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TREATMENT OF WASTEWATER USING GARLIC EXTRACT AS NATURAL COAGULANT AND COCONUT SHELL AS MEDIUM

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Abstract

This project focuses on wastewater treatment using garlic powder, as natural coagulant for coagulation and aeration by PVC rings and coconut shell as two different mediums. This sample collected from a leather tannery which consists of high chemical effluent. Important parameters like pH, chloride, dissolved oxygen; mixed liquid volatile suspended solids, hardness, and turbidity are tested before carrying out the treatment. The wastewater which is treated is checked for the changes in parameters and compared with Central Pollution Control Board (CPCB). Water being the elixir of all life source, is a vital natural resource that covers 70% of the Earth's area. Water pollution has an impact on marine ecosystems, human and wildlife health. Sewage, fertilizer, andagricultural run-off all includes organic elements that when discharged into bodies of water, promotes algae development, oxygen deprivation. Because ofthe low oxygen levels, most indigenous creatures in the area are unable to thrive, disrupting the normal biological balance in rivers and lakes

Keywords: Coagulant, Aeration, Dissolved solids, suspended solids, pH, Sewage, PVC Ring

1 Introduction

Earth being the blue planet, has a scarce resource of freshwater available in earth. The total percentage of freshwater that is available at present is 3% and 70% is bound to be found in the form of snow and ice; hence a percentage of about 0.5% of the total water on earth is applicable for drinking and freshwater uses. Due to discharge of harmful substances the primary or the main water source gets polluted to a large extend. Every $1m^3$ of the polluted water dumped into water bodies is projected to contaminate another 8to $10m^3$ of pristine water. The expanding human population, as well as a rise in the amount of the total water which is utilized per person are causing andwill continue to cause water scarcity around the world.

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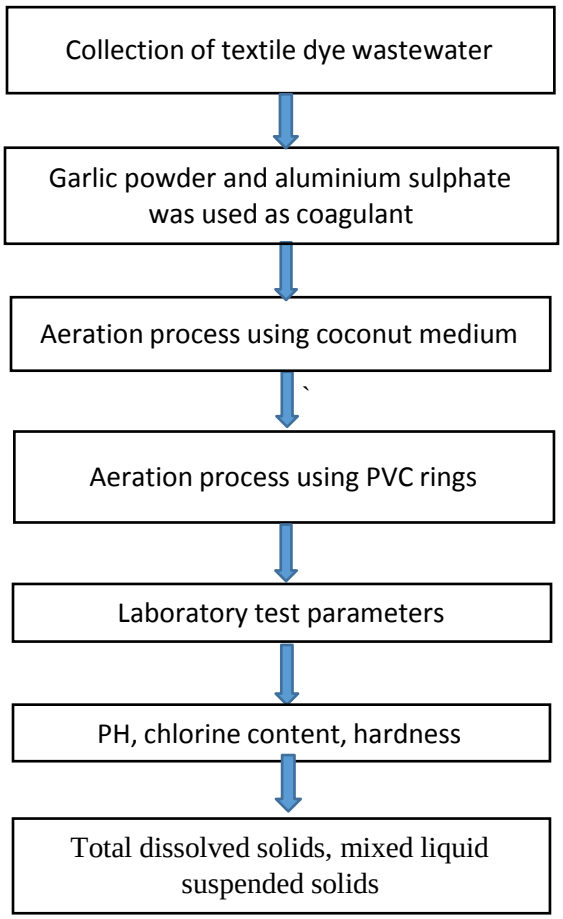
2 Methodology



2.1 Coagulation

- Taking 250ml of sample water for carrying out initial parameters test before starting the process.

- 50 grams of powdered garlic and 35 grams of sulphate powder was mixed together for the preparation of coagulant. A sample of 2 litre was taken into the coagulation tank and using the rotating blade system thesample was mixed with the coagulant for about 5 to 7 min. The sampleis then left undisturbed for about 6 hours for the formation of flocks and its settlement

2.2 Aeration

- The water obtained from coagulation is then collected in tank for aeration by arranging coconut shell as medium. The thickness of layeris 1.5 cm and non-uniform size coconut shells are used. The sample is then let undisturbed for 24 hours with constant supply of oxygen with

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the help of aerators. Then sample is collected for testing the parameterschanges.

- The water obtained from coagulation is then collected simultaneously in tank for aeration by arranging PVC rings as medium.

- The sample is then let undisturbed for 24 hours with constant supply ofoxygen with the help of aerators. Then, sample is collected from it andthen used for carrying out test for parameters changes.

- The sample results obtained from coagulation and aeration are checked for efficiency. Then, parameters are confirmed with CPCB in order to safe discharge of water into water bodies.

3 Materials Used and Their Properties

3.1 Garlic powder

Here garlic powder is used as natural coagulant for the treatment. The extract of garlic was obtained and it was used in this process. The result was found in a greater efficiency in the removal of hazardous chemical composition present in the dyeing waste water. From the result, it was obtained that 96%of COD and 93% of BOD has been achieved. Also, the iron and chromium have been removed 100%.

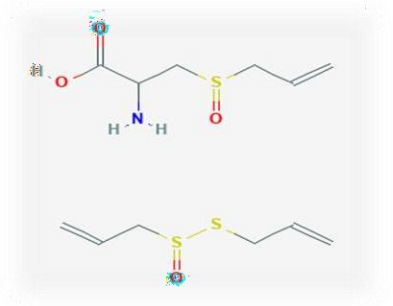

Fig. 1Coagulation

3.2 Aluminium sulphate

Aluminium sulphate in general is used in water purification and as a mordant in dyeing and printing textiles. In water purification, it causes suspended impurities to coagulate into larger particles and then settle to the bottom of the container. It serves as a coagulant and flocculating agent in water treatment, making the water easier to clean. Aluminium is mainly used in municipal water treatment plants to treat wastewater and potable water. Aluminium sulphate is also important for lake treatment and restoration. Untreated wastewater and potable water have negatively charged suspended colloids. Water treatment systems use positively charged metallic salts, like aluminium sulphate, to destabilize the colloidal particles. As a coagulant, aluminium sulphate enhances

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the removal of particulates, such as dissolved organic carbon, and other suspended tiny particles at the microorganism level. After coagulation, aluminium sulphate acts a flocculating agent and enables these particles to stick together and form bigger particles(1), allowing easier purification of the water through sedimentation and filtration.

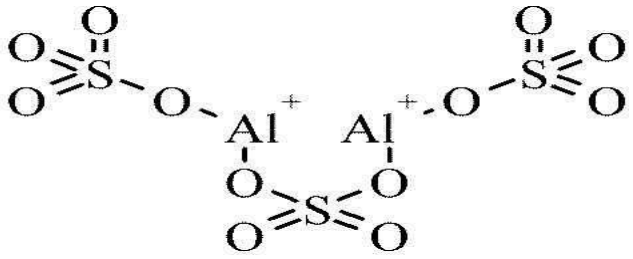

Fig. 2 Aluminum Sulphate

3.3 Textile water

Waste water that is discharged by dye manufacturing and textile finishing industries has become an environmental concern. Textile industry uses various types of synthetic dyes and discharge huge amounts of highly coloured wastewater as the uptake of these dyes by fabrics is very poor. This highly coloured textile wastewater severely affects photosynthetic function in plant but also has an adverse effect on aquatic life due to low light penetration and oxygen consumption. It may also be lethal to certain forms of marine life due to the occurrence of component metals and chlorine present in the synthetic dyes. Therefore, this textile wastewater need be treated before their discharge.

Fig. 3 Textile water

3.4 Coconut shells

Coconut shells are a renewable resource are ideal for filtration due to their high percentage of micro-pores on their surface, making it the most promising option for removing a wide variety of particles and pollutants. Some charcoal leaves an ashy taste in the water, despite the fact that it is completely harmless. With coconut shell, however, this is not the case. It is a more environmentally friendly, effective, and non-leaching chemical that provides

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superior water purification results. It's also available all year long and has no negative impact on the environment. Coconut shells may be collected without cutting the trees. There is plenty of raw material available. Coconuts, as you may know, are widely available throughout the year. Coconuts are widely used in nations such as India, and they are readily available throughout the year. It can be kept for a long period and grows in great numbers. They are renewable and have no negative impact on the environment.

Fig. 4 Coconut shells

3.5 PVC rings

Submerged bubble aeration in particular works effectively by diffusing small airbubbles to mix with the waste water and facilitate the work of aerobic bacteriain breaking down organic waste.

Generally, submerged bubble aeration provides a more advanced system than surface aeration system.

4 Tests Carried Out

The tests carried out on the sample are listed below

- pH
- Chloride
- Total dissolved solids
- MLSS (Mixed Liquid Volatile Suspended Solids)
- Hardness

i) Total hardness
ii) Temporary hardness
iii) Permanent hardness

5 Analysis

5.1 pH

It is a negative parameter where electrodes are used as analysis. It is the negative algorithm and measures whether a liquid is alkaline or acid. The acceptable limit for sewers and surface water ranges between 5.5-10 on the pH scale. In surface water if the pH value is of the range 6.5-7.5, the aquatic plant life, plankton and small fishes are susceptible to loss

pH analysis for every process. The final pH value shows that the treated water is suitable for discharge

Table1-PhValue

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Sample	pH value
Initial Effluent	4.9
After Coagulation	5.7
Coconut Shell	5.9
PVC	6.3

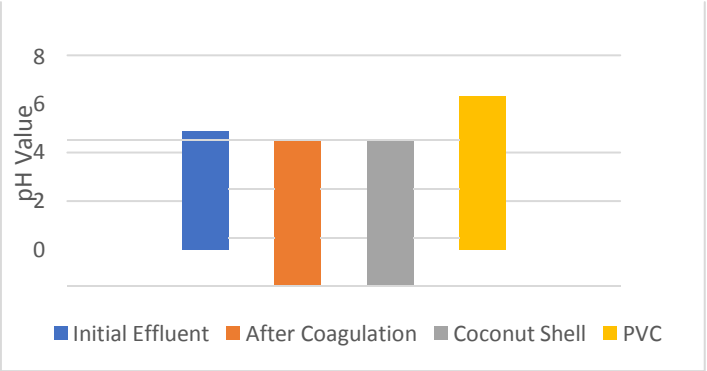

Fig.5 pH result

5.2 Chloride

It's a chemical indicator. The titration method is used to examine it. Industrial effluent, treatment processes, chlorinated sewage, and other effluents are the sources. The procedure of disinfecting water sources is the most significant in water treatment since it kills or deactivates germs that might cause diseases like cholera and typhoid. Disinfection can be accomplished in a variety of ways, although the great majority of supplies are disinfected with chlorine, a potent oxidizer and disinfectant. It is relatively simple to use and cost-effective, which is why it is generally universally used. At the relatively low levels utilised in water treatment operations, there is no direct significance Chloride analysis, which shows the decrease of chloride content after every process in the table

Table2- chloride content

Sample	Chloride Content (mg/l)
Initial Effluent	698
After Coagulation	581
Coconut Shell	485
PVC	432

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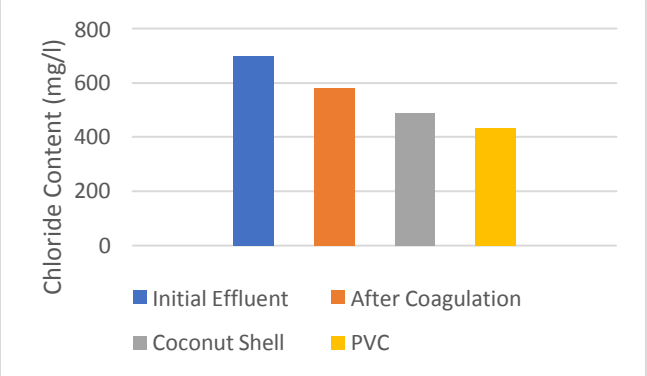

Fig. 6 Chloride result

5.3 Total dissolved solids

It's a parameter that affects a large number of people. The settlement in the Inhofe cone is used to analyse it. There are no obvious health effects, but it is a signal of extreme contamination in water. Its primary application is in the evaluation of treatment plant performance.

The result shows the contamination level of the textile waste water during each process. The initial wastewater has a very hight contamination level and the treated water has very low contamination level. This difference in value shows the performance of the treatment process

Table3-TDS

Sample	TDS (ppm)
Initial Effluent	97300
After Coagulation	31800
Coconut Shell	21900
PVC	10300

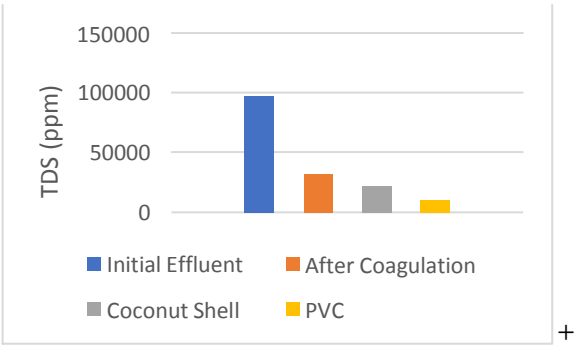

Fig. 7 TDS Result

5.4 MLSS (Mixed Liquid Volatile Suspended Solids)

Experimentally it is determined that the typical control band for concentration of MLSS

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ranges from 2,000-4,000 mg/l for wastewater. In mixed liquor, the volatile solids concentration is approximately equal to the micro-organisms that is present in the water and it can be determined if there are sufficient micro- organisms present to break down the sludge. The process of bulking takes place if it is very high in solids and the treatment becomes overcharged. The process will not have sufficient organic matter removed if it is too low in the wastewater

The result shows the total amount of MLSS present during each process. Theanalysis shows that there is sufficient amount of volatile solids to break downthe sludge

Table4-MLSS

Sample	MLSS (ppm)
Initial Effluent	120000
After Coagulation	51000
Coconut Shell	43000
PVC	41000

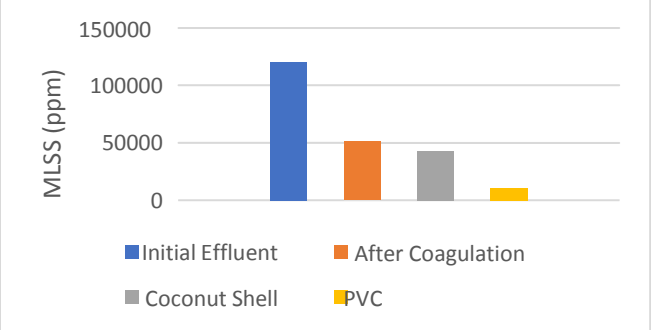

Fig. 8 MLSS result

5.5 Hardness

It's a parameter that affects a large number of people. Titration with EDTA is used to examine it. Hardness is a natural property of water that can improve its palatability and acceptance among consumers for drinking purposes. In recent health studies conducted in a number of nations, it has been discovered that places with hard water have lower rates of heart disease mortality. It encompasses both momentary and long-term hardness. If it surpasses 200 mg/l, it can cause pipe obstruction and a decline in boiler efficiency.

The result shows that total amount of harness during each process

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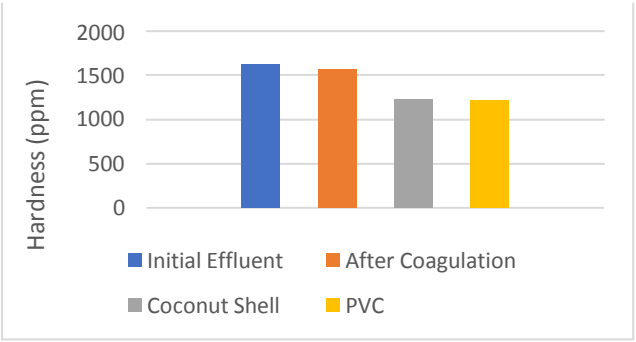

Fig.9 Total hardness result

Table 5-Various hardness

Process	Total Hardness	Temporary Hardness	Permanent Hardness
Initial Effluent	1622.62	785.62	842.56
After Coagulation	1568.57	404.53	1172.77
Coconut Shell	1228.24	368.38	832.47
PVC	1215.22	427.47	721.15

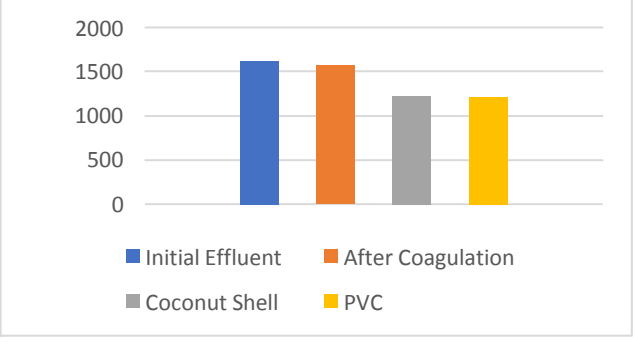

Fig. 10 Temporary hardness result

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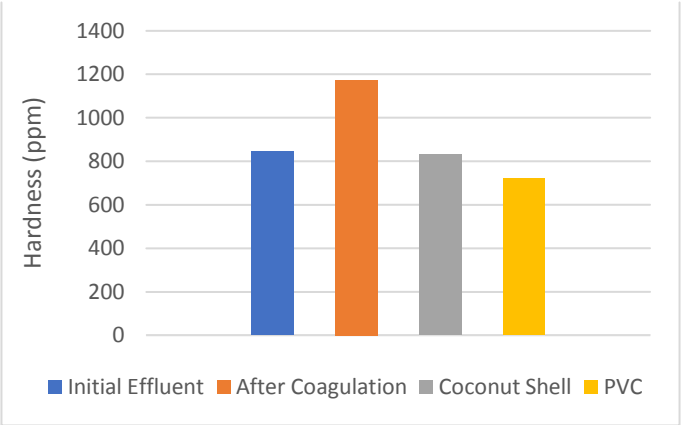

Fig.11Permanent Hardness

6 Result and Discussion

The raw textile dye water after being treated by garlic powder and aluminium sulphate as a coagulant and aeration process by the use of coconut shell and PVC rings showed improvement in the water quality after the test results of pH, chloride, total dissolved solids, MLSS (Mixed Liquid Volatile Suspended Solids), hardness i) total hardness, ii) temporary hardness,iii) permanent hardness. The analysis showed that the sample values of initial effluent, aftercoagulation, coconut shell, PVC met the required value of a treated water which can be used for agricultural purpose and washing of various items for cleaning but not for drinking purpose. It also efficient enough to discharge it into water bodies so that it will be non-hazardous to environment thereby preventing water pollution, also saving aquatic life, along with the prevention of land pollution and ground water contamination.

7 Conclusion

According to the aforementioned findings, coconut shell is a more effective medium for aeration than PVC and the coagulation process is also more effective overall. Polluted water or effluent can be effectively and economically treated using this method. Therefore, in a summary Even without aeration, coagulation utilizing garlic as the coagulant is quite successful. If coagulation is performed using garlic extract as the coagulant and coconut shell as the medium, it has been discovered to be more successful than PVC rings.

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