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A REVIEW: INVESTIGATION OF AFLATOXINS IN A TRADITIONAL BREW OF "*MALWA*" AND "*OBUSHERA*" IN UGANDA AND DEVELOPMENT OF AN IDENTIFICATION KIT FOR THESE AFLATOXINS IN THE ABOVE FOODSTUFFS.

BY

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A Project Report Review Submitted To Busitema University Faculty Of Science and Education, Department of Chemistry As A Partial Fulfillment For The Award Of Bachelor's Degree In Science Education.

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DECLARATION

I OKOIT STEPHEN do hereby declare that the report review entitled " INVESTIGATION OF AFLATOXINS IN A TRADITIONAL BREW OF " *MALWA*" AND " *OBUSHERA*" IN UGANDA AND DEVELOPMENT OF AN IDENTIFICATION KIT FOR THESE AFLATOXINS IN THE ABOVE FOODSTUFFS" has been prepared and submitted to the Department of Chemistry, Faculty of Science and Education in partial fulfilment of the requirements for the award of a Bachelor's degree in Science Education at Busitema University and has not been submitted for any academic qualifications in any other institution.

The contribution of other authors in addition to my work has been credited and fully included in the section of references.

Sign……. Date ……..

OKOIT STEPHEN

APPROVAL

This report review has been submitted to the Faculty of Science and Education at Busitema University and approved by the supervisor below.

DR. KIGOZI MOSES

Sign……..

Date……..

DEDICATION

I dedicate my work to all my friends and in a special way to my loving mother Nakirya Aidah Florence, who has been and is still a strong pillar in my education journey, not forgetting my dear elder sister Taligeza Margret for all the prayers and endeavours invested such that I reach this level.

I also dedicate this work to my lecturers and instructors at Busitema University Faculty of Science and Education but more so specially and especially Dr Kigozi Moses, who has been so good to me and endlessly corrected me in all my mistakes; I appreciate his outstanding work.

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I extend my sincere thanks firstly to my supervisor Dr. Kigozi Moses for he has been very key in making this report a success .I also thank the entire Chemistry department of Busitema University Faculty of Science and Education for having given me this opportunity to make a report on aflatoxins, investigating aflatoxins in a traditional brew of " *malwa*" and " *obushera*" in Uganda and development of an identification kit for these aflatoxins in the those particular foodstuffs.

I can' t forget to acknowledge my loving mother who has always encouraged me through prayers and my sister as well for everything and the tireless efforts that have pushed me to this level. I will forever say thank you. I pray that the almighty God richly rewards you for all that you have done.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

The research review was carried out to investigate aflatoxins in a traditional brew of " *malwa*" and " *obushera*" in Uganda and to develop an identification kit for these aflatoxins in those particular foodstuffs. Many people in different parts of the country use cereals and cereal-based products as a source of energy and these very cereals are used in the production of " *malwa" and " obushera"* . The reason for carrying out this research review is due to the increasing dangers faced by people in Uganda consuming these drinks and later in the long run get affected due to ignorance. Aflatoxins are highly toxic compounds and through various metabolic processes, these aflatoxins can keep on accumulating subsequently in the tissues of animals and humans without changing their composition. Cereals in particular are the crops which are contaminated by these aflatoxins and the aflatoxins being secondary metabolites in this case are given rise to by some fungal species. This has been a serious concern over a period of time in Uganda. Therefore because of the dangers that arise from aflatoxins, the consumption of cereals and any cereal-based products is a serious issue that needs to be considered. In this case therefore possible strategies have to be laid down in order to prevent the resulting dangers which are basically health issues. Besides preventing contamination of cereals and cereal-based products by aflatoxins, detoxification and elimination of these aflatoxins can be applied to overcome these dangers. Various aflatoxins types are found in these drinks, and these very aflatoxins affect the lives of the consumers of these drinks though this occurs in the long run.

Keywords: Aflatoxins, *Aspergillus flavus*, *Aspergillus parasiticus*, " *malwa"* and " *obushera"* .

Abbreviations:

AFB1- Aflatoxins B1

AFB2- Aflatoxins B2

AFM1- Aflatoxins M1

AFM2 - Aflatoxins M2

AFG1- Aflatoxins G1

AFG2- Aflatoxins G2

CHAPTER ONE

1.0 INTRODUCTION

Aflatoxins are a family of toxins (mycotoxins) produced by certain fungi formed on crops such as maize (corn) in peanuts, sorghum millet, cassava, and cotton. The fungi can be created when transporting these crops, harvesting the crops, and storing the crops. (Yi et al., 2005) .Worldwide, people can be exposed to aflatoxins by eating contaminated plant products, meat, and dairy products from animals that eat contaminated feeds. According to results, Africa shows that aflatoxins have immensely affected people though most don' t notice this in the short run. Prolonged exposure to aflatoxins is associated with an increased risk of liver cancer. In Uganda, a drink known as " *Malwa*" is a traditional brew whose cereal ingredients are prone to aflatoxin contamination, similarly to " *obushera*, a local drink made in Uganda. In addition, other crops like groundnuts (seeds) and then ground nuts' paste are also found to contain aflatoxins**.**

Among all the aflatoxins, *aflatoxin B1 (AFB1)* is the most common and most carcinogenic aflatoxin in animals. In addition to the already available methods of identifying aflatoxins, an identification kit is developed for the same purpose. This identification kit acts as a means of finding out how the damage caused by aflatoxins can be eliminated. So far, among the available methods of identifying these aflatoxins include the use of ELISA (Enzyme-linked Immunosorbent Assay) kit, use of thin-layer chromatography (TLC) and High-performance liquid chromatography (HPLC)

1.1 BACKGROUND

Uganda is one of the countries in Africa that deal in growing maize (corn), sorghum, millet, and cassava, among other crops. Some of these crops are used by individuals, more so locally, to make local brews such as " *malwa*" and " *obushera*" . For example, these local drinks are made using sorghum and millet, respectively.

Aflatoxins are toxic metabolites that are significantly produced by two species of molds.The molds of *Aspergillus flavus* and *Aspergillus parasiticus* are extensively spread in nature, and these form toxins at temperatures ranging from twelve to forty-two degrees and humidity above 80%. The toxins that occur in nature, such as mycotoxins, pose severe challenges to food safety. It has been proved that there is evidence of the association between prolonged exposure to aflatoxins and primary liver cancer. There are many different types of aflatoxins that have been identified, and among the 18 different types of aflatoxins specified, the principal members are *Aflatoxin B2 (AFB2), Aflatoxin B1 (AFB1), Aflatoxin M2 (AFM2), Aflatoxin M1 (AFM1), Aflatoxin G2 (AFG2), Aflatoxin G1(AFG1).* The *Aspergillus flavus* strains can alter from highly toxigenic to non-toxic and are more likely to bring about *Aflatoxin B1 (AFB1*) than *Aflatoxin G*1 *(AFG1).* The pressures of *Aspergillus parasiticus* generally have more minor alterations in toxigenicity and produce *Aflatoxin B1 (AFB1*) and different amounts of *Aflatoxin B2 (AFB2*), *Aflatoxin G1 (AFG1), and Aflatoxin G2 (AFG2).* (John D et al., 2008)

The most common aflatoxin, *Aflatoxins B1*, is known and considered among the hepatotoxins with a high potential of causing damage. It is as well known to be a human carcinogen. The toxicity of aflatoxins at deficient levels, for instance, at concentrations of parts per billion, is most likely to cause damaging effects. *Aflatoxin B1 (AFB1),* in the same way at

such deficient concentrations, also causes very detrimental effects. (Ramesh V & Siruguri, 2003).

Human exposure directly to aflatoxins B1 by consuming contaminated drinks like local brews of *" malwa"* and *" obushera"* and other foods like meat, milk, and eggs are the primary source. As mentioned above, many people have been consuming this local brew in Uganda. In the long run, these people have been affected in their human health, causing liver-related health problems. These problems are due to *aflatoxins B1* which exert carcinogencity to the liver. This is specifically by an induction process of guanine. In this process a substitution at codon 249 occurs on the cytochrome gene. (Brigitte et al., 1991).

1.2 PROBLEM STATEMENT

The traditional brew of *" malwa"* and then *" obushera"* as drinks are widely used by many people all over the country of Uganda and more so in the rural areas. For example, in the Teso region, especially the Soroti district, *" malwa"* is highly used by the people. However, even in other countries in Africa, there are still rural areas where *" malwa"* is a primary drink. Similarly, *" obushera"* is another drink many people take here in Uganda. Unlike *" malwa", " obushera"* is taken in rural and urban areas. Both of these drinks are products of cereals, which these cereals contain aflatoxins caused by a specific fungus that develops on these cereals. Therefore, there is an implication that these drinks also contain these aflatoxins in one way or another. These aflatoxins, in the long run, when they have accumulated in the body, are very dangerous because they can cause certain health complications, including malfunctioning of internal body parts. In this research review, an investigation was made on the aflatoxins in these drinks and then development of an identification kit. This was done such that the amount of the

aflatoxins in these drinks is analyzed and then removed by any possible chemical means to reduce on their consumption among the people.

1.3 OBJECTIVES

1.3.1 General objective

i. To determine the presence of aflatoxins in the drinks, " *obushera*" , and the local brew of " *malwa*" .

1.3.2 Specific objectives.

i. To find out the effect of aflatoxins in those drinks on the human body.

ii. To develop an identification kit for aflatoxins.

1.4 JUSTIFICATION**.**

The justification of this research project review is in such a way that through this research, many people who are being affected unknowingly by the aflatoxins can get the knowledge of how to avoid the damages. The research project also helps in a way that through the research project, we can be able to determine the aflatoxins so that they can be eliminated such that the aflatoxins don' t affect the consumers of " *obushera*" and " *malwa.*"

Another justification of this review is that it is to sensitize the masses on what causes the development of aflatoxins in the drinks (" *malwa*" *and* " *obushera*") involved in this project research review such that possible solutions are developed to stop aflatoxins development during processing.

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