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BUSITEMA UNIVERSITY

FAUCULTY OF ENGINEERING

DEPARTMENT OF MINING AND WATER RESOURCES ENGINEERING

EVALUATING THE EFECTIVENESS OF JACK FRUIT SEED POWER IN THE REMOVAL OF TURBIDITY AS A COAGULANT

Case study; Tororo - water treatment plant

BY

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PROJECT REPORT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR

THE AWARD OF A BACHELOR OF SCIENCE IN WATER RESOURCES ENGINEERING

MAY, 2017

ABSTRACT

Jackfruit (*Artorcarpus Heterophyllus* Lam), a member of family Moraceae is a popular fruit of the tropics widely cultivated in India and its neighboring countries as well as in parts of Africa. The literature review discusses the convectional water treatment processes with more emphasis on coagulation-flocculation process, different coagulants both natural and chemicals. Jack fruit seeds as a natural coagulant is also discussed, physicochemical quality of treated water, extraction process of Jf seeds.

Jackfruit seeds contain various properties that are useful in medicinal field for example antimicrobial properties and buffering capacity (Ferreira *et al.*, 2008; Dalen *et al.*, 2010). These factors are useful contributors for remediation of raw water by removing microbes, suspended matters and high turbidity in water (Gheldof *et al.*, 2002).

Coagulation and flocculation process are physical-chemical methods that widely used in the treatment of raw water. Today, the prime concern of the environmental engineers is how to lower the coagulants and flocculants cost and to improve the characteristics of the produced water. In this work, it is tried to use jack fruit seed powder as a natural coagulant.

The literature review briefly gives the general over view of raw water treatment processes, relevant scientific study on coagulation as a whole. It also shows information about different types of coagulants used in raw water treatment both natural and artificial coagulant, clearly pointing out their applications, and their advantages. It focuses on literature on application of Jf powder as a coagulant and its cost effectiveness in relation to other coagulants. The set of literature reviewed is mainly guided by the problem statement and objectives of the study.

The methods used to collect data which involves oral interviews, consultations, laboratory water quality tests which include tests for different parameters like PH, turbidity, color and conductivity, jar test, and using distilled water for extraction. By the end of this research, a low-cost and renewable coagulant for the treatment of raw water treatment will be developed.

Once this project is implemented, the following benefits are expected; reducing the turbidity of water to conform to WHO and UNBS Water quality standards using a natural and low cost coagulant, also there will be reduction in microorganisms.

DEDICATION

I dedicate this report to my parents who tirelessly supported and guided me up to this stage in my life. In addition, I thank dedicate as well this piece of work to my beloved Aunt Ekiring Agnes Amojong and to all my friends for their continuous efforts

ACKNOWLEDGEMENT

I would like to thank Almighty God for His protection and guidance up to this stage in my life. I feel highly indebted to the entire staffs in the department of Mining and Water Resources Engineering for giving me knowledge in the fields of Water resources. Specifically, I am very grateful to Mr. Baagala Brian and Ms. Nakabuye Hope my project supervisors who gave me all the necessary guidance, advice and encouragement during preparation of this report, May the Almighty God bless you abundantly. In a special way, I acknowledge Mr.Ogire John the lab quality technician for his assistance and guidance in my research, Last but not least, I appreciate my parents, Mr. Alexander Isiya, Achar Agnes, Mrs Ekiring Agnes, for the support they have continued to offer me in order to attain quality education. May the Almighty God bless the work of your hands and may He make you live long enough to enjoy the fruits of your labors. Finally I thank all my friends and colleagues for the assistance they have given me in endeavors to see me through with my research.

DECLARATION

I **OMUKAGA LAWRENCE** hereby declare to the best of my knowledge that is my true and original piece of work and has never been submitted to any university or institution of higher learning by anybody for any academic award.

Signature.....

Date 29th-may-2017.....

APPROVAL

This piece of work has been approved by;

Main Supervisor: Mr. BAAGALA BRIAN SEMPIJJA

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Date.....

LIST OF TABLES

Table of Contents

FIGURES

CHAPTER ONE: INTRODUCTION.

1.1 Back ground

Water is used for several purposes by humans but the level of purity of the water being consumed is very crucial since it has a direct effect on health. Therefore before it is used it should be treated to conform to certain standards which are set by WHO and different regulation bodies depending on different countries like UNBS in Uganda.

The conventional methods of drinking water treatment involves a number of combined processes such as coagulation- flocculation, sedimentation, filtration, disinfection and PH correction which are based on the quality of the raw water such as turbidity, color, PH, hardness and amount of microbial load present in raw water. The raw water quality directly affects the cost of achieving desired level of water treatment.

Coagulation is a common process used in removing suspended matter from water. The physical phenomenon of destabilization of colloids is induced by several chemical agents: polyaluminium salts and ferric chloride. However, this process is normally very slow, so some chemical products (usually synthetic polyelectrolytes like polyacrylamides) are added to water in order to accelerate the coagulation process by increasing floc size. This is known as flocculation.

However this puts pressure on the Uganda's over-burdened financial resources since these chemicals are imported thereby making treated water very expensive in Uganda. There is also high sensitivity of inorganic coagulants to the water pH and the possibility of secondary contamination of drinking water with traces of toxic synthetic polymeric coagulants or residual iron and aluminum ions which are the main challenges of flocculation–coagulation water treatment processes.

The utilization of JF seeds for water treatment is may be one of its most interesting usages. There are many previous papers investigating its utilization as a natural adsorbent for special pollutant removal (Kumari *et al.*, 2006; Araujo *et al.* 2010), the seeds of this tropical tree have a high amount of proteins that act like cationic polyelectrolytes once they are added to raw water (Ghebremichael *et al.*, 2005). These proteins act as flocculants inducing agents (Santiago *et al.*, 2002).

1.2 Problem Statement

Most of Uganda's water sources are contaminated. This makes water unsafe for human use before it is treated. The cost of achieving the desired level of water quality depends primarily on the cost and the availability of the coagulation agents. However the currently used chemicals are expensive. The high sensitivity of inorganic coagulants to the water PH is also another challenge. The sludge formed has a limited potential for recycling because of the non-biodegradability of alum and polyaluminium salts. Malaba River being a source of water for treatment, and other purposes, frequent fluctuations in the turbidity and color of water have been observed. This due to seasonal changes in rain fall trends along the river flow and different discharges quality from the tributary into the river. (Ghebremichael *et al.*, 2005, Howard *et al*... 2003)

1.3 Justification

Availability of naturally occurring plants materials that can be used to reduce turbidity from the unsafe water. These can easily be accessed by almost all people in rural areas than the dumping process. The cost of chemicals used in raw water treatment reduced especially on coagulation-flocculation. Water quality will be improved through reduction of harmful bacteria and turbidity

1.4 Objectives of study

MAIN OBJECTIVE

To evaluate the effectiveness of jack fruit seed powder as a coagulant in water treatment.

SPECIFIC OBJECTIVES

To characterize the quality of the raw water

To extract the active reagent from JF seeds.

To determine optimum dosage of jackfruit seed powder as a coagulant.

To carry out an economic analysis.

1.5 Scope of Study

This research project was only limited to:

Characterizing the raw water quality; extracting the active reagent from JF seeds; and determining the optimum dosage rate of extract and estimating the efficiency of coagulant.

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