LIQUID WASTE TREATMENT USING ORGANIC COAGULATING AGENTS

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ABSTRACT

The most detrimental to the environment and human health are sewage pollution. The high concentration of pollutants in sewage makes its treatment and disposal seem like a major problem for a number of sectors. The most efficient method for removing pollutants appears to be coagulation-flocculation. Therefore, I want to use natural coagulants like Cicer arietinum (powder made from chickpeas) and Moringa olifera (powder made from moringa seeds) to treat sewage waste water in my project. In this project, an exploratory study was conducted to see whether natural coagulants could be used to treat wastewater. Sedimentation will be used to treat the sewage wastewater. To assess the effectiveness of the removal of major pollutants involved in the waste water treatment process, such as pH, turbidity, sulphates, chlorides, total solids, total suspended solids (TSS), total dissolved solids (TDS), acidity, alkalinity, biological oxygen demand (BOD), and chemical oxygen demand (COD), the physico-chemical parameters of the waste water are measured both before and after the treatment. This technology is useful for quickly, cheaply, and easily purifying turbid water that has been contaminated.

Keywords: COD, BOD, Turbitity, coagulation, Chromium Removal.

INTRODUCTION

1.1 GENERAL

Sewage is the main source of water pollution nowadays there is no proper maintenance of sewage so it pollutes the fresh water source. The intention of wastewatertreatment is to eliminate the pollutants from water so the treated water can meet the satisfactory quality standards. The type of treatment required which depends on the nature and quality of both sewage and source of disposal. Turbidity in wastewater is due to suspended matter, such as clay, silt, and finely divided organic and inorganic matter, soluble colored organic matters, turbidity water has cloudy look and not attractive. High levels of pollutants in river water causes an increase in BIOLOGICAL OXYGEN DEMAND (BOD_5), CHEMICAL OXYGEN DEMAND (COD), TOTAL DISSOLVED SOLIDS (TDS)**,** total suspended solids (TSS), and hence make such water unsuitable for drinking. It is found all rivers are polluted in most of the stretches by some industry or other irrigation and aquatic life. Coagulant techniques for wastewater treatment have become popular in recent years due to their efficiency in the in the removal of pollutants that are to be removed by biological methods. The discharge of non-biodegradable physicochemical parameters like p^H and like turbidity into water stream is hazardous because the consumption of polluted water causes various health problems.

Turbidity goes on increases sewage becomes stronger. Due to the lack of appropriatewastewater treatment systems in these rural or underdeveloped societies, the best instant option is to use simple and cost-effective point of point technologies such as coagulation. Activated Sludge Process, Oxidation Ponds, Aerated Lagoons and Trickling Filters are theconventional treatment process in India.

This treatment process basically requires land and Energy which increases overall cost of treatment process. The naturally available coagulants were used to reduce the treatment cost.

1.2 HISTORY OF LIQUID WASTE

Sewage (or domestic wastewater or municipal wastewater) is a type of wastewater that is produced by a community of people. It is characterized by volume orate of flow, physical condition, chemical and toxic constituents, and its bacteriologic status (which organisms it contains and in what quantities).

It consists mostly of grey water (from sinks, tubs, showers, dishwashers, and clothes washers), black water (the water used to flush toilets, combined with the human waste that it flushes away); soaps and detergents; and toilet paper (less so in regions where bidets are widely used instead of paper).

Sewage usually travels from a building's plumbing either into a sewer, which will carry it elsewhere, or into an onsite sewage facility (of which there are many kinds). Whether it is combined with surface runoff in the sewer depends on the sewer design (sanitary sewer or combined sewer).

The reality is that most wastewater produced globally remains untreated causing widespread water pollution especially in low-income countries. A global estimate by UNDP and UN-Habitat is that 90% of all wastewater generated is released into the environment untreated. In many developing countries the bulk of domestic and industrialwastewater is discharged without any treatment.

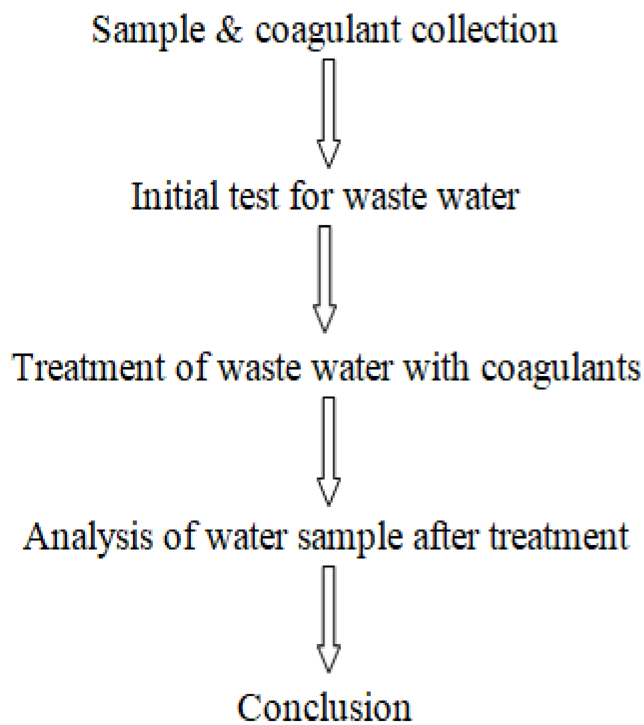
1.3 NATURAL WASTEWATER TREATMENT SYSTEM

Adapting conventional chemical treatments have now caused growing negative impacts on the land and groundwater systems. Natural wastewater treatment systems are thus used all over the world for the treatment of wastewater from industries, house hold and agriculture. Natural treatment systems are those having minimal dependence on mechanical elements to support the wastewater treatment process. Instead, the systems use plants and bacteria to breakdown and neutralize pollutants in wastewater. They minimize the use of chemicals and require little energy to operate.

It is important to use natural wastewater treatment systems considering their use of treated water. This is needed above all in arid regions. Natural wastewater treatment systems are simple, cost-effective and efficient methods to purify the growing amount of wastewater produced by our society. They can be applied as secondary or tertiary purification treatment, allowing there removal of most of the bacteria, microorganism and the destruction of the organic matter. The extreme simplicity in building, operation and maintenance makes these systems highly competitive with the conventional treatment methods.

2. EXPERIMENTAL METHODOLOGY

The hierarchy of work to be done to assess the treatment of SEWEGE effluent using natural coagulation is shown in the following flow chart 2.1.



2.1 FLOW CHART OF EXPERIMENTAL METHODOLOGY

2.1 GUIDANCE FOR HANDLING SEWAGE WASTEWATER

Humans who handle the sewage may be at increased risk of becoming ill fromwaterborne diseases. To reduce this risk and protect against illness, such as diarrhea, vomiting, fever and breathing problems. The following guidance should be followed;They are,

- Use waterproof gloves to prevent cuts and contact with sewage.
- Wash hands with soap and water immediately after handling wastewater
- Avoid touching face, mouth, eyes, open sores and cuts while handling sewage.
- After handling sewage wastewater, wash your hands with soap and water beforeeating or drinking.
- Do not smoke or chew tobacco or gum while handling sewage.
- Keep open sores, cuts, and wounds covered with clean, dry bandages.

- Gently flush eyes with safe water.
- Remove rubber boots and work clothes before leaving the worksite.

2.2 ANALYSIS OF SEWAGE EFFLUENT

The Sewage effluent is analysed to determine various parameters like pH, turbidity, Total suspended solids (TSS),Chemical oxygen demand (COD), Biological Oxygen Demand (BOD), Sulphides (as S), Total Chromium (Cr^{+}), Hexavalent Chromium (Cr^{6+}) at each stage of the treatment system.

3. QUANTITATIVE ANALYSIS OF RAW EFFLUENT AT INITIAL STAGE

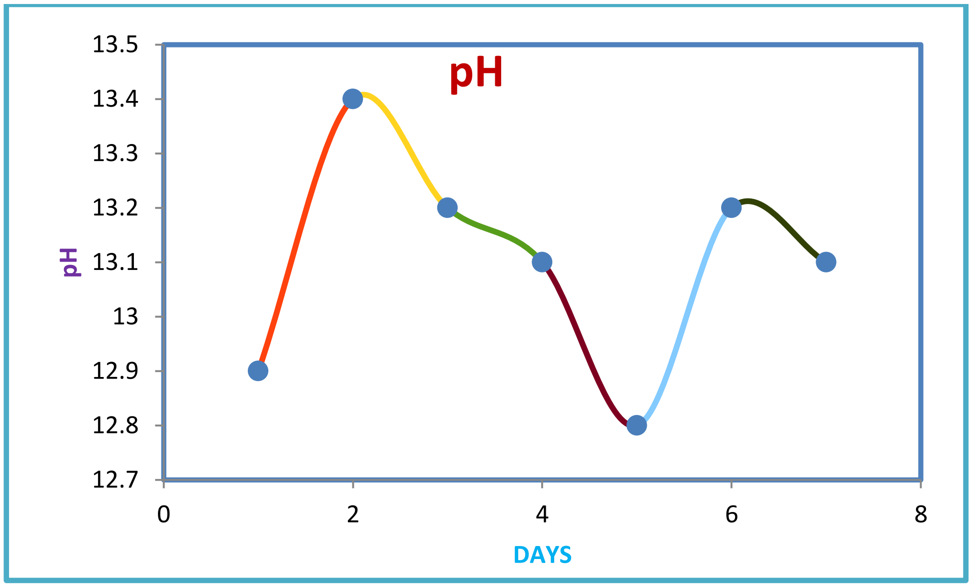
Before any treatment, a quantitative examination of the raw sewage effluent is conducted, and the average of the results is used to determine the baseline values of various effluent characteristics.

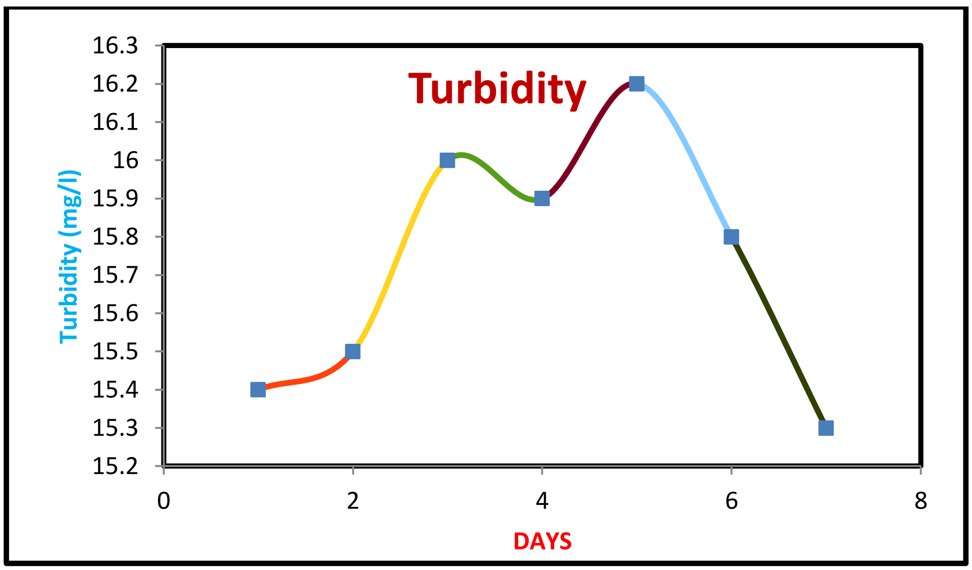
Table 3.1 depicts the results obtained from the quantitative analysis of raw effluent.

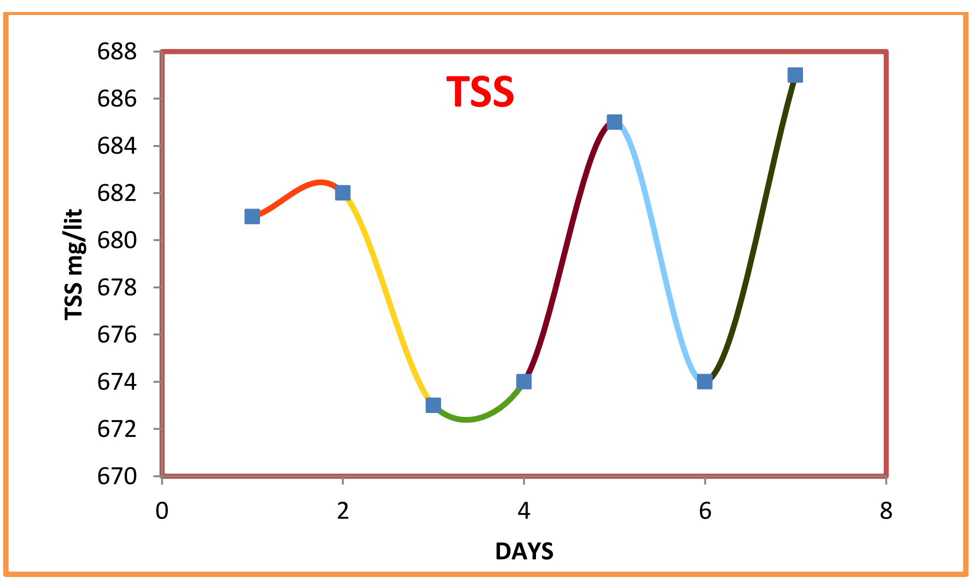
Table 3.1. RAW EFFLUENT ANALYSIS

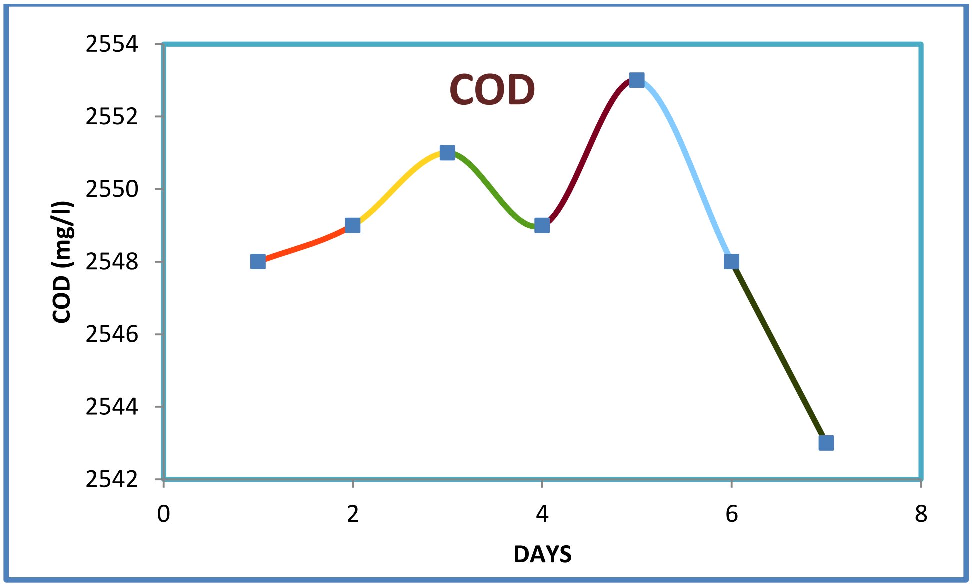
S.No.	Parameter	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Average
1	Turbidity (mg/l)	15.4	15.5	16	15.9	16.2	15.8	15.3	15.73
2	pH	12.9	13.4	13.2	13.1	12.8	13.2	13.1	13.14
3	TSS (mg/l)	681	682	673	674	685	674	687	679.43
4	BOD (mg/l)	595	598	585	593	591	587	588	591
5	COD (mg/l)	2548	2549	2551	2549	2553	2548	2543	2548
6	Sulphides (mg/l)	35	39	35	39	37	33	34	36
7	Total Chromium (Cr^{+}) (mg/l)	25	26	29	28	28	26	27	27
8	HexavalentChromium (as Cr^{6+}) (mg/l)	15.6	15.8	17	15.9	16.4	15.8	15.7	16.02

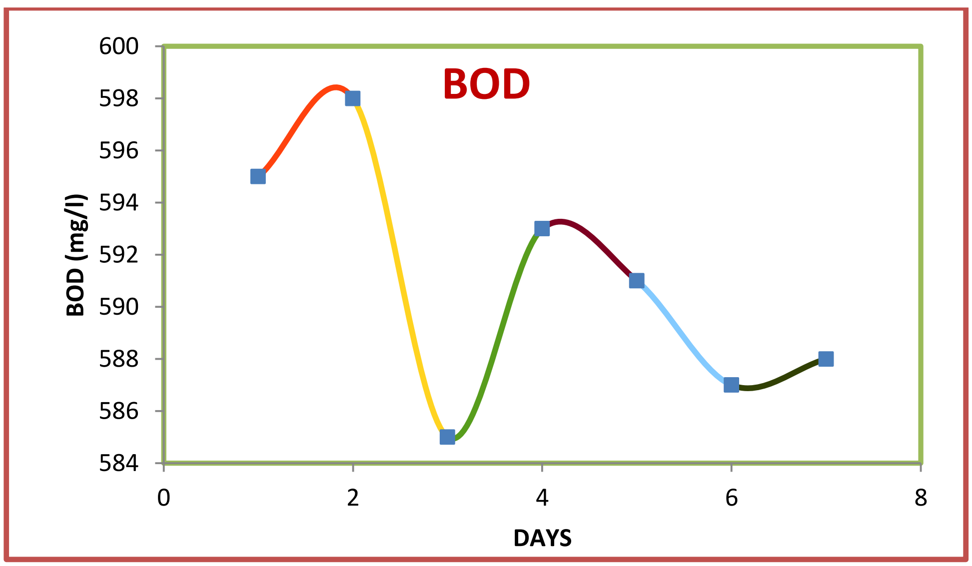
GRAFF:

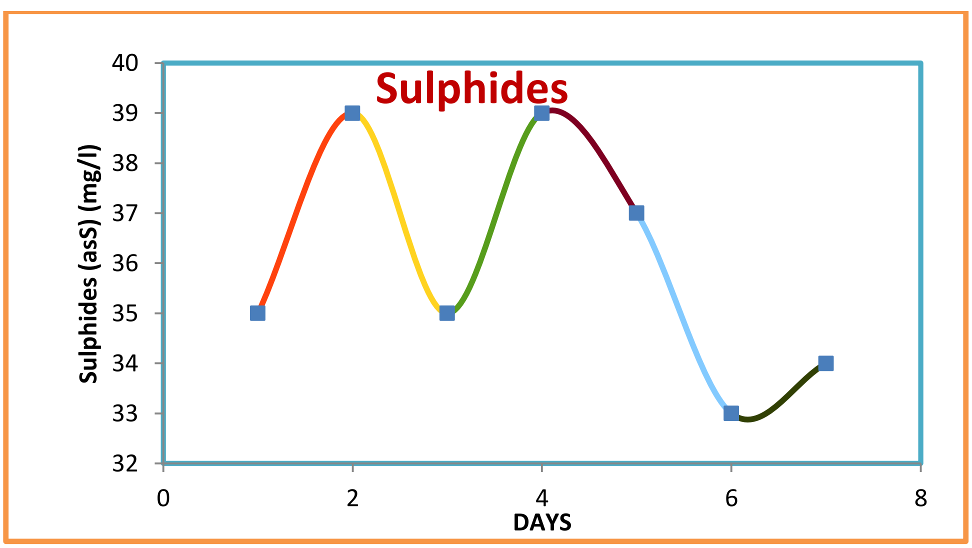

pH
pH
13.5
13.4
13.3
13.2
13.1
13
12.9
12.8
12.7
0
2
4
6
8
DAYS

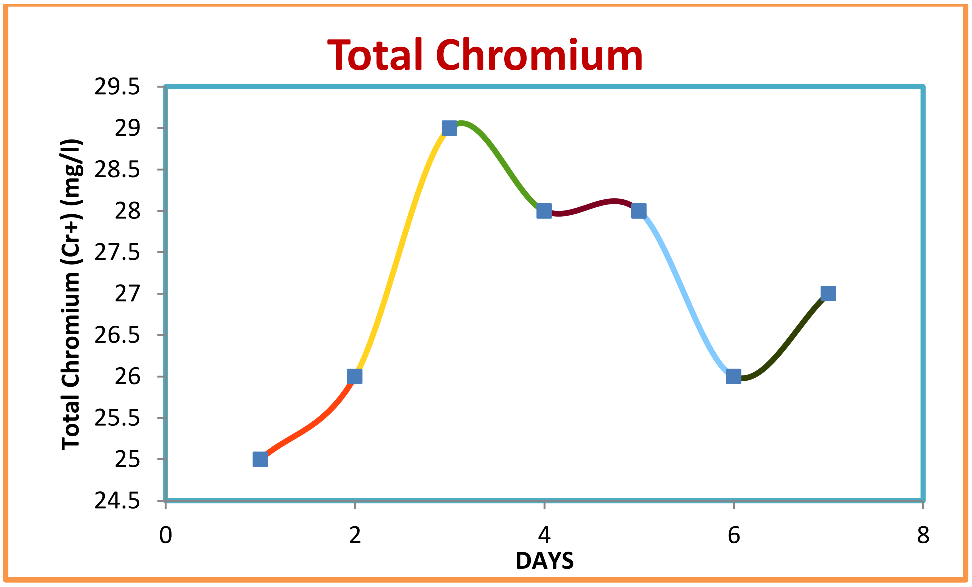

Turbidity
Turbidity (mg/l)
16.3
16.2
16.1
16
15.9
15.8
15.7
15.6
15.5
15.4
15.3
15.2
0
2
4
6
8
DAYS


TSS
TSS mg/lit
688
686
684
682
680
678
676
674
672
670
0
2
4
6
8
DAYS

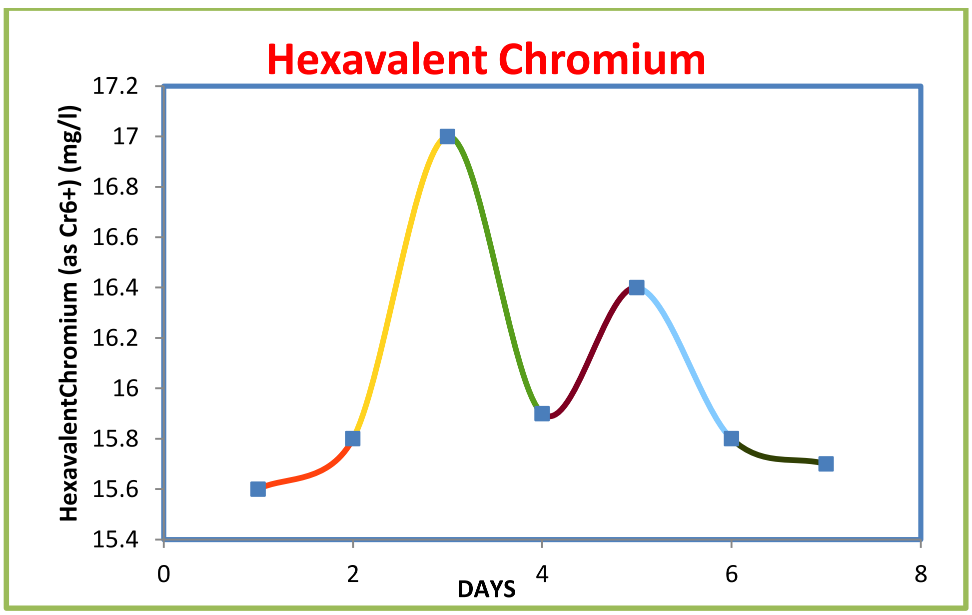

COD
COD (mg/l)
2554
2552
2550
2548
2546
2544
2542
0
2
4
6
8
DAYS


BOD
BOD (mg/l)
600
598
596
594
592
590
588
586
584
0
2
4
6
8
DAYS


Sulphides
Sulphides (asS) (mg/l)
40
39
38
37
36
35
34
33
32
0
2
4
6
8
DAYS



Total Chromium
Total Chromium (Cr+) (mg/l)
29.5
29
28.5
28
27.5
27
26.5
26
25.5
25
24.5
0
2
4
6
8
DAYS



Hexavalent Chromium
HexavalentChromium (as Cr6+) (mg/l)
17.2
17
16.8
16.6
16.4
16.2
16
15.8
15.6
15.4
0
2
4
6
8
DAYS

3.1 COGULATION AND FLOCCULATION OF WASTE WATER TREATMENT

Coagulation and flocculation are an essential part of drinking water treatment as well as wastewater treatment. This article provides an overview of the processes and looks at the latest thinking. Material for this article was largelytaken from reference.

3.2 MORINGA OLEIFERA

The most widely cultivated species of a monogeneric family, the Moringaceae mostly found in the sub-Himalayan tracts of India, Pakistan, Bangladesh and Afghanistan. This rapidly-growing tree (also known as the horseradish tree, drumstick tree, benzolive tree or Ben oil tree), is now widely cultivated in many locations in the tropics. It is commonly referred to as the miracletree because of the multipurpose uses of the plant parts. Seed kernels contain a significant amount of oil that is commercially known as Ben oil or Behen oil whichis high in tocopherols.

Earlier researches have revealed its ability to treat high, medium and low turbidity water. It can also be used as a softening agent as well as been as a dewatering agent hence its importance cannot be overemphasized in water treatment. When this compared with conventional chemical coagulants, it has the following advantages such as cost effectiveness, availability, biodegradable sludge, eco- friendly, low sludge volume, it does not produce harmful by- products, it is easily handled as it is not corrosive, and it does not affect pH of water. Seed in differentextracted and purified forms has proven to be effective at removing suspended material, soften hard waters, removal of turbidity, Chemical Oxygen Demand (COD), color and other organic pollutant.

Fig.3.1 Image of MORINGA OLEIFERA TREE

3.3 CICER ARIETINUM

The most widely cultivated species. Chickpea is a key ingredient in hummus and chana masala, and it can be ground into a flour to make falafel. It is also usedin salads, soups and stews, curry and other meal products like channa. The chickpea is important in Indian, Mediterranean and Middle Eastern cuisine. The plant grows to 20–50 cm (8–20 in) high and has small, feathery leaves on either side of the stem. Chickpeas are a type of pulse, with one seedpod containing two or three peas. It has white flowers with blue, violet, or pink veins.

When this compared with conventional chemical coagulants, it has the following advantages such as cost effectiveness, availability, biodegradable sludge, eco-friendly, low sludge volume, it does not produce harmful by- products, it is easily handled as itis not corrosive, and it does not affect pH of water.

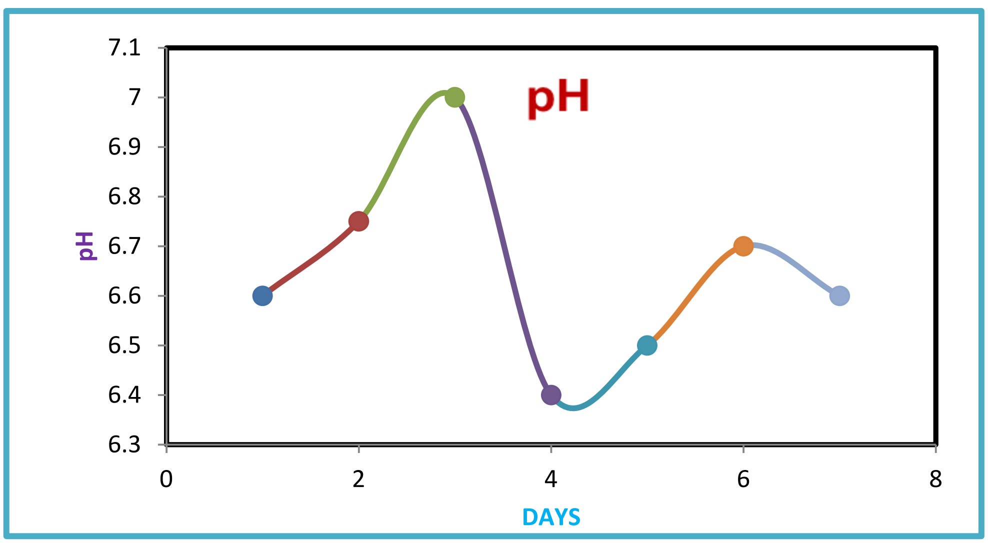
4. FINAL ANALYSIS OF WASTEWATER

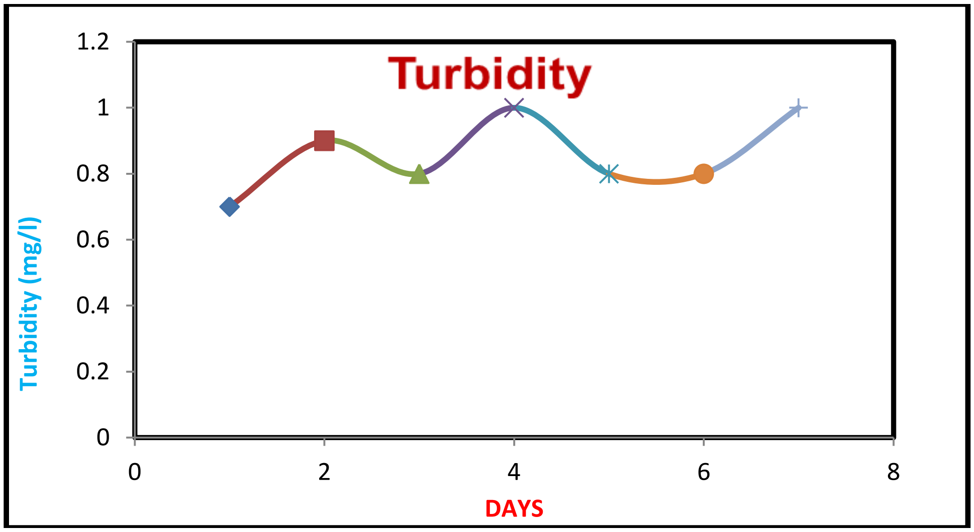
The treated effluent is quantitatively analysed, and an average is calculated and as shown in table 4.1.

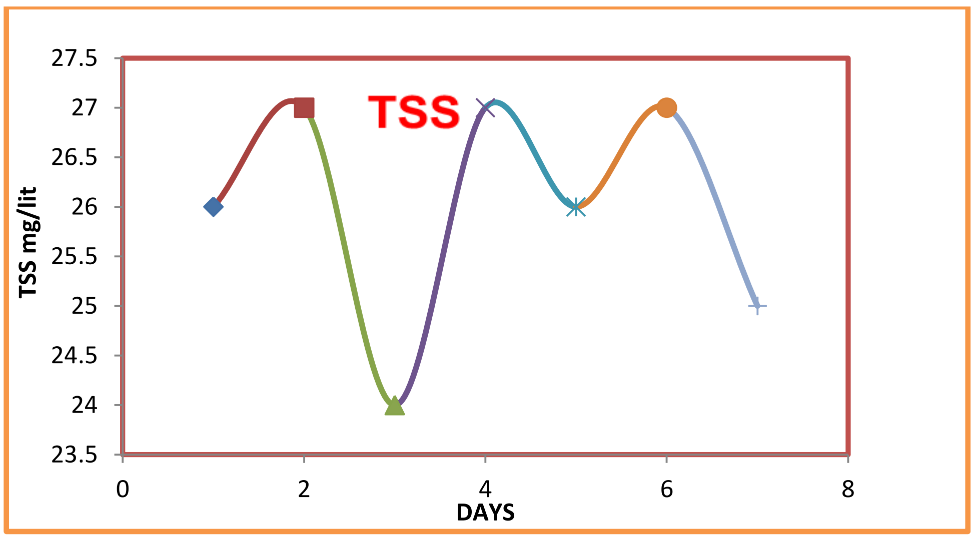
Table 4.1. TREATED EFFLUENT ANALYSIS

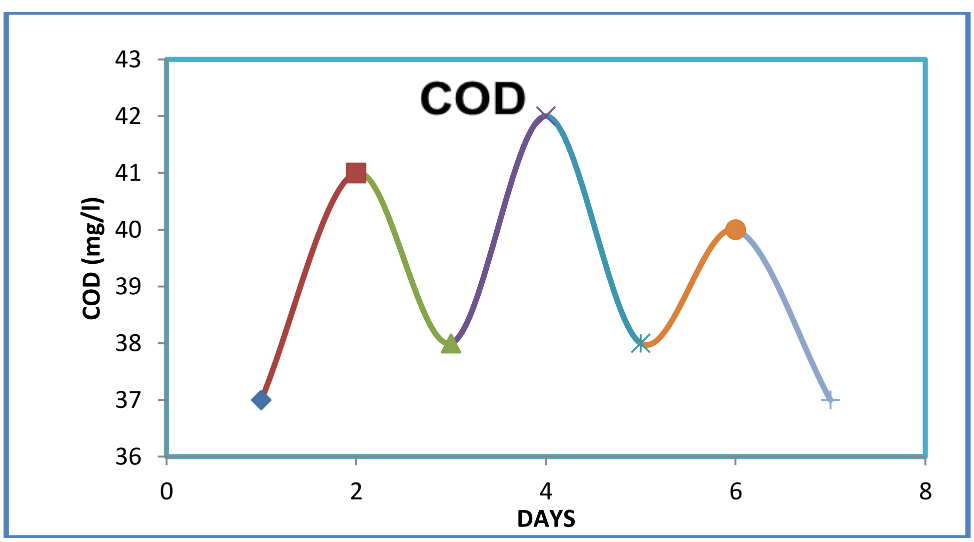
S.No.	Parameter	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Average
1	Ph	6.6	6.75	7	6.4	6.5	6.7	6.6	6.65
2	Turbidity (mg/l)	0.7	0.9	0.8	1	0.8	0.8	1	0.85
3	TSS (mg/l)	26	27	24	27	26	27	25	26
4	COD (mg/l)	37	41	38	42	38	40	37	39
5	BOD (mg/l)	13	14	13	11	13	12	15	13
6	Sulphides (mg/l)	1.47	1.52	1.56	1.48	1.51	1.49	1.5	1.5
7	Total Chromium (Cr^{+}) (mg/l)	1.54	1.53	1.67	1.55	1.59	1.63	1.61	1.59
8	Hexavalent Chromium (as Cr^{6+}) (mg/l)	0.08	0.09	0.09	0.08	0.07	0.06	0.08	0.08

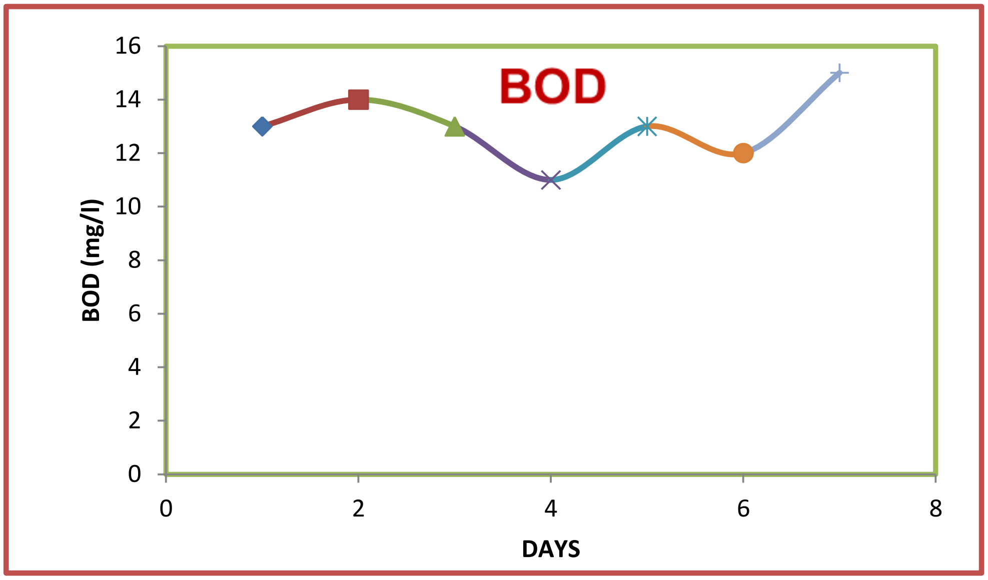
GRAFF:

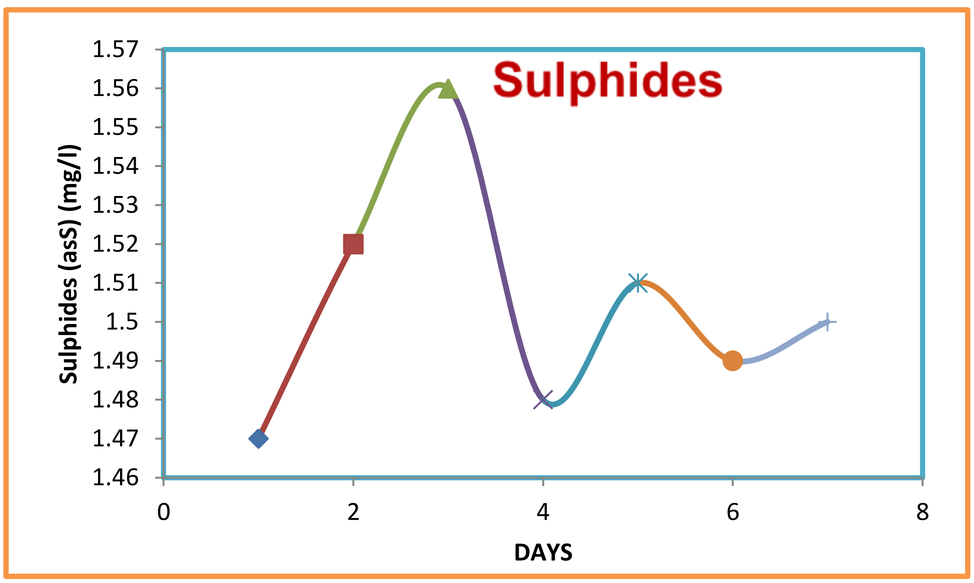


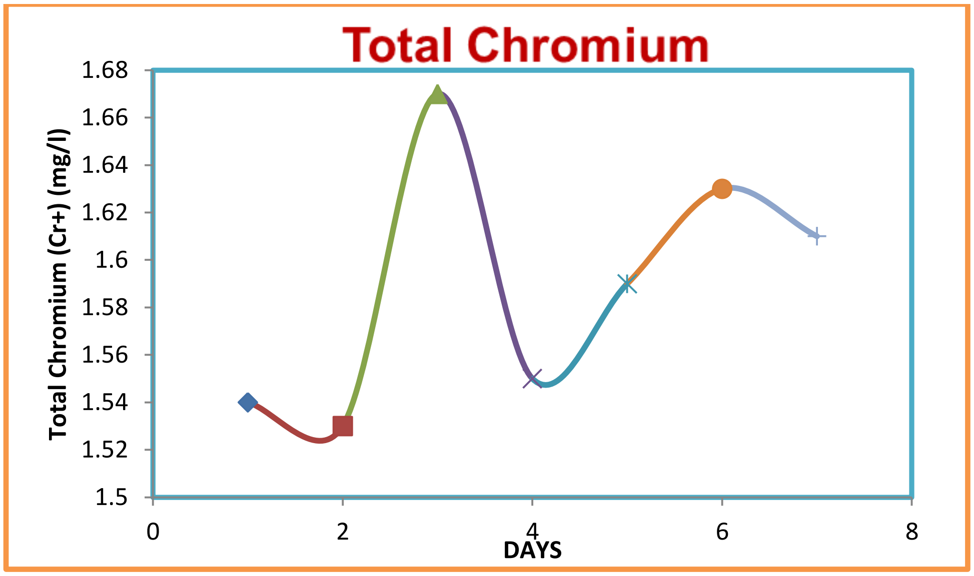

Turbidity
Turbidity (mg/l)
1.2
1
0.8
0.6
0.4
0.2
0
0
2
4
6
8
DAYS

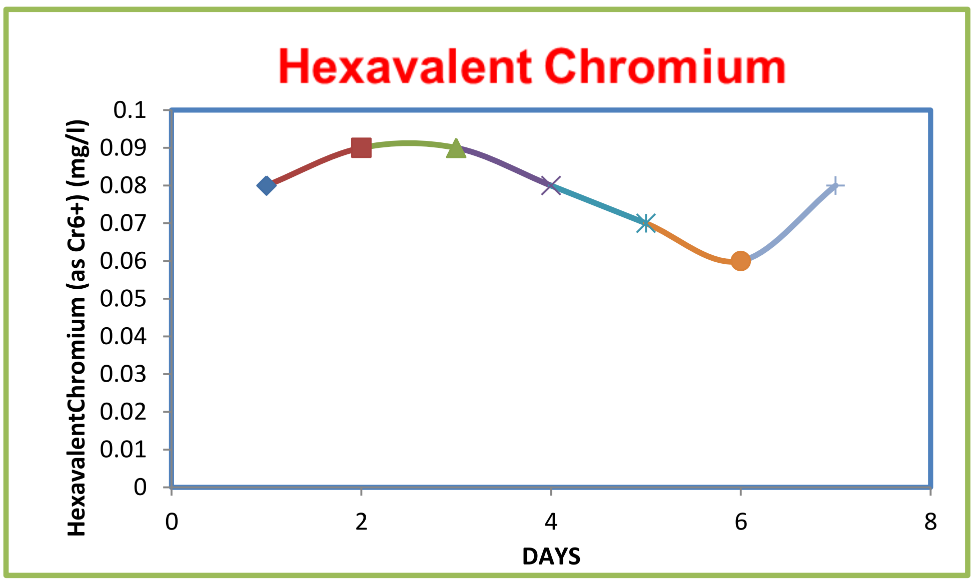

TSS
TSS mg/lit
27.5
27
26.5
26
25.5
25
24.5
24
23.5
0
2
4
6
8
DAYS


COD
COD (mg/l)
43
42
41
40
39
38
37
36
0
2
4
6
8
DAYS


BOD
BOD (mg/l)
DAYS
16
14
12
10
8
6
4
2
0
0
2
4
6
8


Sulphides
Sulphides (asS) (mg/l)
DAYS
1.57
1.56
1.55
1.54
1.53
1.52
1.51
1.5
1.49
1.48
1.47
1.46
0
2
4
6
8


Total Chromium
Total Chromium (Cr+) (mg/l)
1.68
1.66
1.64
1.62
1.6
1.58
1.56
1.54
1.52
1.5
0
2
4
6
8
DAYS


Hexavalent Chromium
HexavalentChromium (as Cr6+) (mg/l)
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
0
2
4
6
8
DAYS

CONCLUSION

The features of the sewage waste water and an analysis of the different parameters. Since the goal of sustainable environmental technology is to improve the quality of life for underprivileged populations, the use of natural coagulants derived from plant-based sources is an important advancement. However, the loss of large agro-based plant plantations has restricted the use of natural coagulants.

Technically speaking, these naturally occurring coagulants are quite effective at treating low-turbidity fluids; however, they might not be practical for treating wastewaters with extremely high pH levels. Therefore, it is always advisable for those who treat water to carefully choose the best natural coagulants and customise them for certain uses.

Better results are obtained from the treated waste water when Moringa oleifera is used as a natural coagulant. Finding the ideal coagulant dosage and employing natural coagulant in proportions yields the greatest outcomes.

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