CHARACTERISATION OF THE POLYSACCHARIDE MATERIAL ISOLATED FROM THE FRUIT OF *CORDIA ABYSSINICA*

BY

CATHRINE KATAYI-CHIDEWE

A thesis submitted in partial fulfillment of

the requirements for the degree of

Doctor of Philosophy

Department of Biochemistry

Faculty of Science

University of Zimbabwe

July 2004

ABSTRACT

Treatment of aqueous extracts of the fruit of *C. abyssinica*, containing 0.25% sodium chloride with three volumes of ethanol produced an acidic polysaccharide with a 2% yield, on a fresh weight basis. With a protein content between 2.6% and 4.6%, the polymer contained 0.29% hydroxyproline. Uronic acid content, determined using the m-hydroxydiphenyl method was 9%. Some uronic acid residues along the polymer chain were methyl esterified, with the methoxyl content being 38%. With an ash content of 17% the polymer had a mineral ion content of Ca, 0.3%, Mg, 0.3%, Na, 0.2% and K, 4.8%. The optical rotation of a 0.25% solution was – 50 ^{o}. The molecular weight of the polysaccharide crudely estimated by viscometry was approximately 1 800 000 daltons. Acid and enzymatic hydrolysis, followed by HPLC and TLC analysis, revealed that the polysaccharide consisted of glucose, galactose, mannose, arabinose, xylose, rhamnose, fucose, galacturonic acid and an unidentified sugar. Solutions of the polysaccharide showed pseudoplastic flow behaviour. When suspended in water, the polysaccharide that was precipitated with salt and ethanol formed gels at a concentration of 2% at room temperature and at 4 ^{o}C. Emulsions formed by the polysaccharide at neutral and alkaline pH were less stable than those formed by gum arabic. Emulsion formation was enhanced by increasing the concentration of polysaccharide and the emulsions formed remained stable even under conditions of high salt concentration. On its own, the polymer formed brittle films but flexible films were formed in the presence of 1% glycerol. Apples coated with films based on the polysaccharide lost 33% less moisture than uncoated apples after 30 days of storage at room temperature. Composite films, prepared in the presence of up to 1.5% starch, had improved elastic properties.

"*Trust in the Lord with all thine heart, and lean not unto thine understanding. In all thy ways acknowledge him and he shall direct thy paths.*" **Proverbs 3 vs 4**

DEDICATIONS

This thesis is dedicated to:

my husband TERRENCE,

my children PATIENCE and XAVIER

my late mother Ms P. Katsidzira and my father S. Katayi

and my brothers and sisters.

ACKNOWLEDGEMENTS

The work described in this report was generously funded, in part, by the Swedish Agency for Research Corporation with developing Countries (SAREC), International Foundation for Science (IFS) and the University of Zimbabwe Research Board.

My sincere gratitude and appreciation goes to the following people:

Professor M. A. N. Benhura, my supervisor and main source of inspiration, for his tireless encouragement and patience throughout the course of the project.

Professor Milas in France, for assisting in the determination of molecular weight of the polymer by light scattering.

Mr A. Kasiyamhuru, Mr L. Chirombe, Mrs A Chinyanga, Mrs J. Mapingire and other technical staff in the department of Biochemistry, UZ, for technical assistance.

Dr I Ncube, Dr M. Muchuweti and Dr I. Nyambayo, for assistance on some aspects of the project.

Fellow postgraduate students for sharing ideas and moral support in times of despair.

My husband and children for always being there for me, no matter what the circumstances were.

Above all I thank GOD for guiding me throughout the course of the project and for giving me the precious gift of **LIFE.**

TABLES

Page

FIGURES

Page

APPENDICES

Page

1. Mudadi N. A. Benhura and **Cathrine Katayi- Chidewe**. (2000). Preliminary study of the gelling properties of polysaccharide isolated from the fruit of *Cordia abyssinica*. *Gums and Stabilisers for the Food Industry*, **10,** 69-75.

2. Mudadi N. A. Benhura and **Cathrine Katayi- Chidewe**. (2000). Viscosity and solubility properties of the polysaccharide that is isolated from the fruit of *Cordia abyssinica*. *Advances in Food Science (CTML),* **22 (5,6),** 165-169

3. Mudadi N. A. Benhura and **Cathrine Katayi- Chidewe**. (2002). Some properties of a polysaccharide preparation that is isolated from the fruit of *Cordia abyssinica*. *Food Chemistry*, **76**, 343-347

3. Mudadi N. A. Benhura and **Cathrine Katayi- Chidewe**. (2004). Emulsifying properties of a polysaccharide isolated from the fruit of *Cordia abyssinica*. *International Journal of Food Science and Technology*, **39,** 579-583**.**

CONTENTS

Page