Antidiabetic Effect of The Aqueous Bark Extract of *FicusBenghalensis* on Alloxan Induced Diabetic Rats

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Abstract

Alloxan is a toxic glucose analogue, which selectively destroys insulin-producing cells in the pancreas (that is beta cells) when administered to rodents and many other animal species. This causes an insulin-dependent diabetes mellitus (called "Alloxan Diabetes") in these animals, with characteristics similar to type 1 diabetes in humans. Alloxan is selectively toxic to insulin-producing pancreatic beta cells because it preferentially accumulates in beta cells through uptake via the GLUT2 glucose transporter.[1]The present study was designed to investigate the antidiabetic effect of the aqueous bark extract of *Ficusbenghalensis*in normal and alloxan induced diabetic rats. The experimental groups were rendered diabetic by intraperitoneal injection of a single dose of alloxan monohydrate (150 mg/kg body weight [BW]). Rats with glucose levels 200-260 mg/dL were considered diabetic and were divided into 3 groups. One group of diabetic animals was orally administered, daily with bark extract at a dosage of 200 mg/kg BW. One group of alloxan rats was treated as diabetic control and the other group was orally administered 10 mg/kg BW Glibenclamidedaily.**Results**: Oral administration of 200mg/kg wt. of aqueous extract of bark for 7 days exhibited significant reduction in blood glucose level in diabetic rats. A comparison was made with well known anti-diabetic drug Glibenclamide10 mg/kg body wt.The anti-diabetic effect of was aqueous extract of bark nearly comparable than that observed with Glibenclamide.

Key words:*Alloxan, ficusbenghalensis, comparative study, Glibenclamide*

Introduction

The chronic hyperglycemia of diabetes is associated with long-term damage, dysfunction, and failure of various organs, especially the eyes, kidneys, nerves, heart, and blood vessels.[2]

The synthetic hypoglycemic agent can produce the serious side effect and are not suitable in pregnancy(Doodman and Roll,1985),where as the drug derived from the plants are frequently consider to be less toxin with fewer side effect .(Momin,1989).[3]Therefore, there is a necessity to look for newer agents that meet the requirement of an ideal anti-diabetic compound. Nature has been a source of medicinal substances for thousands of years, and plant-based systems continue to play an essential role in the primary health care of 80% of the world's underdeveloped and developing countries.[4]There is an increasing demand for natural products with anti-diabetic activity for use by diabetic patients.

Ethnopharmacological surveys indicate that more than 1200 plants are used worldwide in traditional medicine for their alleged hypoglycemic activity. [5, 6]

A very large up to 30m in height with widely spreading branches bearing many aerial roots functioning as a prop roots belonging to family moraceae. It is distributed throughout India, from sea-level to 1200m.

The bark is astringent, acrid, sweet, refringent and tonic. It is useful in burning sensation, haemoptysis, diarrhoea, dysentery, diabetes, ulcer.

This study has been undertaken to study the action of above mentioned plants aqueous extract on blood glucose level in alloxan induced diabetic rats.[7]

Materials and Methods

Plant material

The barks of*Ficusbenghalensis was* collected freshly from Ayurvedic shop, Belgaum and same

were authenticated by Dr. M.S.Goudar, R.L.S. Institute, Belgaum, shade dried and powdered from 40#size.

Preparation of aqueous extract of bark in formulation form(suspension)

The bark extract was prepared on the basis of an ayurvedic anti -diabetic formulation proposed by Pandey et al.Eight hundred grams barks of*Ficusbenghalensis was* extracted individually with 1500 ml alcohol by the maceration process and evaporated to dryness. The extract was filtered using a muslin cloth and concentrated. The fine powder was stored in desiccators until use. The herbal formulation of bio- active extract were formulated into suspension form by using 2% Tween-80.The additives Methyl Paraben and Propyl Paraben were used. [8,9]

Animals

Healthy young albino rats (Sprague-Dawley Strain) of either sex weighing 150 to 220g were selected for experiment. The animals were fed on convention laboratory diet with unlimited supply of water.

Experimental induction of diabetes

The rats were injected intraperitoneally with alloxan monohydrate (S.D.Fine chemicals limited) dissolved in sterile normal saline solution at a dose of 150mg/kg of body weight. Alloxan is capable of producing fatal hypoglycaemia as a result massive pancreative insulin release; therefore the rats were treated with 20% glucose solution (15-20 ml) orally after 6 hr.[10] After 72 hr. of alloxan injection, the animals were tested for the evidence of diabetes by estimating their blood glucose level by using Glucometer.The glucose level more than 150mg/100ml of blood was criteria.

Experimental design

To the animals, The extract was given in the form of herbal formulation (2ml) 200mg/kg orally

and the standard drug Glibenclamide (10mg/kg) administered by dissolving in normal saline respectively. The Glibenclamide tablets in powdered form used for activity was Dao nil, Aventis Pharma Ltd., Goa. The blood sample was obtained through the tail vein puncturingwith hypodermic needle. A 0.2 ml blood was withdrawn at interval of initial (O hour.), 3, 5, and 7hr. of single dose administration (for acute study) and at the end of seven day for prolonged treatment. The animals were segregated into the three groups of six rats in which one group is diabetic control, herbal formulation and standard drug glibenclamide group were used.[11]

Determination of blood glucose level

The blood glucose level was measured in all the groups by using Glucometer (Palsatum Health Care Pvt. Ltd., Bangalore).

Table-1 : Study for Determination of blood glucose level

Group(n)	Dose	Blood glucose level(mg/100ml)				
		Initial (0 hr.)	3rd hour	5th hour	7th hour	7th day
Diabetic control	2ml saline	220+_3.15	228+_3.80	232+_4.10	239+_3.10	223+_3.08
herbal formulation	2ml (200mg/kg.b.w.)	223+_4.12	220+_3.08	215+_1.20**	209+_1.89**	180+_2.17**
Standard drug Glibenclamide	600µg/kg	205+_4.53	193+_4.23	176+_3.45**	170+_3.35**	162+_3.67**

The values are given as mean ± s.d. of six rats in each group. Experimental group were compared with diabetic control and std. drug n=6, p*<0.05-significance, p**<0.01-more significant.

Results and Discussion

The standardized barks powder of*Ficusbenghalensis*was *subjected* to extraction by simple maceration method with water at room temperature forseven days. The extract were filtered and concentrated to dryness. The dried extractswere subjected to phytochemical investigation. The results of qualitative chemical investigation has indicated that the presence of Flavonoids, tannins, and carbohydrate. This result also confirmedthought the literature survey.

In the acute oral toxicity studies, no mortality and no macroscopical vital organ abnormality/damage were observed for polyherbal formulation up to 2000mg/kg.

Table 1 shows the blood glucose levels of diabetic control,herbal formulation and glibenclamide treated rats. In diabetic control rats, the increase in blood glucose concentration was observed after 1 hrs. The blood glucose level remained high over the next hrs. herbal formulation and glibenclamide treated rats showed decrease in blood glucose level at 1 and 2 hrs when compared with the diabetic control rats. The effect was more pronounced at the 2 hrs intervals.

Results obtained from herbal formulation indicate that herbal formulation showed more significant ($p<0.01$) anti diabetic activity (209#1.89) in acute as well as prolonged treatment (180#2.17) compared to diabetic control (239#3.10) and (223#3.08) respectively. The results were compared with standard drug glibenclamide showed anti diabetic activity in acute(182#2.58) and in prolonged treatment(170#1.472).The results were nearly comparable with standard drug glibenclamide(table no. 1).The anti-diabetic studies of the herbal formulation on alloxan induced diabetic rats showed that herbal posses highly significant antidiabetic effect with minimal toxicity. It can be concluded that this herbal formulation may be an ideal alternative for the existing synthetic preparation**.**

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