INTERNATIONAL JOURNAL OF ADVANCES IN PHARMACY, BIOLOGY AND CHEMISTRY

Research Article

Evaluation of Antidiabetic Activity of *Bauhinia purpurea* Linn in Streptozotocin Induced Diabetic Rats

Prasanna shama K and Shastry CS

Department of Pharmacology, NGSM Institute of pharmaceutical sciences, paneer a constituent college of Nitte University, Deralakatte, Mangalore, Karnataka, India.

ABSTRACT

The present study was expected to evaluate anti diabetic activity ofethanol extracts of *Bauhinia purpurea* Linn plant parts Viz stem, root. Leaf and flowers in Wister rats.Diabetes mellitus was induced in rats by single intraperitoneal injection ofstreptozotocin (STZ, 50 mg/kg body weight). After STZ induction, the hyperglycemicrats were treated with all three extracts orally at the dose 200 mg/kg body weight dailyfor 15 days. Glibenclamide (0.5 mg/kg b. w., p.o.) was used as reference drug. Thefasting blood glucose levels were measured on every 5th day during the 15 daytreatment. All the extracts at 100, 200,400 mg/kg orally significantly ($p < 0.001$) exhibited antidiabetic activity in STZ-induced diabetic rats by reducing and normalizing the elevatedfasting blood glucose levels as compared to those of STZ control group. The methanolextract was most active. The present study concludes that *Bauhinia purpura* Linn confirmed promising anti diabetic activity in STZ-induced diabetic Wister rats.

Keywords: *Bauhinia purpura* Linn, Streptozotocin, Antidiabetic activity.

INTRODUCTION

Diabetics have significantly accelerated levels of oxidative stress and this contributes massively to mostneurological, cardiovascular, retinal, renal diabeticcomplications.[1] Diabetes mellitus is a metabolic disorder characterized by hyperglycemia, glycosurea,and negative nitrogen balance and it is mainly due to absolute deficiency or diminishedeffectiveness of insulin. It is the most prevalent disease in the world affecting 25% of thepopulation and afflicts 150 million people and is predicted to rise to 300 million by 2025.[2] Diabetes is still not completely curable by the present antidiabetic therapy.Insulin therapy is the only satisfactory approach in diabetic mellitus, even though ithas several drawbacks like insulin resistance, anorexia, brain atrophy, and fatty liver inchronic treatment[3]. There are several oral hypoglycemic agents used therapeuticallybut certain adverse effects and weak effectiveness of them has led to the search formore effective agents. Therefore, herbal drugs are gradually gaining popularity in thetreatment of diabetes mellitus. The major qualities of herbal medicine seem to be their supposed efficacy, low incidence of serious adverse effects and low cost.

Bauhinia purpurea Linn possess antibacterial, antidiabetic, analgesic, anti-inflammatory, anti-diarrheal, anticancerous, nephroprotective, and thyroid hormone-regulating activity.[4] Water extracts of the leaves of *Bauhinia purpurea* have been shown to have anti-ulcer activity in animals in the 'ethanol-induced gastric ulcer model'. Water extracts did not show any signs of toxicity when given to rats orally at doses up to 5000 mg/kg[5]

The use of natural products as medicinal agents presumably predates the earliest recorded history. *Bauhinia purpurea* is a species of flowering plant is used in several traditional medicine systems to cure various diseases. A wide range of chemical compounds including 5,6-Dihydroxy-7-methoxyflavone 6-*O*- β –D xylopyrano-Side, bis [3',4'-dihydroxy-6-methoxy-7,8-furano-5',6'-mono-methylalloxy]-5-C-5-biflavonyl and (4'-hydroxy-7-methyl 3-C-α-L-rhamnopyranosyl)-5-C-5-(4'-hydroxy-7-methyl-3-C-α-D-glucopyranosyl) bioflavonoid, bibenzyls, dibenzooxepins, mixture of phytol fatty esters, lutein, β-sitosterol,

isoquercitin and astragalin etc. The present review discusses phyto-chemistry, pharmacology, medicinal properties and biological activity of *B. purpurea* and its usage in different ailments[4].

Plant material

The parts viz; stem, root,leaf,and flowers of *B. purpurea* were collected locally from Deralakatte,karnataka , India. The plant material wastaxonomically identified at the Department of Botany, by Prof (Dr) Noel Pinto St Agnes college Mangalore, Karnataka, India. The voucher specimen was maintained in our research laboratory for future reference. The stem, root, leaf, flower from the plant were collected and the parts were shade-dried with occasional shifting and then coarse powder with mechanical grinder and stored in an airtight container for use inthe study.

Drugs and chemicals

Streptozotocin (STZ) from SISCO Research Laboratory, Mumbai, India; Glibenclamide from Hoechst, Mumbai, India. All the other reagents used were ofanalytical reagent grade obtained commercially.

Preparation of extract

The powdered plant material (1000 g) was extracted with ethanol (1000 ml) using soxhlet apparatus. The extacts were separately taken, filtered and evaporated to dryness on hot water bath. The dry extrcats [yield was stem yield: 3gms, root, yield: 4gms, leaves, yield: 3 gms flower, yield: 2.5 gms] were kept in a vacuum desiccators until use. The Preliminary phytochemical analysis performed presence of triterpenoids & its esters, falavonoids[6].

Experimental animals

Adult male Wister albino rats weighing 170-200 g, procured from registered animal house (KSHEMA Deralakatte Kanataka Mangalore India) and were housed in a clean polypropylene cage with not more than four animals per cage and maintained under standard laboratory conditions (temperature 25 ± 2°C with dark/light cycle 12/12 h).They were fed with standard pellet diet and water *adlibitum*. The animals were acclimatized to laboratory conditions for 10 days prior to experiment. All experimental procedures described were reviewed and approved by the Institutional Animal Ethics Committee.

Acute toxicity studies

The acute oral toxicity of ethanol extract of *Bauhinia purpurea* Linn in male Swiss albino mice was studied as per reported method. These extracts were given to six groups (n = 6) of animals at 500, 1000,1500,2000,3000 and 5000 mg/kg body weight (b.w.) per os (p.o.).[7] The treated animals were kept under observation for 2 days, for mortality and general behaviour. No death was observedtill the end of the study.

Induction of diabetes

Diabetes mellitus was induced in overnight fasted rats by asingle intraperitoneal injection of streptozotocin (50 mg/kg body weight). After 3 days, fasting blood glucose levels were measured and the animals showing blood glucose level 225 mg/dl were used for the present investigation.

Experimental protocol

The rats were divided into six groups (n = 6). Group 1 which served as normal non diabetic control all other groups were comprised of diabetic rats. Group 2 served as diabetic (STZ) control. Group 3 served as a standard drug drug glibenclamide (0.5 mg/kg b.w., p.o.) [8] treated , and group 4-15 received ethanol stem, root, leaf, flower extracts at the dose of 100,200, 400 mg/kg b.w., p.o., respectively daily for 15days.[8] Fasting blood glucose (FBG) level of each rat was measured on 0, 5th, 10th and15 day by using a one touch glucometer (Accu-check).

Statistical Analysis

The experimental data were expressed as mean ± standard errorof mean (SEM). Statistical significance was analyzed by one-way analysis of variance(ANOVA) followed by Dunnett's post hoc test of significance. P values of < 0.001 were considered as statistically significant.

RESULTS AND DISCUSSION

The present work was aimed to study the anti diabetic activity of different solvents extracts from B.P in STZ-induced diabetic rats. The results of this study revealed that ethanol extract at the doses of each 200, 400mg/kg body weight orally, demonstrated effective anti hyperglycemic activity in STZ induced diabetic rats; and restored body weight towards normal.

Streptozotocin (STZ) is an antibiotic obtained from Streptomyces achromogenes. STZenters the pancreatic cells via a glucose transporter-GLUT2 and causes alkylation of deoxyribonucleic acid (DNA) leading to pancreatic damage. Its toxicity depends upon the

potent alkylation properties combined with the synergistic action of nitric oxide andreactive oxygen species that continue to DNA fragmentation. As a result of STZ action, streptozotocin pancreatic cells are destroyed by necrosis. STZ is not only damaging tothe pancreatic cells but also to hepatocytes, nephrons and cardiomyocytes.[8,9]

In the present study, hyperglycemia was observed in rats after 3 days of STZ-induction. Treatment with ethanol extracts in STZ-induced diabetic rats,

started reducing fasting blood glucose levels after 5 days and made them completely normoglycemic after 15 days. The antidiabetic effect of ethanol extracts each at 200, 400 mg/kg dose was found to be comparable to that the effect exerted by the reference drug, glibenclamide at the dose of 0.5 mg/kg (Table 1 & Fig 1) the parts viz; stem,root, leaf, flowers of *Bauhinia purpurea* Linn has antidiabetic effect. Phytochemical screening gave positive test for triterpenoids & its esters, flavonoides. They are known as bio active antidiabetic principles. [10,11] has property of increased insulin secretion , could be resposnsible for its antidiabetic activity. They acts as insulin secretagogues.[12,13] Thus the claim made by the traditional Indian system of medicine regarding the use of this plant in the treatment of diabetes stands confirms. As far as the mechanism of action is concerned, we can speculate that antihyperglycemic activity of *Bauhinai purpurea* Linn could be due to an enhancement of peripheral metabolism of glucose, and increase in the production of insulin.

ACKNOWLEDGEMENT

The authors are thankful to Nitte University, Department of pharmacology, NGSM Institute of pharmaceutical sciences, & Nitte education trust, for providing all the neccessory help in carrying out this research work.

Table 1: Anti Diabetic activity of *B. purpurea by* streptozotocin induced diabetes

Group	Drug	Day o	Day 05	Day 10	Day 15
1.	Normal	76±0.3	75±0.04	74±0.4	74±0.5
2.	.control	278±0.5	280±0.4	285±0.4	292±0.4
3.	Std Glibenclamide. 0.5 mg/kg	279±0.4	95±0.4***	81±0.5***	78±0.7***
4.	BP St 100mg/kg	278±0.6	210±0.3	198±0.2	196±0.8
5.	BP St 200mg/kg	274±0.4	170±0.7**	167±0.6**	156±0.5**
6.	BP St 400mg/kg	278±0.3	105±0.4***	100±0.5***	96±0.8***
7.	BP Rt 100mg/kg	280±0.4	220±0.1	217±0.2	215±0.3
8.	BP Rt 200mg/kg	282±0.4	181±0.08**	175±0.4**	166±0.4**
9.	BP Rt 400mg/kg	283±0.3	110±0.53***	109±0.86***	108±0.1***
10.	BP Lf 100mg/kg	280±0.9	230±0.23	225±0.43	220±0.2
11.	BP Lf 200mg/kg	279±0.42	182±0.56**	178±0.24**	170±0.4**
12.	BP Lf 400mg/kg	283±0.05	115±0.48***	113±0.34***	112±0.3***
13.	BP Fl 100mg/kg	281±0.04	235±0.9	230±0.3	228±0.7
14.	BP Fl 200mg/kg	280±0.8	190±0.2**	187±0.4**	183±0.2**
15.	BP Fl 400mg/kg	280±0.7	130±0.5***	127±0.6***	125±0.4***

** Represents statistical significance vs. control ($P < 0.01$).
*** Represents statistical significance vs. control ($P < 0.001$).
B.P: Bauhinia purpurea Linn., St: stem, Rt: root, Lf: Leaf., Fl: Flower.

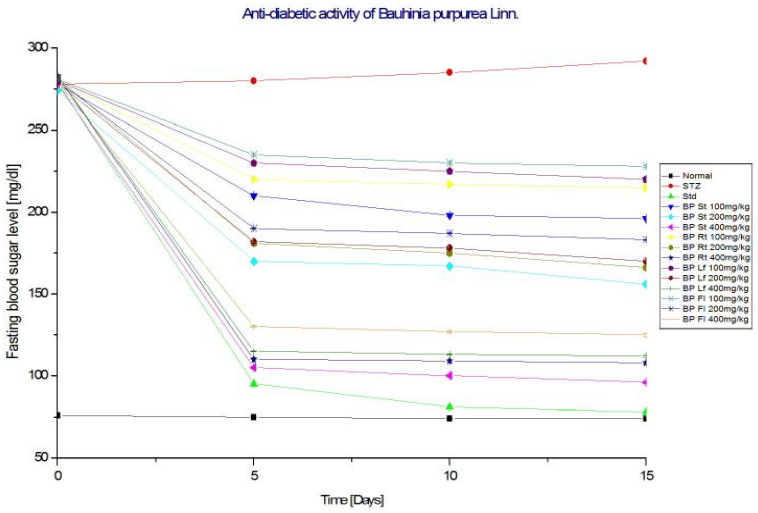

Fig. 1: Anti Diabetic activity of *B. purpurea by* streptozotocin induced diabetes

REFERENCES

1. Mohanty P, Hamouda W, Garg R, Aljada A, Ghanim H and Dandona P. Glucosechallengestimulates reactive oxygen species(ROS) generation by leucocytes. J Clin Endocrinol Metab. 2000;85:2970-2973
2. Vats RK, Kumar V, Kothari A, Mital A and Ramachandran U. Emerging targets fordiabetes. Curr Sci. 2000;88:241-247.
3. Weidmann P, Boehlen LM and Courten M. Pathogenesis and treatment ofhypertension associated with diabetes mellitus. American Heart J. 1993;125:1498-1513.
4. Kumar T. Chandrashekar K.S Bauhinia purpurea linn.: A review of its ethnobotany, phytochemical and pharmacological profile. Research Journal of Medicinal Plant. 2011;5(4): 420-431.
5. Zakaria ZA and Abdul Hisam EE. In vivo antiulcer activity of the aqueous extract of Bauhinia purpurea leaf. Journal of Ethnopharmacology. 2011;137(2): 1047-1054.
6. Kokate CK. Practical Pharmacognosy. 4th Edition. New Delhi: Vallabh Prakashan, 1996.
7. Lorke DA. A new approach to practical acute toxicity testing. Arch Toxicol. 1983;54: 275-287.
8. Biswas M, Kar B, Bhattacharya S, Kumar RBS, Ghosh AK and Haldar PK. Antihyperglycemic activity and antioxidant role of Terminalia arjuna leaf instreptozotocin-induced diabetic rats. Pharm Biol. 2011;49:335-340.
9. Mythili MD, Vyas R, Akila G and Gunasekharan S. Effect of streptozotocin on the ultra structure of rat pancreatic islets. Microscopy Res Tech. 2004;63:274-281.
10. Oliver-Bever B. Medicinal plants in tropical WestAfrica, Cambridge University press, London.1986;245-267.
11. Rhemann AV and Zaman K. Medicinal plantswith hypoglycemic activity, Journal of Ethnopharmacology. 1989;26:1-5
12. Chakravarth BK., Gupta S, Gambir SS and Gode KD. Pancreatic beta cell regeneration. Anovel antidiabetic mechanism of Pterocarpusmarsupium Roxb. Indain Journal of Pharmacology.1980;123-127.
13. Geetha BS, Mathew BC and Augusti KT. Hypoglycemic effects of leucodelphinidinderivative isolated from Ficus bengalensis Linn.Indian Journal of Physiological Pharmacology. 1994;38:220-222.