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COURSE CODE: CHEG 5251

**RESEARCH PROPOSAL ON:**

# TEXTILE WASTE WATER TREATMENT USING MORINGA SEED IN QUIHA



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## DECLARATION

We, the undersigned, declare that this exploration offer named "Textile Wastewater Treatment Using Moringa Seed in Quiha" is our original work and has not been presented for any degree or parchment in any other institution. Any references or citations from external sources are properly conceded.

thus, we would like to assure our signature.

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## ABSTRACT

*Samples of municipal and industrial wastewaters will be treated by coagulation-flocculation and sedimentation using moringa oleifera seeds as a primary coagulant. The quality of treated waste water will be analyzed and compared to that of the waste water treated with alum. Experiments will be conducted at various dosages of moringa oleifera seeds. Parameters of the quality of the wastewater will be measured before and after treatment to evaluate the removal on the major pollutants of concerned in waste water treatment, such as suspended solids, chemical oxygen demand (COD), biochemical oxygen demand (BOD) and turbidity. The basic parameters will be amount of dosage, contact time and ph. Four experiments will be conducted based on the basic parameters which mainly determine the treatment efficiency of the seed powder. For experiment one to see effects of dosage will be analyzed at (1g/L, 3g/L and 5g/L); for experiment two the effect of contact time will be determined by at (1Hr, 2Hr and 3Hr), for experiment three the effect of pH will b analyzed by adjusting the pH of waste water at (4.5, 7 and 9.5). And the last experiment which will be done checking coagulation efficiency with alum. From these experiments we will be made analysis of the effects of these parameters by how much they affect treatment efficiency will be existing. Then finally samples of treated water will be characterized for, BOD, COD and turbidity test. Finally, the efficiencies of natural coagulant Moringa oleifera (MO) and Chemical coagulant Alum (Al2 (SO4)3 will be investigated. The optimum values of the three parameters in the treatment process are dose-3g/l, flocculation time-2hours and pH-9.5 and the maximum BOD, COD and turbidity reduction at these optimum parameters using M. oleifera are found to be 80%, 81% and 94.44% respectively and the maximum removal in BOD, COD and turbidity using Alum will be found to be 20%, 25% and 85% respectively. The Results showed that the moringa oleifera seeds will be efficient as a primary coagulant in waste water treatment for removal of suspended solids, BOD, COD and turbidity.*



***Key Words:*** *Turbidity removal, Dye removal, decolorization, Adsorption, Coagulation, Flocculation.*

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# Table of contents

# LISTOF FIGURES

# LIST OF TABLES

# LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| Bod | Biochemical Oxygen Demand |
| COD | Chemical Oxygen Demand |
| Do | Amount of Dissolved Oxygen |
| Magna | Chemical Which Used for In the Process of Flocculation of Waste Water |
| Pc | Potassium Chlorate |
| Tds | Total Dissolved Solids |
| Tss | Total Suspended Solids |

# CHAPTER ONE

# 1. INTRODUCTION

## 1.1 Background

Moringa oleifera, a multipurpose tree known for its nutritive and medicinal parcels, has lately gained attention for its eventuality in wastewater treatment. Its seeds contain natural cationic proteins able of negativing suspended patches, making it an effective andeco-friendly volition to synthetic coagulants. With rising enterprises over the environmental and health impacts of chemical coagulants like aluminum sulfate, Moringa oleifera provides a sustainable result for treating artificial backwaters similar as cloth wastewater (6) K.R. ramakrishnan and T. Viraraghavan, 1998).

Moringa is known in over 82 countries and by over 200 different names. Perhaps it is the tree in the Garden of Eden referred to in the bible. It sure qualifies to be that tree. Among the world's most useful plants, the Moringa tree was highly valued by the Greeks, Romans and Egyptians as early as 2000 BC for its medicinal properties. Some ancient writings date back to 150 AD (9) Nomanbhay, 2013).

Every part of the Moringa Tree including the leaves, flowers, seed pods, and roots are used for food, health, or cooking. Moringa is being used in projects around the world to stop starvation now as we speak.

In many countries its leaves are used as forage for livestock and its oil (similar to olive) for cooking. Even the wood can be used for heat, though not the best wood for that purpose.

Moringa was valued throughout Rome, Greece, and Egypt where it was used for skin lotion and perfume. It was first described as medicinal herbs around 2000 B.C. So, it is one of the ancient herbs such as Myrrh and Olive leaf (4) Jahn, 1986).

Moringa leaves are being used in projects to help end starvation in countries like Africa. It is because of the incredible nutrition they contain including protein and iron. This includes all the important amino acids as well.  When you have good nutrition, you have less health problems and dietary deficiencies. In India, they work on preventive medicine through herbs and nutrition. It is being raised in the warmer parts of California, Arizona, New Mexico, Florida, and in Imperial Valley (1) D.A., 1997).

To overcome chemical coagulant problems, it is necessary to increase the use of natural coagulants for drinking water treatment. Naturally occurring coagulants are usually presumed safe for human health. Some studies on natural coagulants have been carried out and various natural coagulants were produced or extracted from microorganisms, animals or plants (5) J. Roussy, 2005).

One of these alternatives is Moringa oleifera seeds. Moringa oleifera is a perfect example of a so called “multipurpose tree”. Earlier studies have found Moringa to be non-toxic and recommended it for use as a coagulant in developing countries. The use of Moringa has an added advantage over the chemical treatment of water because it is biological and has been reported as edible.

Now days it is used for industrial waste water treatment as a coagulant agent and also it absorbs dissolved organic materials and inorganic substances BOD and COD of waste water (4) Jahn, 1986).

## 1.2. Statement of the problem

Textile diligence induce large volumes of wastewater containing adulterants like colorings, heavy essence, and suspended solids. Conventional treatments frequently calculate on chemical coagulants, which are expensive and may leave poisonous remainders. The need for an affordable, effective, and environmentally friendly indispensable highlights the significance of exploring natural coagulants similar as Moringa oleifera seeds.

Although some heavy metal ions play important roles in living systems, they are very toxic and hence capable of causing serious environmental health problems. In addition to this chemical oxygen demand (COD), biochemical oxygen demand (BOD), nutrients (nitrogen and phosphors), suspended solids, and heavy metals found in textile waste water are causing environmental problems and serious health problems. Previously aluminum sulphate will be used as a coagulant agent for waste water treatment in most textile industries. But this aluminum sulphate has its own environmental effect since it forms toxic precipitates and not cost effective. Hence, there a real need to find useful treatment agents for these growing quantities of textile wastes. So moringa seed will be substitute aluminum sulphate and used as a primary coagulant. It is effective coagulant compared to aluminum sulphate with respect to coagulation efficiency and cost.

## 1.3. Objective

### 1.3.1. General objective

- To estimate the effectiveness of Moringa oleifera seeds in treating textile wastewater.

### 1.3.2. Specific objective

- Waste water will be characterization before treatment
- Determine the optimal lozenge, contact time, and pH for Moringa oleifera.
- Compare the treatment effectiveness of Moringa oleifera with aluminum sulfate.
- Assess the junking effectiveness of crucial adulterants (duck, COD, turbidity).
- Characterization of treated water sample

## 1.4 Research Questions (Sometimes hypothesis)

- How effective are moringa seeds in reducing turbidity, color, and suspended solids in textile wastewater?
- What is the removal efficiency of moringa seed extract for dyes and heavy metals commonly found in textile wastewater?
- How does the coagulation performance of moringa seeds compare to traditional chemical coagulants like alum?
- What is the optimal dosage of moringa seed extract for achieving maximum pollutant removal?
- How do factors such as pH, temperature, and mixing time affect the coagulation process?
- What are the differences in treatment efficiency when using crude seed powder versus processed extracts (e.g., oil-free moringa cake)?

## 1.5 Significance of the study

This study aims to introduce an affordable and sustainable wastewater treatment result, particularly salutary for low- income regions. By using locally available Moringa seeds, it minimizes reliance on imported chemicals, reduces environmental pollution, and promoteseco-friendly practices.

The use of moringa seeds in textile wastewater treatment will be gained significant attention due to their natural coagulant properties and eco-friendly characteristics. Here's why this is significant:

Reduction in Chemical Dependency Traditional textile wastewater treatment relies on chemical coagulants like alum and polyalanine chloride, which will be leave harmful residues in the environment. Moringa seeds act as a natural coagulant due to their cationic proteins that neutralize the negative charges of suspended particles, promoting flocculation and sedimentation (7) Mataka, 2010).

This reduces the need for synthetic chemicals, minimizing secondary pollution. Cost-Effectiveness Moringa seeds will be abundant in many tropical and subtropical regions, making them a cost-effective alternative to expensive chemical coagulants, especially in developing countries. They are a sustainable solution for rural and small-scale industries that cannot afford advanced wastewater treatment systems (1) D.A., 1997).

Eco-Friendly and Biodegradable Moringa seeds will be biodegradable and non-toxic, making them environmentally safer compared to synthetic alternatives. The use of moringa seeds aligns with sustainable development goals (SDGs) and promotes green technologies in wastewater management. Effective in Removing Contaminants Textile wastewater contains dyes, heavy metals, and other pollutants that are challenging to treat. Moringa seed extract will be used to remove Suspended solids Color from dyes (e.g., by adsorbing dye molecules) Heavy metals (by chelation or adsorption) Oil and grease. This makes it a comprehensive treatment agent for various pollutants. Improved Water Quality Moringa seed treatment enhances water clarity, reduces turbidity, and lowers biological oxygen demand (BOD) and chemical oxygen demand (COD) levels (9) Nomanbhay, 2013).

It will be to help wastewater suitable for discharge or reuse in irrigation or industrial processes. Sustainability and Circular Economy Utilizing moringa seeds in wastewater treatment promotes the circular economy by valorizing agricultural byproducts.

It will be supports sustainable agriculture and reduces waste, creating a closed-loop system. Challenges and future research dosage optimization determining the correct dose of moringa seed extract for effective treatment (5) J. Roussy, 2005).

## 1.6 Scope of the study

The exploration focuses on the treatment of textile wastewater from Quiha textile Factory. Parameters like lozenge, pH, and contact time are delved under controlled laboratory conditions to estimate the performance of Moringa oleifera.

Coagulation-flocculation followed by sedimentation; filtration will be used worldwide in the waste water treatment industry before the distribution of treated water to consumers. However recent studies have pointed out several serious drawbacks of using Aluminum salts. This drawback method will be substituted by Moringa oleifera (1) D.A., 1997).

The Purpose of this study introduces the application of moringa oleifera as a natural coagulant and will be replaced to aluminum salphate. The cost of procuring these chemicals and equipment's will be to increasing rapidly and most developing countries are finding it difficult to cope. Therefore, where cheaper alternatives will be found, to replace or supplement the conventional treatment chemicals, there will be a welcome benefit for the poorer less developed countries by a less cost of moringa seed powder. Natural Coagulant Vs Inorganic Coagulant Drawbacks of Alum - Alzheimer's disease and similar health related problems associated with residual aluminum in treated water. It produces large sludge volumes, It require pH Alkalinity adjustment, Low efficiency in coagulation of cold water, It will be costly and require high foreign exchange (4) Jahn, 1986).

# CHAPTER TWO

# 2. LITERATURE REVIEW

Textile waste water is one of the oldest industries which is highly complex and is characterized by high BOD, COD, and suspended solids and settles able solids. Untreated effluents when discharged directly into the water bodies or into the open lands cause irreversible damage to the environment. Coagulation–flocculation is to be one of the most important physicochemical treatment steps employed in industrial wastewater treatment to reduce the suspended and colloidal materials responsible for turbidity of the wastewater (2) G. McKay., 1979).

During the last decade, more interest has been given on the use of natural coagulants in treating industrial wastewater. Natural coagulants are, in general, used as point-of-use technology in less-developed communities, since they are relatively cost-effective compared to chemical coagulants. Also, they can be easily processed in usable form and biodegradable (9) Nomanbhay, 2013).

Moringa oleifera is used as locally available natural coagulant in this study to reduce turbidity, COD, organic materials, metal oxides, insoluble toxic compounds, and stable emulsions in textile wastewater. The tests were carried out, using wastewater with conventional jar test apparatus. Optimum dosage, contact time and optimum pH were determined. The optimum dosage of Moringa oleifera is found 1.5gm/500ml. The optimum pH value and contact time will be found to be, 9.5 and 2hrs respectively. In Moringa oleifera the maximum reduction in turbidity is found to be 82.02% and maximum reduction in COD is found to be 83.33%. Among the natural coagulants, maximum turbidity reduction of 82.02% and COD reduction of 90% is to be found with Moringa oleifera (7) Mataka, 2010).

## 2.1 Global Context

Textile wastewater has been a significant environmental challenge worldwide due to its high contaminant cargo, including colorings, heavy essence, and organic matter. Studies have shown that conventional treatments, while effective, frequently leave chemical remainders that pose pitfalls to mortal health and submarine ecosystems.

The use of natural coagulants like Moringa oleifera has gained global attention as a sustainable volition.

## 2.2 Physiochemical Analysis of Textile Effluent

The wastewater will be exemplified in terms of pH, turbidity, SS, TDS, COD and BOD. These parameters will be determined following analytical methods given in the series of standard methods for the examination of water and waste water. Methods - 2130 -B, 2540-C, 2540-D, 5210-B and 5220-D will be used for the measurement of turbidity, TSS, TDS, COD and BOD, respectively16. PH is to be measured using digital SCHOTT pH meter mode (4) Jahn, 1986).

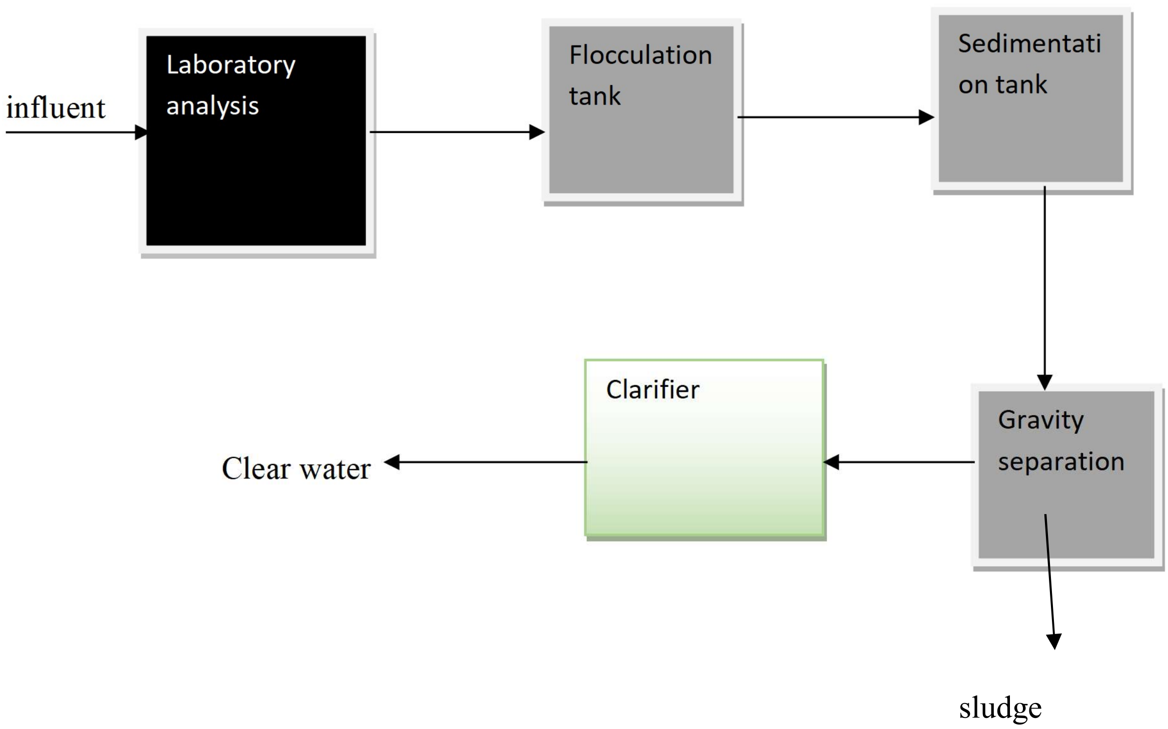


Figure 1:process flow diagram

## 2.3 Physio-chemical properties of moringa oleifera

Moringa seed has high adsorption property so that it can coagulate suspended solids, dissolved solids, heavy metals, nutrients organic and inorganic materials by adsorbing as their mass increases. Now days it will be used for industrial waste water treatment as a coagulant agent and also it absorbs dissolved organic materials and inorganic substances BOD and COD of waste water (6) K.R. ramakrishnan and T. Viraraghavan, 1998).

Moringa oleifera is a perfect example of a so-called multipurpose tree". Earlier studies have found Moringa to be non-toxic and recommended it for use as a coagulant in developing countries. The use of Moringa has an added advantage over the chemical treatment of water because it is biological and has been reported as edible, according to Suleiman. Hardness removal efficiency of Moringa oleifera will be found to increase with increasing dosage. M. oleifera seeds act as a natural absorbents and antimicrobial agent. Its seed contain 1% active polyelectrolyte's that neutralize the negative charged colloid in the dirty water. This protein can therefore be a nontoxic natural polypeptide for sedimentation of mineral particles and organics in the purification of drinking water. Moringa oleifera seeds are also acting as antimicrobial agent against variety range of bacteria and fungi.

Due to the small size of the Moringa oleifera coagulant protein, a bridging effect may not be considered as the likely coagulation mechanism1. Moringa seeds possess antimicrobial properties reported that a recombinant protein in the seed is able to flocculate gram-positive and gram-negative bacteria cells. In this case, microorganisms can be removed by settling in the same manner as the removal of colloids in properly coagulated and flocculated water. On the other hand, the seeds may also act directly upon microorganisms and result in growth inhibition.

Antimicrobial peptides are thought to act by disrupting the cell membrane or by inhibiting essential enzymes reported that Moringa seeds could inhibit the replication of bacteriophages (1) D.A., 1997).

**PH:**

Present study, treatment of Moringa oleifera seed powder will be given to textile waste water samples in different doses. During the analysis, it will be observed that after treatment with Moringa *s*eed powder; pH is to be decreased at 1500 and 2000 dose, but it was partially increased at 3000 mg/l dose, pH will be. After treatment the range of pH will be from 7 - 7.5.

The recommended acceptable range of pH for drinking water specified by WHO will be between 6.0 and 8.0. The treatments gave a pH range of 7 to 7.5 which falls within the reducing trends as the concentrations often dosing solutions will be increased. The reverse is to be observed with the Moringa treatment. The pH increases with increasing concentrations of the Moringa as coagulant. It will be reported that the action of M. oleifera as a coagulant lies in the presence of water-soluble cationic proteins in the seeds. This suggests that in water, the basic amino acids present in the protein of Moringa would accept a proton from water resulting in the release of a hydroxyl group making the solution basic (9) Nomanbhay, 2013).

**Turbidity:**

The initial Turbidity observed will be 135 NTU in textile waste water which was beyond the limits of WHO standards. It is to be observed that the use of Moringa oleifera seed powder showed decrease in turbidity of textile waste water with increased dose at 1g/l, 3g/l and increase turbidity with increasing dosage 5g/l, 10g/l and 20g/l respectively. The overdosing resulted in the saturation of the polymer bridge sites and caused re stabilization of the destabilized particles due to insufficient number of particles to form more inter-particle bridges. The high positive charge and small size suggest that the main destabilization mechanism may could be adsorption and charge neutralization. This will be also reported by Madsen et.al 6, 1987 and found that 90-99% of turbidity will be removed by using Moringa seed Powder (3) G. Vera, 2005).

**Total solids and Total dissolved solids:**

The initial TS is to be in range of 7000-8000 mg/l for textile waste water which will be beyond the limits of WHO. In case of TDS, initial range was 6000-7000 mg/l above permissible limit. After the treatment M. oleifera seed powder, the total solids and total dissolved solids were reduced from ground water. The range of total solids was found in between 3500-5000 mg/l and for total dissolved solids range was 2000-3500 mg/l. These were present within the limit according to WHO standards. Moringa oleifera is known to be a natural cationic polyelectrolyte and flocculants with a chemical composition of basic polypeptides with molecular weights ranging from 6000 to 16,000 Daltons, containing up to six amino acids of mainly glutamic acid, methionine and arginine.

**Color:**

The initial blue-black color of textile waste water will be completely removed after treatment of M. oleifera seed powder. The M. oleifera seeds shows absorbent properties. Good clarification is obtained (7) Mataka, 2010).

**Acidity:**

The Acidity observed was 500 mg/l for textile water. At various doses of M. oleifera, it was observed that the acidity decreased and found in the range of 5 5- 6.5 which is within the limit according WHO standards.

Because the seeds of M. oleifera contain lower molecular weight water-soluble proteins which carry a positive charge. When the seeds we crashed and added to water, the protein produces positive charge acting like magnets and attracting predominately negatively charged particles (2) G. McKay., 1979).

**Alkalinity:**

Alkalinity during the present research work will be observed to be 130mg/l for ground water. At various doses of Moringa oleifera seed powder, it will be observed that the alkalinity reduced after the treatment at 50 mg/l dose. But at higher dose of 100 and 150 mg/l of Moringa seed, the alkalinity was slowly increased. The alkalinity was present in the range of 95 - 100 mg/l which was within limits of WHO standards (4) Jahn, 1986).

**Chloride:**

The Chlorides will be present 12 mg/l in the textile waste water samples. It will be observed that Moringa seed treatment with chloride ions reduces the chloride level, because cations from the *s*eed attract negatively charged chloride ions present in ground water and neutralize the chlorides and therefore Chloride ions range between 5-9 mg/l in ground water samples which is within standard limit (6) K.R. ramakrishnan and T. Viraraghavan, 1998).

**Hardness:**

Hardness will be 190 mg/l for ground water sample. It will be observed that hardness of water is decreased with increased dose of Moringa seed powder at 1000, 3000 and increased with increasing 5000, 10000 mg/l of textile waste water. Hardness range was 100 - 170 mg/l and within the limit (8) Nascimento, 2012).

## 2.4 Advantage and Disadvantage of moringa oleifera Vs Aluminum sulphate

### 2.4.1 Advantage of moringa oleifera over aluminum sulphate

It is natural, completely non-toxic. The moringa Oleifera seed extract appears to have natural buffering capacity so, no pH alkalinity adjustments are required. Beside the level of turbidity, it reduces the level of microorganism in water. It is completely biodegradable. The volume of sludge produced is considerably less in case of Moringa than in case of alum (5) J. Roussy, 2005).

### 2.4.2 Disadvantage of moringa oleifera over aluminum sulphate

At present availability of seeds is a problem it requires mass cultivation. The costs of the Shelled Seed powder of M.O will be probably higher than the cost of alum at present. The waste water treated by M. oleifera produces odor after two days from treatment. Another disadvantage water extract increases Dissolved Organic Carbon in treated water (2) G. McKay., 1979).

## 2.5 In the Study Area

The Quiha Textile Factory produces large volumes of wastewater with high situations of BOD, COD, and turbidity. This study focuses on applying Moringa oleifera seeds as a natural coagulant to treat this wastewater effectively and sustainably.

# CHAPTER THREE

# 3. MATERIALS AND METHODS

## 3.1 Study Area

The study will be conducted in Quiha, located in Tigray, Ethiopia. The region is home to several cloth diligence, including the Quiha Textile Factory, which serves as the source of wastewater samples.

## 3.2 Materials and equipment's

Table 1:Materials and chemicals used

| Materials | Functions |
|---|---|
| Moringa seed | Will be used as coagulant agent |
| Waste water | Sample to be treated |
| Hydrochloric acid | To will be adjust the pH of waste water |
| Sodium hydroxide | To adjust the pH of waste water |
| Aluminum sulfate | Treating waste for comparison |
| Sodium sulfite | For calibration of BOD meter |
| Distilled water | For calibration of PH meter |

Table 2:: equipment's used

| Equipment's | Functions |
|---|---|
| PH meter | To will be measure the pH of waste water |
| Filter | To will be separate suspended solids |
| DO meter | To will be measure BOD |
| COD meter | To measure COD |
| Grinder | For size reduction of seed |
| Beakers | For experimental analysis |
| Mixer | To will be mix the waste with the coagulant |

## 3.3 Methods

### 3.3.1 Task one: Raw material collection and preparation

Seeds of Moringa will be purchased from local market, dried using sun light and grinded by adjusting size in grinding mill until a consistent powder obtained. Textile waste effluent sample will be collected from Quiha textile factory.

### 3.3.2 Task two: Sample characterization

The textile waste effluent sample will be characterized for the following properties.

**Determination of pH Value**

Procedure

- distilled water will be used to wash the electrode of the pH meter.
- The sample will be poured into a clean dry beaker

The pH electrode will be immersed into the sample and pH value will be read recorded

Turbidity will be used to indicates the amount of suspended solids, settable materials, undissolved heavy metals and perceptible materials found in textile waste water.

Turbid meter will be used to measure turbidity.

**Procedures**

- Tape water will be used to clean the cell
- The sample will be poured in to the cell, inserted in to the turbid meter
- Then the read button will be pressed
- Finally, the value will be recorded

**Biochemical Oxygen Demand (BOD) Test**

The BOD test will be a biological test; dependent on the actions of the microorganisms found in the wastewater. In order to have as much consistency as possible, it is important to standardize testing procedures when measuring BOD.

- ✓ The beaker will be used to collect or pour the textile waste water
- ✓ The calibration solution will be formed by taking sodium sulfite with pure water
- ✓ The BOD meter will be calibrated by this solution until it becomes zero reading.
- ✓ It will be inserted into the waste water and then records the data.

**Chemical Oxygen Demand (COD) Testing Procedures**

The chemical oxygen demand (COD) test will be used to measures the oxygen equivalent consumed by organic matter in a sample during strong chemical oxidation. The strong chemical oxidation conditions are provided by the reagents used in the analysis.

### 3.3.3 Task three: parameters specification

**Experiment one:**

**Effect of amount of coagulant**

Five samples of 500 textile waste water will be poured in the beaker. The sample will be treated with Moringa seed powder at various amount of coagulant by taking 1g, 3g, and 5g of moringa seed powder dissolved in 10 ml of tape water. The waste will be continuously stirred for 2hours at pH value of 8.5. Then it is allowed to settle for 6 hours. Finally, the mixture will be filtered through the filter paper and then BOD, COD and turbidity of the filtrate will be determined.

**Experiment two**

**Effect of contact time**

Three samples of 500 ml of textile waste will be poured into three beakers and each waste will be treated with 3g of Moringa seed powder and then will be continuously stirred by varying the contact time at 1hour, 2hours and 3hours. After this it will be allowed to sediment for 6 hours then the mixture is filter by gravity through the filter paper. Finally, BOD, COD and turbidity of the filtrate will be measured.

**Experiment three**

**Effect of pH on coagulation efficiency**

Three samples of 500 ml of textile waste water will be taken and adjusted at pH of 4.5, 7 and 9.5 are treated with 3g Moringa seed powder and the solution will be continuously stirred for 2hours. The solution will be sedimented for 6 hours then it will be filtered by gravity through the filter paper. Finally, BOD, COD and turbidity of the filtrate will be measured.

**Experiment four:**

**Efficiency comparison of moringa and aluminum sulfate**

One sample of 500 ml of textile waste will be taken and treat with aluminum sulfate at its optimum parameters of 5g aluminum sulphate, ph. of 9.5 and then will be continuously stirred for 2hours. The solution is to be sedimented for 6 hours then it will be filtered by gravity through the filter paper. Then, BOD, COD and turbidity of the filtrate will be measured. The optimum coagulation efficiency of aluminum sulphate will be compared with that of the optimum coagulation efficiency of moringa seed powder.

## 3.4 Data Analysis and Interpretation

Statistical analysis will be conducted to compare the effectiveness of Moringa oleifera and aluminum sulphate to treat textile waste water treatment. Results will be presented in tables and graphs to illustrate trends and optimal conditions.

## 3.5 Research ethics

insure all wastewater samples are handled and disposed of safely.

gain necessary warrants from the Quiha Textile Factory.

# CHAPTER FOUR

# 4.BUDGET AND ACTION PLAN

## 4.1 Budget breakdown

In most textile industries large amount of waste is generated from each section of process in industry. Therefore, it will be essential to have waste water treatment plant. Currently these industries expend much money for this treatment in terms of its chemicals used such as aluminum sulfate, magna, pc sulfuric acid, and also some equipment such as Z-tape machine cascade ion exchange, different sedimentation, flocculation tanks.

We will be considering the cost of chemicals and equipment's which will be substituted by flocculation tanks and moringa seed powder. From the application of moringa seed can substitute the COD and BOD treatment machines which means that it will be change the Z-tape machine, cascade ion exchanger these can changed by flocculation tanks the application of magna and pc chemicals will be eliminated by substitute moringa because the treatment efficiency of moringa will be effective compared to that of existing treatment operation.

Table 3:Budget on equipment sizing and cost

| Equipment and material | Total volume (L) | Cost ($) |
|---|---|---|
| Moringa seed | - | 111 |
| Flocculation tank | 4500 | 45022.38 |
| Sedimentation tank | 4800 | 30157.6 |
| Grinder | 4500 | 859.6 |
| Gravity separation | 4800 | 5738.7 |
| Mixer | 4800 | 4192.45 |
| Total | 23400 | 86081.78 |

Table 4:Budget on chemicals and materials of cost

| NO | Purchasing equipment and material | Total price ($) |
|---|---|---|
| 1 | Aluminum sulphate | 1.85 |
| 2 | Magna | 150 |
| 3 | Potassium chlorate | 30 |
| 4 | Ion exchanger | 27786.5 |
| 5 | Z-tape machine | 25452.86 |
| 6 | Flocculation tank | 45022.38 |
| 7 | Sedimentation tank | 30157.6 |
| 8 | Mixer | 1397.7 |
| 9 | Electrode | 32 |
| total | | 130030.9 |

## 4.2 Action plan

Table 5: Action plan of to this research proposal

| Task | Timeline | Responsible party |
|---|---|---|
| Literature review | Weeks 1-2 | Research team |
| Sample collection | Week 3 | Research team |
| Experimental setup | Weeks 4-5 | Research team |
| Data collection and analysis | Weeks 6-8 | Research team |
| Report writing | Weeks 9-10 | Research team |
| Submission | Week 11 | Research team |

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