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# EXTRACTION AND CHARACTERISATION OF LIGNIN FROM SIM-SM STEMS AND G.NUT STALKS

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## DECLARATION

I Jauke Alon declares that this project report is original work and has not been published or submitted before to any university or higher institution of learning except where referenced.

Jauke Alon

Sign.....Date...23 RD: MAY: 2023

**Approval**

This Research project report has been done under my supervision and guidance.

Supervisor:

Dr. Kamoga Omar

Sign.....Date.....23/05/2023.....

## Dedication

This dissertation is dedicated to my dear my Mother Nakalanzi Sarah for her financial support. Special thanks go to my dear Uncle (Sunday Stephen) for his endless financial and mentor support all through my academic journey.

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## ABSTRACT

Lignocellulosic biomass has been known for potential use to produce chemicals and biomaterials. Lignin is the second most abundant natural polymer with cellulose being number one of Lignocellulosic biomass. Lignin is a three-dimensional, highly cross-linked macromolecule composed of three types of substituted phenols, which include: coniferyl, sinapyl, and p-coumaryl alcohols by enzymatic polymerization, yielding a vast number of functional groups and linkages. This research was intended to extract lignin

from Sim-sim stems and G. nut stalks by sodium hydroxide treatment. Isolated lignin was characterized by Fourier transform infrared spectroscopy (FTIR) for chemical composition and function groups. The analysis of FTIR spectra revealed that the chemical structure of lignin varies depending on its species and the isolation method employed

The melting apparatus also revealed that lignin obtained from g. nut stalks had a high melting point compared to lignin from sim-sim stems

It was found that lignin obtained from sim-sim provided the greatest yield of 15.7% compared to lignin from G. nut stalks of 13.9% by weight yielding low lignin.

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# CHAPTER ONE

## 1.0 INTRODUCTION:

### 1.1 BACKGROUND

Most of the physical and chemical properties of the plants are determined by its main constituent called ‘lignin'. The word lignin has been derived from the Latin word lignum which means wood.

Lignin is the substance that makes trees woody and is present mostly in cell walls of the vascular plants, ferns and club mosses. It is a phenyl-propanoid structural polymer which binds the fibres and cell walls together and gives plants the required rigidity. It also decreases permeation of water across the cell walls of the xylem tissue and makes the wood resistant to attack by micro-organisrns. The lignin content in the plants varies from about 18% to 35% of the total wood content (Glennie & McCarthy 1962.). About 1010 tons of terrestrial biomass is produced annually through photosynthesis, and 5-36% (Adler, 1977; Chen, 1998) of this Lignocellulosic biomass of both softwood (gymnosperm) and hardwood (angiosperm) is lignin. Softwood species have a higher lignin/cellulose ratio than hardwood species.

Lignin and cellulose (including hemicellulose) are the main structural components of almost all the plants. Natural decay or biodegradation of plant tissues is therefore the key process of the carbon cycle in nature. Interspersed with hemicellulose micro fibrils, The lignin results in a heterogeneous composite aromatic polymer having biologically stable carbon to carbon and ether (C-O-C) linkages: This makes wood a good and lasting building material as well as a fuel. Plant cells can be viewed as a chemical factory wherein a large variety of highly sophisticated chemical compounds are synthesized from simple raw materials with the help of enzymes. Plants are thus the source of many important renewable chemicals, industrial compounds and energy.

Lignin is a complex macromolecule mainly synthesized from three p-hydroxy cinnamyl alcohols (p-coumary, conifery, and sinaply) which give rise to p-hydroxyphenyl, guaiacyl,

can provides an effective way to improve the application of lignin. Now, further research should be carried on the following in provision of surplus energy; Extraction and characterization of lignin from rice stalks, Extraction and characterization of lignin using klasson method, Extraction, structural characterization of lignin from sugarcane bagasse.

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