UNIVERSITI TEKNOLOGI MARA

EFFECT OF *Ficus deltoidea* LEAVES ON GLUCOSE AND GLYCOGEN METABOLISM IN LIVER OF NORMAL AND STREPTOZOTOCIN-INDUCED DIABETIC RATS

NURDIANA BINTI SAMSULRIZAL

Thesis submitted in fulfillment of the requirements
for the degree of
Master of Science

Faculty of Applied Sciences

December 2008

Candidate's declaration

I declare that the work in this thesis was carried out in accordance with the regulations of University Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any other degree or qualification.

In the event that my thesis be found to violate the conditions mentioned above, I voluntarily waive the right of conferment of my degree and agree to be subjected to the disciplinary rules and regulations of University Teknologi MARA.

Name of Candidate	Nurdiana binti Samsulrizal
Candidate's ID No.	2005106828
Programme	Master of Science
Faculty	Applied Sciences
Thesis Title	Effect of *Ficus deltoidea* leaves on glucose and glycogen metabolism in liver of normal and streptozotocin-induced diabetic rats
Signature of Candidate	
Date	13 JANUARY 2009

EFFECT OF *Ficus deltoidea* LEAVES ON GLUCOSE AND GLYCOGEN METABOLISM IN LIVER OF NORMAL AND STREPTOZOTOCIN-INDUCED DIABETIC RATS

ABSTRACT

Ficus deltoidea from the Moraceae family is commonly called "mas cotek" by the Malays. The Malay folklore medicines believed that consuming a decoction of the vascular bundle of *Ficus deltoidea* led to a lowering of the blood glucose level of diabetic patients. The present study was designed primarily to evaluate the antidiabetic activity of *Ficus deltoidea* leaves on *in-vivo* and *in-vitro* models. Phytochemical examination of the plant by using simple qualitative screening methods showed that the aqueous and ethanolic extracts of *Ficus deltoidea* leaves contained saponins, flavonoids and tannins. The extracts also showed high inhibitory activity on α-glucosidase. To evaluate the effects of *Ficus deltoidea* leaves extracts on the hepatic activities of key glucose metabolic enzymes, non-diabetic and streptozotocin (STZ)-induced diabetic rats were treated with the extracts (200 mg/kg) for 2 weeks. Diabetes was induced in 1 month old rats by single intravenous injection of STZ at a dose of 65 mg/kg body weight. After a week, they were checked for fasting blood glucose concentrations to confirm the status of diabetes. The blood glucose concentrations were measured for 2 weeks upon the administration of *Ficus deltoidea* extract. A significant increase was observed in fasting blood glucose level in untreated diabetic rats. Diabetic rats also showed a significant decrease in the activities of hepatic hexokinase (HK), glucokinase (GK), phosphofructokinase (PFK), glucose-6-phosphate dehydrogenase (G6PDH) and glycogen content. Conversely, a significant increase in the activity of fructose-1,6-bisphosphatase (FBPase) was observed in untreated diabetic rats. However, after 14 days treatment with the plant extracts, the activities of HK ($p < 0.01$), GK ($p < 0.05$), PFK ($p < 0.05$), G6PDH ($p < 0.05$) and the levels of hepatic glycogen ($p < 0.05$) were found to significantly increase while the activity of FBPase ($p < 0.05$) was significantly decreased at the end of the experiment. The findings suggest that *Ficus deltoidea* exert its antidiabetic effect by inhibiting α-glucosidase, increasing glycolysis and decreasing gluconeogenesis.

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

1.1 General overview

Diabetes mellitus is a syndrome, which affects more and more people in all countries over the world. It is the fourth or fifth leading cause of death in the world (Andrew & Clifford, 2001). The incidence of diabetes mellitus is on the rise all over the world, especially in Asia. The World Health Organization (WHO) in 1994 estimated 46.9 million people with diabetes in Asia. They forecast that the number would rise to 126.2 million by the year 2010 and this increase will affect both industrialized and developing countries.

Two major types of diabetes are recognized clinically by WHO namely, insulin-dependent diabetes mellitus (IDDM) or type I and non-insulin dependent diabetes mellitus (NIDDM) or type II. Type I develops due to the autoimmune destruction of the insulin-producing β-cells of the pancreas while diabetes mellitus type II arises from a heterogeneous etiology, with secondary effect from environmental influences. Type I is conventionally treated with exogenous insulin. Exogenous therapy is required to prevent ketosis and to reduce the hyperglucagonemia and the elevated blood glucose level. Type II is treated with oral hypoglycemic agents such as sulphonylureas and biguanides (Felig *et al.,* 1995; Rosak, 2002). Oral hypoglycemic agents are used to stimulate the pancreatic β-cells to secrete insulin and/or increase the sensitivity of peripheral insulin