of water resources due to slaughtering and its processes. Slaughterhouses produce wastewater that contains diluted blood, undigested food, faeces, fats, lards, rumens, urine, soluble proteins, suspended particles, loose meat and other particles. Colloidal particles and pollutant load can be reduced by coagulation processes. The chemicals are used in this process and they are aluminium salts, talcum, activated carbon, silica etc., these chemical coagulants possess some disadvantages and they are listed below.

a) Input of chemical required.
b) Chemical used may cause corrosion if pH exceeds 8.5.
c) Alum in higher concentration can cause Alzheimer disease.
d) They are inefficient in lower temperature and also it produces a larger sludge volume.

It is necessary to discover a coagulant which overcomes those demerits. They can be over came by the employment of natural coagulants in the coagulation process.

Cicer arentinum (Chick pea) is a legume which is the native of Middle East and Asia. Its seeds are high in protein and are used for human consumption and also it is used as animal feed.

2. MATERIALS AND METHODS

Collection of sample: The sample wastewater that is used throughout the study was collected from the drains slaughter house located at Uthamapalyam, Theni, Tamilnadu where 30 heads were slaughtered a day. The wastewater is collected in polyethylene cans after getting rinsed in Deionised water. Then the wastewater can is transported to Bharathidasan Institute of Technology, Trichy. The pH, turbidity, TDS, BOD and COD of the wastewater samples collected from the abattoir.

Table.1. Characteristics of Wastewater

Parameters	Slaughterhouse wastewater
pH	9.0
Turbidity (NTU)	174
TDS (mg/l)	7780
BOD (mg/l)	1545.45
COD (mg/l)	570

Preparation of natural coagulant: The seeds of *Cicer arenti*num was bought from the local market. The seeds were sundried and were grounded to powder using mortar.

Batch Experiments using Jar test: Jar test experiments were experimented to find the feasibility of the Cicer arentinum seeds as a coagulant in slaughterhouse wastewater treatment. The tests were manipulated in 500 ml beakers. Raw wastewater sample of 150 ml were stirred using stirrer in jar test apparatus. The seed powder doses of 0.5g, 1g, 1.5g and 2g were added to the wastewater. The contact time was stably maintained at 30 minutes. After the coagulation process gets over in jar test, the sample is made to settle for 30 minutes. The sample after treatment is measured for pH, turbidity, TDS, BOD and COD.

Figure.1. Powdered Cicer arentinum seed

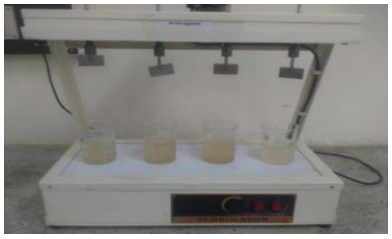

Figure.2. Jar test apparatus

3. RESULTS AND DISCUSSIONS

Effect of Cicer arentinum seed powder on pH of the sample: When the seed powder is added to demineralised water the initial pH was found to be 9.0 and which had no significant change on slaughterhouse wastewater while performing the jar test.

Effect of Cicer arentinum seed powder on Turbidity of the sample: It was observed with floc formation with clear supernatant on dosage of Cicer arentinum seed powder on slaughterhouse wastewater on initial dosages. Initial turbidity of the sample was 174 NTU. The maximum turbidity removal efficiency was 68.3%. The increase in dosage of the coagulant leads to increase in turbidity this may be due to suspension of the particles. The removal efficiencies for various dosages were plotted on the graph.

Effect of Cicer arentinum seed powder on TDS of the sample: Total dissolved Solids present in the raw slaughterhouse wastewater was 7780 ppm and on the usage of Cicer arentinum seed powder the removal efficiency was not so efficient. The removal efficiency ranges were about 65-83% respectively. The efficiency might be lesser because the minute particles in the coagulant can cause the increase in the amount of solids in the water sample. The higher efficiency was observed in 2.0 gram dosage of Cicer arentinum seed powder. The efficiencies were plotted in the graph.

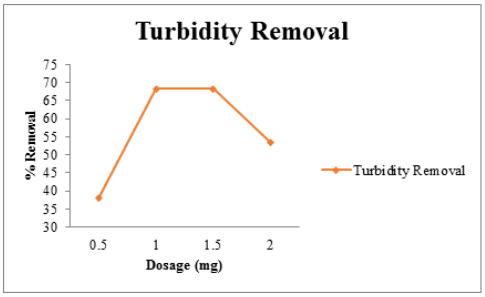

Figure.3. Turbidity Removal efficiency

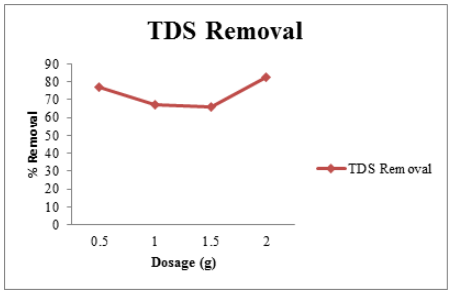

Figure.4. TDS Removal efficiency

Effect of *Cicer arentinum* seed powder on BOD of the sample: BOD concentrations of the sample were changed after the utilisation of natural coagulants in different dosages. Initial BOD of the untreated sample was 1545.45 ppm. The BOD removal for various dosages was on the range between 70-83%. The maximum BOD removal efficiency was 83.3% at 2 gram dosage of *Cicer arentinum* seed powder. The various removal efficiencies of BOD were plotted in the graph.

Effect of Cicer arentinum seed powder on COD of the sample: Initial COD was observed to be 570 ppm. The maximum removal of COD was 79.16% at 1.0 gram dosage of Cicer arentinum seed powder. The removal efficiencies were on the range between 28-84%. COD removal percentages were found to be drastically varying among the dosages.

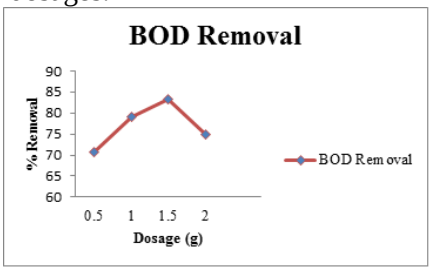

Figure.5. BOD Removal efficiency

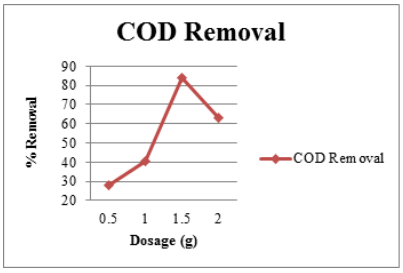

Figure.6. COD Removal efficiency

4. CONCLUSION

The following conclusions were drawn from the observations on the Slaughterhouse wastewater treatment by the usage of Cicer arentinum seed powder as a coagulant.

a) There is no significant change in pH while applying the coagulant in this wastewater.
b) The maximum turbidity removal efficiency was 68.3% on 0.5 gram dosage of the coagulant
c) The maximum total dissolved solids removal was 82.2% at 2 gram dosage of the coagulant.
d) The maximum BOD removal efficiency was 83.3% at 2 gram dosage of the coagulant.

e) The maximum COD removal efficiency was 84.2% at 1.5 gram dosage of the coagulant.

We can therefore conclude that the usage of Cicer arentinum seed as a coagulant in slaughterhouse wastewater treatment is not very effective in the removal of turbidity but it can remove TDS, BOD and COD efficiently. The major advantage on this work is the consistency in pH, due to which unnecessary precautions are avoided. Since its overall efficiency is not up to the mark we need more research on development of a natural coagulant in slaughterhouse wastewater treatment.

REFERENCES

Akinro A.O, Ologunagba I.B, and Olotu Yahaya, Environmental implications of unhygienic operation of city abattoir in Akure, Western Nigeria, 12(3), 2012, 60-64.

Amuda O.S, and Alade A, Coagulation/flocculation process and sludge conditioning in beverage industrial wastewater treatment, Journal of Hazardous Materials, 2007, doi:10.1016/j.jhazmat.2006.07.044

Gauri S. Mittal, Treatment of wastewater from abattoir before land application a review, 2005, 1119- 1135.

Metcalf, and Eddy Inc., Wastewater Engineering Treatment Disposal, Reuse Tata McGraw-Hill, 3rd edition, 1995.

Mohammad Asif, Review on spermicidal activities of Cicer arentinum, 2013, 61-79.

Raghupathi Matheyarasu, Balaji Seshadri, Nanthi S. Bolan, and Ravi Naidu, Impacts of Abattoir Waste-Water Irrigation on Soil Fertility and Productivity, 2011, 55-75.