BUSITEMA UNIVERSITY
Pursuing Excellence

FACULTY OF ENGINEERING

DEPARTMENT OF CHEMICAL & PROCESS ENGINEERING

FINAL YEAR PROJECT

DESIGN & CONSTRUCTION OF A CLAY BASED EVAPORATIVE COOLER FOR FRUITS

By

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ABSTRACT

A clay based evaporative cooling system was designed and constructed to increase the shelf life of stored fruits. The evaporative cooler was tasted and evaluated using three different fruits, that is to say, bananas, apples and mangoes.

The equipment operates on the principle of evaporative cooling. this cooler was made up of galvanized steel as a cooling chamber because of its features of corrosion resistance and high thermal conductivity, the surface was made up of clay because of its properties of low porosity, low heat conductivity and its availability and lastly, sand was used as the cooling pad because of its high porosity and its ability of not disintegrating in water. The water reservoir was placed on top of the cooling chamber so as to provide the head for water to flow into the sand by gravity.

From the performance evaluation of the prototype, it was found that the system has a minimum efficiency of 75% and that's during the morning hours and the maximum efficiency of 86% obtained in afternoon hours. After analyzing the percentage mass loss of the fruits, it was found out that the cooler works best with mangoes followed by bananas.

DECLARATION

I KIBUUKA ERNEST declare to the best of my knowledge that this report project is as a result of my research and effort and it has never been presented or submitted to any institution or university for an academic award.

DATE...16th/May/2019...........

SIGNATURE.....

APPROVAL

This project report was compiled and submitted to the Department of chemical and process engineering under the supervision of;

Main Supervisor

Mrs. KABASA MARY SALLY

Signature ……………………………………………………

Date……………………………… ……………………………

DEDICATION

This report is dedicated to my beloved parents Mr and Mrs Kiyingi David in appreciation for their selfless care and unflinching support provided to me since childhood, and for the spirit of hard work, courage and determination instilled into me, which attributes I have cherished with firmness and which have indeed made me what I am today.

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CHAPTER ONE: INTRODUCTION

1.1. Background

Fruits are important sources of minerals and vitamins especially A and C. Some also provide carbohydrates and protein, which are needed for normal healthy growth.(Adebisi & Olurin, 2009)Today, many individuals strive to maintain a healthy lifestyle consisting of a balanced diet of fresh fruits. As the demand for such produce increases, so too does the rate of post-harvest storage losses, as a result of inadequate facilities to store such produce. It was estimated that the average post-harvest storage loss in fresh produce in most developed countries is 5% to 25% and 20% to 50% in the developing countries.(Samantha Deoraj, 2015). Regionally, harvesting is done early in the morning in order to maximize the lower temperatures because under temperatures of 25°C to 35°C that typically exists in the afternoons, the respiration rate is high thus reducing the storage life. Undesirable effects of excessive temperature on fruits include accelerated ripening, shrinkage, and bitter taste in carrots which are directly linked to respiration, transpiration and ethylene production. These are due to the higher respiration rates. (Odesola, 2009). There is, therefore, the need to decrease the temperature of the fruits thereby decreasing the respiration rates, water loss, ethylene production and sensitivity to it as well as reduced microbial development. The most effective method utilized in storing produce involves refrigerated cool stores. However, many small-scale farmers and vendors in Uganda and in most developing countries are unable to incorporate the above method in preserving fruits due to its high cost with respect to installation, energy consumption and maintenance. Currently, the business revenue of many farmers in the region is limited due to the high loss in produce such as pineapples, carrots, tomatoes and guavas because of its perishable properties (Mohammed, 2001). A device needs to be designed and constructed in order to maximize the shelf life of the fruits at a low cost, thus reducing the losses endured by smallscale fruits retailers. This device will allow the appropriate cooling temperatures between 15°C to 21°C (Lerner, 2001) necessary to reduce the deterioration process.

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