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Pursuing Excellence

FACULTY OF ENGINEERING

DEPARTMENT OF GINNING AND TEXTILE ENGINEERING

PROGRAMME: BACHELOR OF SCIENCE IN TEXTILE ENGINEERING

RESEARCH PROJECT TITLE:

ANTIMICROBIAL TREATMENT OF COTTON FABRIC WITH BIDENS PILOSA LEAF EXTRACTS

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DECLARATION

I **Oshaba Jonan** declare that the information contained in this report was written by me and has not been copied from anywhere else. It is the information I researched and results from the experiments or tests that I carried out. I declare that it has not been presented anywhere in any institution for the award of any academic certificate, diploma or degree.

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APPROVAL

I present this report to the following persons for approval.

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DEDICATION

This research is dedicates to my aunt Mrs. MUGISHA ANNE and her husband Mr. MUGISHA STEVEN; all of whom have contributed tremendously towards the completion of this research, both spiritually and financially.

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ABSTRACT

The study covers leaves of bidens pilosa with the bioactive compounds extracted using solvents of ethanol, water and acetone which were later applied to cloth for antimicrobial activity test. Soxhlet extraction method was used. The number of phytochemicals whose test was positive were higher for organic extracts than for aqueous extracts. Flavonoids, glycosides, tannins, phenols, terpenoids tested positive for ethanol and acetone extracts while flavonoids and glycosides tested positive in water extract. The yield of the extract was 16% for water and 5.7%; for ethanol. Only extracts of water and ethanol were applied on cloth for study of the antimicrobial property. The agar diffusion method gave 17mm diameter as zone of inhibition for water extract against staphylococcus aureus with organic extracts exhibiting no antimicrobial activity while ciprofloxacin used as the standard drug had 39mm inhibition zone. The minimum inhibitory concentration test against S. aureus carried out using the broth dilution method showed 20mg/ml for ethanol and acetone and 10mg/ml for water extract. The extracts were applied to the bleached cotton fabric by dipping in liquor ratio 20 and drying at 70^0c. Curing was done at 150^0c. Antimicrobial tests were carried out for treated cotton cloth against staphylococcus aureus (S. aureus) and Escherichia coli (E. coli) using the disc diffusion method for cloth. The cloth exhibited higher antimicrobial activity against S. aureus and very little activity against E. coli. The antimicrobial activity; against S. aureus, of water extract was high when the cloth of more concentration (27%) was used. The zone of inhibition was 9.5mm. The ethanol extract on cloth showed negligible effect. Extracts from bidens pilosa leaves when incorporated in cotton cloth show promising potential against S. aureus, specifically aqueous extracts.

LIST OF FIGURES

LIST OF ABBREVIATIONS AND ACCRONYMS

UIRI-Uganda Industrial Research Institute

E. coli- Escherichia coli

S. aureus- Staphylococcus aureus

m- Meter

ml- mil-liter

MIC- minimum inhibitory concentration

TTO- Tea tree oil

SFE –Supercritical fluid extraction

HCl –hydrochloric acid

$FeCl_3$- iron (III) chloride

H_2SO_4 –Sulphuric acid

NaOH- Sodium hydroxide

Contents

1.0. CHAPTER ONE

1.1. INTRODUCTION

There is increased need for functional textiles which perform different tasks other than only providing cover to humans, or in other applications. A lot of functional finishes have been developed and one of the tasks for these finishes in textiles is the antimicrobial activity and antioxidant activity.

Antimicrobial finishing is a chemical treatment for textiles that provides the ability to destroy or inhibit the growth of microscopic organisms. Antimicrobial textiles are rapidly advancing for use in various fields like industries, medical, engineering, agriculture and food. Textile fibres with built-in antimicrobial properties will also serve the purpose alone or in blends with other fibres. They are referred to as bioactive fibres. Bioactive fibres find application enormous areas such as sanitary materials, dressing materials, surgical threads, materials for filtration of gases and liquids, air conditioning and ventilation, constructional materials, special materials for food industry, pharmaceutical industry, footwear industry, clothing industry, automotive industry(Sun, 2016a). Antimicrobial textiles are rapidly advancing for use in various fields like industries, medical, engineering, agriculture and food*(Shahid and Mohammad, 2013)*. Textile fibres with built-in antimicrobial properties will also serve the purpose alone or in blends with other fibres. They are referred to as bioactive fibres. Later, the home textiles, such as, curtains coverings, and bath mats came with antimicrobial finish. The application of the finish is now extended to textiles used for outdoor, healthcare sector, sports and leisure. Antimicrobial finishing technologies include pad drying, crosslinking, sol-gel technology, plasma technology, nanotechnology. Microencapsulation and application of cyclodextrins give slow release of the finishes and ensure durability in the textile.*(Joshi, Ali and Purwar, 2009,* Shahid and Mohammad, 2013)

Due to the problems associated with use of synthetic chemicals, especially pollution to environment and toxicity to humans, there is need for alternative biodegradable finishing agents *(Sathianarayanan et al., 2010).* Natural biopolymers are the only suitable and renewable products. The antimicrobial activity of few plants species out of about 250,000-500,000 known plant species, has been under study (Sun, 2016b). This is attributed to their use as traditional medicines. One of the most used medicinal plants is bidens pilosa, which is a common species with in the tropics. It grows to an average height of about 0.6m and maximum height of 1.5m and is an annual plant. It origin is known to be South America.*(Science, 2016,* Cortés-rojas, Chagas-paula and Fernando, 2013)

The project covers 'cotton textile treated with antibacterial plant extracts'. The project shows bidens pilosa as the bioactive agent source. The whole process rests on the idea of functional finishes for antimicrobial textiles.

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