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Original Article

Antidiabetic effect of methanolic extract of *Decalepis hamiltonii* root (wight and Arn) in normal and alloxan induced diabetic rats

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ARTICLE INFO

Article history:
Received 6 August 2012
Accepted 5 November 2012

Keywords:
Diabetes mellitus
Alloxan
Decalepis hamiltonii
OGTT

ABSTRACT

Diabetes mellitus is a major health growing problem in most countries. Purpose of the study was to evaluate the antidiabetic activity of methanolic extracts of root of *Decalepis hamiltonii* in normal and alloxan induced diabetic rats. Alloxan monohydrate 120 mg/kg was used to induce diabetes mellitus. The methanolic extract of *D. hamiltonii* at 200 mg and 400 mg and glibenclamide at 7 mg/kg bwt were administered to normal and alloxan induced diabetic rats which significantly reduced the blood glucose in the normal rats and alloxan induced diabetic rats. Also the administration of extract significantly decreased serum total cholesterol, triglyceride, and AST and ALT levels and at the same time increased liver glycogen content. OGTT was performed by administration of 200 mg and 400 mg of methanolic extract of *D. hamiltonii* and 7 mg of glibenclamide to different groups respectively which significantly lower at all time points that blood was sampled after oral glucose load. These results suggest that the methanolic extract of root of *D. hamiltonii* was effective in lowering blood glucose level in diabetic rats.

1. Introduction

Diabetes mellitus (DM) is a chronic disease caused by inherited or acquired deficiency in insulin secretion and by decreased responsiveness of the organs to secreted insulin.[1] Diabetes mellitus is a syndrome, initially characterized by a loss of glucose homeostasis resulting from defects in insulin secretion, insulin action both resulting impaired metabolism of glucose and other energy yielding fuels such as lipids and proteins.[2] DM is a leading cause of end stage kidney disease, cardiomyopathy and heart attacks, strokes, retinal degeneration leading to blindness and non-traumatic amputations.[3] Dyslipidemia, quite common in diabetic patients, is the main risk factor for cardiovascular and cerebrovascular diseases.

DM is currently one of the most costly and burdensome chronic diseases and is a condition that is increasing in epidemic proportions throughout the world. Diabetes is a serious illness with multiple complications and premature mortality, accounting for at least 10% of total health care expenditure in many countries.[4] The prevalence of diabetes of all age groups worldwide is projected to rise from 171 million in

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0974-6943/$ – see front matter
http://dx.doi.org/10.1016/j.jopr.2012.11.035

2000 to 366 million in 2030.[5] Reason of this rise includes increase in sedentary life style, consumption of energy rich diet, obesity, higher life span, etc.[6] DM is a major and growing health problem in most countries. It causes considerable amount of disability, premature mortality, and loss of productivity as well as increased demands on health care facilities.

As diabetes aggravates and β-cell function deteriorates, the insulin level begins to fall below the body's requirements and causes prolonged and more severe hyperglycemia.[7] Hyperglycemia induces long term complications of diabetes such as cardiovascular complications and microvascular complications such as retinopathy, nephropathy and neuropathy and foot ulcer.[8]

Several approaches are presently available to reduce the hyperglycemia including insulin therapy which suppresses glucose production and augments glucose utilization and several drawbacks like insulin resistance,[9] anorexic nervosa, brain atrophy and fatty liver[10] after chronic treatment; treatment by sulfonylurea, which stimulates pancreatic islet cell to secrete insulin; metformin, which acts to reduce hepatic glucose production; α-glucosidase inhibitors, which interfere with glucose absorption. Unfortunately, all of these therapies have limited efficacy and various side effects and thus searching for new classes of compounds is essential to overcome these problems. In spite of the presence of known antidiabetic medicine in the pharmaceutical market, remedies from medicinal plants are used with success to treat this disease.[11]

Based on the WHO recommendations hypoglycemic agents of plant origin used in traditional medicine are important (WHO, 1980).[12] The attributed antihyperglycemic effects of these plants is due to their ability to restore the function of pancreatic tissues by causing an increase in insulin output or inhibit the intestinal absorption of glucose or to the facilitation of metabolites in insulin dependent processes. Hence treatment with herbal drugs has as effect on protecting β-cells and smoothing out fluctuation in glucose levels. Most of these plants have been found to contain substances like glycosides, alkaloids, terpenoids, flavanoids etc. that are frequently implicated as having antidiabetic effects.[13]

Alloxan was one of the most widely used chemical diabetogens during initial research work on experimental diabetes. It is a cyclic urea analog of chemical composition 2,4,5,6-tetraoxo-hexa hydropyrimidine.[14] Alloxan induces diabetes in animals and impairs glucose induced insulin secretion from β cells of Islets of Langerhans of Pancreas. It has been reported that alloxan rapidly and selectively accumulates in β cells in comparison with non-β cells. Several reports directly or indirectly indicate that alloxan affects the membrane potential and ion channels in β cells.[15]

In the present investigation, methanolic extract of root of *Decalepis hamiltonii* was used to evaluate the antidiabetic activity in normal and alloxan induced diabetic rats.

2. Materials and methods

2.1. Plant material

The root of *D. hamiltonii* used for the investigation was purchased from a plant supplier in Chennai, Tamil Nadu, India. The plant was authenticated taxonomically at Plant Anatomy and Research Center, Chennai, Tamil Nadu, India.

2.2. Preparation of extract

The root of *D. hamiltonii* were dried in shade, crushed to coarse powder. The powder was defatted with petroleum ether (60–80 °C) and then extracted with 90% methanol using soxhlet extractor. The solvent was evaporated under reduced pressure and dried in vacuum and the filtrate obtained was used for further studies.

2.3. Animals

Healthy albino wistar rats weighing 150–200 g was used for the present study. They were housed in polypropylene cages under controlled conditions of temperature (25 ± 2 °C) with a 12-h light–dark cycles. All the animals were acclimatized for 7 days before the study. They were fed with standard pellet diet obtained from Sai-Durga feeds and foods, Bangalore, India and water ad libitum. All the studies conducted were approved by the Institutional Animal Ethical Committee of JSS College of Pharmacy, Proposal number IAEC/P.Cog/06/2010-2011.

2.4. Oral glucose tolerance test (OGTT)

The oral glucose tolerance test was performed in overnight fasted (18 h) normal rats. The rats were divided into four groups of six rats each. Group 1 served as normal control received orally 0.3% Carboxy methyl cellulose. Group 2 received orally reference drug Glibenclamide at a dose of 7 mg/kg bwt. Group 3 and 4 received orally 200 mg and 400 mg/kg of methanolic extract of *D. hamiltonii* dissolved in 0.3% Carboxy methyl cellulose respectively. After 30 min of treatment, all the groups were orally loaded with 2 g/kg of glucose. Blood samples were collected just prior to glucose administration and at 30, 60, 120 and 150 min after glucose loading. Blood glucose levels were measured using commercial kit.

2.5. Hypoglycemic activity in normal rats

Healthy wistar albino rats weighing 150–200 g were fasted overnight and were divided into four groups of six rats each.

Group 1: Normal control received orally 0.3% Carboxy methyl cellulose.
Group 2: Normal rats received orally reference drug Glibenclamide (7 mg/kg bwt)
Group 3: Normal rats received orally methanolic extract of *D. hamiltonii* (200 mg/kg bwt) dissolved in 0.3% Carboxy methyl cellulose.
Group 4: Normal rats received orally methanolic extract of *D. hamiltonii* (400 mg/kg bwt) dissolved in 0.3% Carboxy methyl cellulose.

Blood samples were collected before and 1, 2 and 4 h after treatment and the glucose level were determined by using commercial kit.