ASSESSMENT OF ANTIDIABETIC PROPERTIES OF THE PRICKLY PEAR CACTUS IN SWISS WHITE MICE

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A Thesis Submitted to the Graduate School in Partial Fulfilment for the Requirements of the Award of Master of Science Degree in Biochemistry of Egerton University

EGERTON UNIVERSITY

NOVEMBER, 2016
DECLARATION AND RECOMMENDATION

DECLARATION
This is my original work and has not been submitted or presented for examination in any institution either in part or as a whole.

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RECOMMENDATION
This thesis has been submitted with our approval as the supervisors for examination according to Egerton University regulations.

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DEDICATION

I dedicate this thesis to my dear parents, siblings and friends for their love, support and encouragement during my studies. Thank you and God bless you.
ABSTRACT

Diabetes mellitus, a metabolic disorder that affects the body’s ability to make or use insulin, has become a major public-health issue globally. This is because of the numerous health problems it causes to humans including: brain damage, heart and renal diseases, circulatory problems, and death. The onset of diabetes mellitus can be due to various causes including genetic that leads mainly to development of Type I diabetes mellitus and the lifestyle of an individual that leads to obesity, a common cause of the Type II diabetes. Various management strategies have been proposed and implemented with the most recent one being the use of extracts of the “prickly pear cactus” *Opuntia* species, a shrub that grows mainly in semi-arid regions of America, Asia and Africa. The current study aimed at assessing the efficacy of prickly pear cactus cladode extracts in managing diabetes mellitus in diabetic mice and its possible cytotoxic effects. Healthy, adult Swiss white albino male mice weighing 20-30 g were induced with diabetes mellitus using Alloxan (150 mg/kg body weight) administered intra-peritoneally. Prickly pear cactus cladode extracts were administered orally at daily dosages of 0.6 ml and 0.8 ml for pre-determined periods. Fasting blood sugar levels, live body weights and packed cell volume values were monitored during and after termination of feeding on cactus cladode extracts. Liver and kidney tissues were obtained at the end of the experiment and processed for histopathological examination. Alloxan administration caused a 3- to 4-fold increase in blood sugar levels. Diabetic animals treated with cactus cladode extracts showed a decline in blood sugar levels, however, the levels varied with the period of treatment. Diabetic animals treated with cactus cladode extracts for 10 days showed a significant decline in blood sugar levels on the 7th (p=0.012) and 10th (p=0.001) days of feeding on the extracts when compared to the diabetic control animals. Histopathological examination revealed kidneys sections characterised with normal renal architecture. Mild degenerative changes were observed in liver sections of diabetic treated animals. No mortality was reported throughout the experiment. This study has demonstrated that extracts from prickly pear cactus cladode from Kenya have potential in managing blood sugar in alloxan-induced diabetic mice. This study has also demonstrated that cactus cladode extracts minimises the effects of diabetes mellitus on kidneys and liver of diabetic mice.
# TABLE OF CONTENTS

**DECLARATION AND RECOMMENDATION** .................................................................2

**COPYRIGHT** .............................................................................................................3

**ACKNOWLEDGEMENTS** .........................................................................................4

**DEDICATION** ..........................................................................................................5

**ABSTRACT** ...............................................................................................................6

**TABLE OF CONTENTS** ............................................................................................6

**LIST OF FIGURES** ....................................................................................................12

**LIST OF PLATES** .....................................................................................................12

**LIST OF ABBREVIATIONS AND ACRONYMS** ......................................................14

**CHAPTER ONE** .......................................................................................................1

**GENERAL INTRODUCTION** ..................................................................................1

  1.1 Background of the study .....................................................................................1

  1.2 Statement of the problem ....................................................................................3

  1.3 Objectives ............................................................................................................3

    1.3.1 General objective ..........................................................................................3

    1.3.2 Specific objectives .......................................................................................3

  1.4 Hypotheses ..........................................................................................................3

  1.5 Justification .........................................................................................................4

**CHAPTER TWO** .......................................................................................................5

**LITERATURE REVIEW** ..........................................................................................5

  2.1 Diabetes mellitus ................................................................................................5

  2.2 Types of diabetes ................................................................................................5
2.3 Causes of diabetes mellitus ..............................................................................................7
  2.3.1 Autoimmune causes of diabetes mellitus .................................................................7
  2.3.2 Metabolic causes of diabetes mellitus .................................................................7
2.4 Signs and symptoms of diabetes mellitus ........................................................................7
2.5 Diagnosis of diabetes mellitus ....................................................................................8
2.6 Global burden of diabetes mellitus ...............................................................................9
2.7 Progression of Type II diabetes mellitus ......................................................................10
2.8 Health risks associated with diabetes mellitus ...........................................................11
  2.8.1 Kidney diseases ......................................................................................................11
  2.8.2 Cardiovascular diseases ........................................................................................11
  2.8.3 Nerve diseases (Diabetic neuropathy) ....................................................................12
  2.8.4 Eye diseases (Diabetic retinopathy) ......................................................................12
  2.8.5 Urinary tract infections and other infections ........................................................12
  2.8.6 Pregnancy complications ......................................................................................12
2.9 Management of diabetes mellitus ...............................................................................13
  2.9.1 Drugs used in the management of diabetes mellitus .............................................13
  2.9.2 Medicinal plants used in management of diabetes mellitus ..................................15
2.10 Morphology of Opuntia ..........................................................................................16
2.11 Traditional uses of Opuntia .......................................................................................17
  2.11.1 Food ....................................................................................................................17
  2.11.2 Ornamental ..........................................................................................................18
  2.11.3 Medicine (Medicinal Uses) ...............................................................................18
CHAPTER THREE .................................................................................................................20

THE PRICKLY PEAR CACTUS CLADODES (OPUNTIA SPECIES) MODULATE
BLOOD SUGAR IN SWISS WHITE ALBINO MICE .................................................................20

3.1 Abstract ..............................................................................................................................20

3.2 Introduction .......................................................................................................................20

3.3 Materials and Methods ......................................................................................................21

3.3.1 Plant collection, preservation and identification ..........................................................21

3.3.2 Plant sample preparation ...............................................................................................22

3.3.3 Ethical consideration .....................................................................................................22

3.3.4 Experimental animals ..................................................................................................22

3.3.5 Induction of diabetes ....................................................................................................23

3.3.6 Hypoglycaemic activity test .........................................................................................23

3.3.7 Data Analysis ................................................................................................................24

3.4 Results ................................................................................................................................24

3.4.1 Determination of optimal volume of cactus extract for hypoglycaemic activity test ..........................................................24

3.4.2 Hypoglycaemic activity ...............................................................................................24

3.5 Discussion .........................................................................................................................28

3.6 References ........................................................................................................................30

CHAPTER FOUR ......................................................................................................................33

SAFETY EVALUATION OF PRICKLY PEAR CACTUS CLADODES IN SWISS
WHITE ALBINO MICE .............................................................................................................33

4.1 Abstract ..............................................................................................................................33
LIST OF TABLES

Table 3.1: Blood sugar levels of alloxan-induced diabetic mice following administration of cactus cladode extract.................................................................26

Table 4.1: Effect of prickly pear cactus cladode extracts on live body weights of healthy mice fed on cactus cladode extracts for 5 days.........................................................37

Table 4.2: Effect of prickly pear cactus cladodes on live body weights of healthy mice fed on cactus cladode extracts for 10 days..........................................................39

Table 4.3: Effect of prickly pear cactus extract on live body weights of alloxan-induced diabetic mice fed on cactus cladode extracts........................................42

Table 4.4: Effect of prickly pear cactus extract on packed cell volumes of healthy mice fed on cactus cladode extracts for 5 days.........................................................45

Table 4.5: Effect of prickly pear cactus extract on packed cell volumes of healthy mice fed on cactus cladode extracts for 10 days..........................................................47

Table 4.6: Effect of prickly pear cactus extract on packed cell volumes of alloxan-induced diabetic mice fed on cactus cladode extracts........................................49
LIST OF FIGURES

Figure 1.1: People with diabetes in 2013 and 2035 projection………………………………………...2
Figure 2.1: Summary of metabolic disorders arising from uncontrolled diabetes mellitus…..8
Figure 2.2: Global distribution of diabetes……………………………………………………………..10
Figure 2.3: Picture of prickly pear cactus with leaves (pads), flowers and unripe fruits………………………………………………………………………………………….16
Figure 2.4: Ripe fruits of Opuntia………………………………………………………………………17
Figure 3.1: Lyophiliser concentrating cactus cladode extracts……………………………………….22
Figure 3.2: Effect of prickly pear cactus cladodes on blood sugar levels of diabetic mice after termination of feeding on cactus cladode extracts………………………………………...27
Figure 4.1: Effect of prickly pear cactus cladode extracts on live body weights of healthy mice fed on cactus cladode extracts for 5 days. ………………………………………………………………38
Figure 4.2: Effect of prickly pear cactus cladodes extracts on live body weights of healthy mice fed on cactus extracts for 10 days……………………………………………………………...40
Figure 4.3: Effect of prickly pear cactus cladodes on live body weights of alloxan-induced diabetic mice fed on cactus cladode extracts for 10 days………………………………………...43
Figure 4.4: Effect of prickly pear cactus on live body weights of alloxan-induced diabetic mice fed on cactus cladode extracts for 5 days………………………………………………………...44
Figure 4.5: Effect of prickly pear cactus extract on packed cell volumes of healthy mice fed on cactus cladode extracts for 5 days………………………………………………………...46
Figure 4.6: Effect of prickly pear cactus extracts on packed cell volumes of healthy mice fed on cactus cladode extract for 10 days……………………………………………………………...48
Figure 4.7: Effect of prickly pear cactus extract on packed cell volumes of diabetic mice fed on cactus cladode extracts for 10 days……………………………………………………………...50
Figure 4.8: Effect of prickly pear cactus extract on packed cell volumes of diabetic mice fed on cactus cladode extracts for 5 days…………………………………………………………….51
LIST OF PLATES

Plate 4.1: Liver section of healthy control mice.................................................................52
Plate 4.2: Liver section of diabetic control mice...............................................................52
Plate 4.3: Liver section of healthy mice fed on 0.6 ml cactus cladode extract for five days.........................................................................................................................53
Plate 4.4: Liver section of healthy mice fed on 0.8 ml cactus cladode extract for five days.........................................................................................................................53
Plate 4.5: Liver section of healthy mice fed on 0.6 ml cactus cladode extract for ten days.................................................................................................................................54
Plate 4.6: Liver section of healthy mice fed on 0.8 ml cactus cladode extract for ten days.................................................................................................................................54
Plate 4.7: Liver section of alloxan-induced diabetic mice fed on 0.6 ml cactus cladode extracts for five days............................................................................................55
Plate 4.8: Liver section of alloxan-induced diabetic mice fed on 0.6 ml cactus cladode extracts for ten days...............................................................................................56
Plate 4.9: Kidney section of healthy control mice..............................................................57
Plate 4.10: Kidney section of diabetic control mice............................................................57
Plate 4.11: Kidney section of healthy mice fed on 0.6 ml cactus cladode extract for five days............................................................................................................................58
Plate 4.12: Kidney section of healthy mice fed on 0.8 ml cactus cladode extract for five days............................................................................................................................58
Plate 4.13: Kidney section of healthy mice fed on 0.6 ml cactus cladode extract for ten days..............................................................................................................................59
Plate 4.14: Kidney section of healthy mice fed on 0.8 ml cactus cladode extract for ten days..............................................................................................................................59
Plate 4.15: Kidney section of alloxan-induced diabetic mice fed on 0.6 ml cactus cladode extracts for five days.........................................................................................60
Plate 4.16: Kidney section of alloxan-induced diabetic mice fed on 0.6 ml cactus cladode extracts for ten days.........................................................................................60
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADA</td>
<td>American Diabetes Association</td>
</tr>
<tr>
<td>BMI</td>
<td>Body Mass Index</td>
</tr>
<tr>
<td>DM</td>
<td>Diabetes Mellitus</td>
</tr>
<tr>
<td>ESRD</td>
<td>End Stage Renal Disease</td>
</tr>
<tr>
<td>FBG</td>
<td>Fasting Blood Glucose</td>
</tr>
<tr>
<td>FPG</td>
<td>Fasting Plasma Glucose</td>
</tr>
<tr>
<td>GFR</td>
<td>Glomerular Filtration Rate</td>
</tr>
<tr>
<td>GISD</td>
<td>Global Invasive Species Database</td>
</tr>
<tr>
<td>GLP</td>
<td>Glucagon Like Peptides</td>
</tr>
<tr>
<td>H &amp; E</td>
<td>Haematoxylin and Eosin</td>
</tr>
<tr>
<td>IDDM</td>
<td>Insulin Dependent Diabetes Mellitus</td>
</tr>
<tr>
<td>IDF</td>
<td>International Diabetes Federation</td>
</tr>
<tr>
<td>IPR</td>
<td>Institute of Primate Research</td>
</tr>
<tr>
<td>KEFRI</td>
<td>Kenya Forestry Research Institute</td>
</tr>
<tr>
<td>LADA</td>
<td>Latent Autoimmune Diabetes of Adulthood</td>
</tr>
<tr>
<td>NIDDM</td>
<td>Non-Insulin Dependent Diabetes Mellitus</td>
</tr>
<tr>
<td>PCV</td>
<td>Packed Cell Volume</td>
</tr>
<tr>
<td>ROS</td>
<td>Reactive Oxygen Species</td>
</tr>
<tr>
<td>SEM</td>
<td>Standard Error of the Mean</td>
</tr>
<tr>
<td>TID</td>
<td>Type I Diabetes</td>
</tr>
<tr>
<td>UTI</td>
<td>Urinary Tract Infection</td>
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