



Evaluation of antidiabetic activity of leaves and fruits of *Ficus religiosa* Linn.

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Abstract

The ethanolic extracts of the leaves and fruits of *Ficus religiosa* Linn. were comparatively evaluated for their blood glucose lowering activity in normal and alloxan induced diabetic rats. The ethanolic extract of the fruit, at a dosage of 250 mg/kg body weight, was found to exert a more pronounced antidiabetic activity than a 100mg/kg body weight dose. Fruit extracts were found to have no effect on normal rats. While, leaves extract was ineffective to lower the blood glucose level significantly in diabetic rats.

Key-Words: *Ficus religiosa* Linn., Alloxan, Diabetes

Introduction

Diabetes is the most common disease associated with carbohydrate metabolism and is a major cause of disability and hospitalization. The use of ethno botanicals has a long folkloric history for the treatment of blood sugar abnormalities.

Some of the *Ficus* species are known to have antidiabetic properties like *F.bengalensis* bark (bengalanoside); *F. racemosa* bark (sitosteryl glucosides) and fruits; *F.carica* fruits¹.

Ficus religiosa Linn, commonly known as peepal tree, belongs to the Moraceae family. Its bark is used in Ayurvedic medicine for the treatment of diabetes. Until, the studies have been restricted to its bark, so its other parts, i.e., the fruits and leaves deserve evaluation for their antidiabetic activity. Its stem bark contains β -sitosterol -D-glucoside and root bark contains phytosterolin due to which it has anti-diabetic activity.^{2,3} Its fruits and leaves contain flavonoids and leaves also contain sterols.^{4,5} Flavonoids and sterols are known to possess antidiabetic activity in various other plant species.^{1,6} So, it was thought that fruits and leaves may also possess antidiabetic and anti-oxidant activities.

In the present investigation, the ethanolic extracts of the leaves and fruits of *F. religiosa* were evaluated for their blood glucose lowering activity in normal and alloxan induced diabetic rats. The ethanolic extract of the fruits, at a dosage of 250 mg/kg body weight, was found to exert a more pronounced antidiabetic activity than a 100mg/kg body weight dose. Fruit extract was found to have no effect on normal rats. While, leaves extract was ineffective to lower the blood glucose level significantly in diabetic rats.

Material and methods

Plant material

Leaves and fruits of *F. religiosa* were collected from the Barkatullah University Campus, Bhopal in the month of March-April. The plant was identified and authenticated by Head, Department Of Pharmacy, Barkatullah University, Bhopal (BUPH-4014).

Preparation of extract

The materials were washed, cleaned properly to remove foreign material by using water, dried in shade for 15-20 days, pulverized to coarse powder. About 500 gm of powder was macerated with 95 % ethanol shaken frequently for 6 hours, and allowed to stand for 7 days. After exhaustive extraction, the ethanolic extracts were concentrated, evaporated to dryness and weighed. Percentage yield was calculated with reference to air-dried material.⁷

Preliminary phytochemical screening

Qualitative analysis of plant materials for presence of major chemical groups like flavonoids, steroids, phenolics, terpenoids, glycosides etc. was carried out.⁸

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Procurement of Animals

Healthy and 2-3 months old albino Wistar rats of either sex (weighing 140-160 gm) were procured from DRDE, Gwalior and maintained at 24-28°C throughout the experiment. All the animals were fed on standard diet & water ad-libitum and maintained in large spacious polypropylene cages & well-ventilated animal house with 12-hour dark and light cycle.⁹ The institutional ethical committee, Department Of Pharmacy, Barkatullah University, Bhopal approved the use of animals in the present study. Alloxan monohydrate, 150 mg/kg was freshly prepared as 5 % w/v solution in sterile water and a single dose injected intraperitoneally to overnight fasted animals.⁹ After 72 hours of alloxan administration, animals with moderate diabetes having glycosuria and hyperglycemia (i.e. with blood glucose level of 200-300 mg/kg) were taken for experiment.

Experimental

A total number of 54 rats (36 diabetic surviving rats, 18 normal rats) were used. The rats were divided into 9 groups of 6 rats each. The rats of group 1, group 8 & group 9 were normal while the rats of group 2 to group 7 were diabetic surviving. The treatment was carried out for 30 days. All the drugs were given orally, once daily to the rats in 0.3% CMC i.e. vehicle.

Group 1: Vehicle control: Normal rats treated with vehicle alone.

Group 2: Diabetic control: Diabetic rats treated with vehicle alone.

Group 3: Standard drug treated: Diabetic rats treated with Glibenclamide, 600 μ g/kg.

Group 4: Diabetic + Leaf extract: Diabetic rats treated with leaf extract, 100 mg/kg.

Group 5: Diabetic + Leaf extract: Diabetic rats treated with leaf extract, 250 mg/kg.

Group 6: Diabetic + Fruit extract: Diabetic rats treated with fruit extract, 100 mg/kg.

Group 7: Diabetic + Fruit extract: Diabetic rats treated with fruit extract, 250 mg/kg.

Group 8: Leaf extract alone: Normal rats treated with leaf extract, 250 mg/kg.

Group 9: Fruit extract alone: Normal rats treated with fruit extract, 250 mg/kg.

Since the alcoholic extracts of fruits and leaves were not freely soluble in water, stock suspensions were prepared in 0.3 % CMC¹⁰. Two different doses (100 mg/kg & 250 mg/kg) of each extract were given orally to selected groups of animals, once daily throughout the experiment.¹¹ Glibenclamide at a dose of 600 μ g/kg was used as standard drug.⁹ The specified dose of Glibenclamide in 0.3 % CMC was given orally, once daily throughout the experiment.¹⁰

Collection and Processing of Blood for Biochemical assays

The treatment was carried out for 30 days. At day 1, day 15 and day 30 the animals were deprived of food overnight and about 1ml of blood was collected through sino-ocular puncture in a centrifuge tube containing anticoagulant (10% sodium citrate solution) and the plasma was separated by centrifugation at 3000 rpm for 10 minutes and immediately used for biochemical assays. All the biochemical parameters (blood glucose, total cholesterol and triglyceride) were analyzed using standard procedures in Auto analyzer. Percent reduction of glucose, total cholesterol and triglyceride were calculated as function of time.¹²

Statistical analysis

Values were represented as mean \pm S.D. for 6 animals in each group. Data were analyzed using one-way analysis of variance (ANOVA). Individual groups were compared critically.

Results and Discussion

Table-1 depicts the blood glucose level of different groups of rats on day 1, 15 and 30. Blood glucose level was significantly ($p < 0.001$) increased in diabetic control group as compared to vehicle control group. Administration of *Ficus religiosa* fruit extract (100 and 250 mg/kg body wt.) and glibenclamide significantly ($p < 0.001$) decreased the diabetic blood sugar level as compared to diabetic control group and both the doses of fruit extracts worked similarly as standard drug, glibenclamide (insignificant difference). Maximum effect was observed at 250 mg/kg of fruit extract on day 30, while leaves had no effect on blood glucose level. The groups treated with extract alone, at a dose of 250 mg/kg of leaf and fruit extract found to be insignificant when compared with vehicle control group.

It is concluded that the drug can be used as an adjuvant in the diabetic therapy and can be further more screened for the chemical entity responsible for the activity.

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Table 1: Effect of Alcoholic Extracts of Leaves & Fruits of *Ficus religiosa* on Blood Glucose Level

Group	Treatment dose/kg body wt	Blood glucose (mg/dL)			% reduction
		Day 1	Day 15	Day 30	
1.	Vehicle control	80.22 ± 2.10	81.96 ± 2.41	84.81 ± 1.58 ^a	-5.72
2.	Diabetic control	248.33±0.914	285.77 ± 3.09	267.92 ± 1.65 ^b	-7.88
3.	Standard Drug Treated	234.73 ± 1.59	201.48 ± 2.64	102.31 ± 2.15 ^c	56.41
4.	Diabetic + Leaf Ext. 100 mg/kg	249.44±4.87	245.87±6.58	254.88±0.96 ^b	-2.18
5.	Diabetic + Leaf Ext. 250 mg/kg	248.71±5.55	214.55±2.20	234.15±1.06 ^b	5.85
6.	Diabetic + Fruit Ext. 100 mg/kg	247.14±3.62	195.59±5.09	218.64±3.02 ^c	11.53
7.	Diabetic + Fruit Ext. 250 mg/kg	247.50±4.33	181.16±1.65	202.58±0.79 ^c	18.15
8.	Leaf Ext. alone, 250 mg/kg	79.80±3.61	80.22±1.47	83.14±1.32 ^a	-4.19
9.	Fruit Ext. alone, 250 mg/kg	80.47±4.54	81.63±1.66	83.25±1.61 ^a	-3.45

Values are given as mean ± S.D. for 6 rats in each group. Values not sharing common superscripts differ significantly at P < 0.001.