

FACULTY OF ENGINEERING

DEPARTMENT OF CHEMICAL AND PROCESS ENGINEERING

**PROJECT TITLE: ADOPTION OF A VACUUM DRYING TECHNOLOGY FOR
VANILLA BEANS**

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*A development project report submitted in partial fulfillment of the requirement for the award of
the Bachelor of Science in Agro Processing Engineering of Busitema University.*

Date of submission:/...../.....

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ABSTRACT

This report contains work compiled for a development project of adoption of vacuum drying technology for vanilla beans. Vanilla beans are harvested when they are green and flavorless. This is because the botany of vanilla beans revealed that the flavor precursors are found in the interior of the vanilla bean and the hydrolytic / degradative enzymes that catalyze the flavor precursors into flavor compounds are found on the outer surface layer. So it's during the curing process when the vanilla beans develop the aroma.

The curing process has four major stages that is killing which is to disorganize the bean tissue, such that contact is created between the substrate and the respective enzyme. The second process is sweating, this is to provide conditions for enzyme catalyzed production of flavor compounds and also non enzymatic reactions. Then drying and conditioning all explained in chapter two (literature review). During the sweating process the moisture content of vanilla beans increase to 60 – 70% and this makes it necessary for drying as the next stage. Drying of vanilla beans is a difficult stage due to different factors and this stage is apparently critical to the prevention of flavor quality, because prolonged drying may lead to loss in flavor content. The problem associated with the current method of drying vanilla are discussed in both chapter one and chapter two, also in chapter two the curing process and different methods of drying and different types of dryers are discussed. Chapter three explains the methodology of constructing the vacuum dryer for vanilla beans which can mitigate the problems in the problem statement and chapter four has the results and discussions which give a clear evidence that drying under vacuum reduces the drying time as compared to using a traditional method of sun drying.

The vacuum dryer was designed, constructed and tested and the recommendations were to further study on automation of the equipment which will be a great advantage for drying.

DECLARATION.

I TUGUME DAN, hereby declare to the best of my knowledge, that this report is an outcome of my original work and that it has not been presented to any institution of learning for an academic award.

Signature: Tugumedan

Date: 30th May 2017



APPROVAL

This proposal report has been submitted to the department of agro processing of Busitema University with the approval of my supervisors.

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DEDICATION

With great pleasure let me dedicate this report to my mother Mrs. Magezi Felesta for the great contribution she has made towards my studies and to all my family members, lectures and teachers, friends and all people who have help me in one way or the other up to this greater height.

ACKNOWLEDGEMENT

First and foremost I thank the Almighty God who has kept me and you alive and for enabling us go throughout our daily endeavors.

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CHAPTER ONE

1.0 INTRODUCTION

Vanilla is a flavoring plant derived from orchids of the genus *Vanilla*, primarily from the Mexican species, **flat-leaved vanilla** (*V. planifolia*). Vanilla (*Vanilla planifolia* A.) is a major natural flavor widely used in many industries such as food, beverages, sodas, pharmaceuticals, cosmetics tobacco and traditional crafts.

Production of vanilla in Uganda began in the 1950's. Levels remained low until 1995, when vanilla was targeted by the USAID funded Investment in Developing Export Agriculture for promotion. From 1995 to 2003, vanilla growing, curing and export increased significantly in Uganda. Export figures rose from five tons in 1995 to over 120 tons in 2003. The total export value for vanilla is currently \$25 million.

The vanilla beans are harvested when they are green and flavorless but by the use of the curing process the vanillin and other numerous flavor compounds are developed. However, present curing methods yield only a fraction of the vanilla flavor from flavor precursors in green beans.

Studies on the botany of vanilla beans revealed that flavor precursors are found in the bean interior, whereas hydrolytic or other degradative enzymes, which catalyze the release of the flavor precursors to flavor compounds, are localized mostly in the outer fruit wall region. Therefore the curing processes help in bring into contact the substrate and the enzyme.

The curing processes include killing which is the first stage. This is to disorganize the bean tissue, such that contact is created between the substrate and the respective enzyme. The second process is sweating, this is to provide conditions for enzyme catalyzed production of flavor compounds and also non enzymatic reactions. The last stages are drying and conditioning (slow drying) drying is to reduce moisture content to protect against microbial spoilage and stop any further enzymatic activity. And during slow drying or conditioning at room temperature this helps in developing the flavor fully.

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