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COMPARATIVE STUDY OF ANTIDIABETIC ACTIVITY OF STEM BARK OF *FICUS BENGALENSIS* LINN. COLLECTED FROM DIFFERENT GEOGRAPHICAL REGIONS ON ALLOXAN INDUCED DIABETIC RATS

Alimuddin Saifi
Professor, Department of Pharmaceutical Technology, M. I. E. T. Meerut, U.P. India-250005

Maya Krishna Gupta
Principal, Sri Sai RR Institute of Pharmacy, Aligarh, U.P. India -202001

Rohit Mohan
Director, NLPD Professional Institute, Barabanki, U.P. India-225001, rohitkus21@gmail.com

Bhuwanendra Singh
Professor, Department of Pharmacognosy, SD College of Pharmacy and Vocational Studies, Muzaffarnagar U.P. India -251001

Sajjad Alam
Assistant Professor, Azad Institute of Pharmacy & Research, Lucknow, U.P. India-226002

NM Patel
Shri BM Shah College of Pharmaceutical Education & Research, Modasa, Gujarat, India-383315

Abstract

Ficus bengalensis Linn.belongs to family Moraceae is considered as safe, effective and economical for various ailments in Indian traditional system of medicine viz. antidiabetic, hypocholesterolaemic and hypolipidaemic effects etc. We planned our work as to collect stem barks of mentioned plant drug from different geographical regions and extract out by 95% v/v ethanol and evaluated for antidiabetic activity. Code names for plant drugs collected from Delhi, Gujarat and Uttaranchal were given as (FB/DL), (FB/GJ) and FB/UA respectively. All of the alcoholic extracts were compared for antidiabetic activity to evaluate the effects of climatic and atmospheric conditions on chemical composition and ultimately on pharmacological actions of the plant drug. Six animal groups having six Wister albino rats in each group were made. Three groups were served as Normal Control, Diabetic Control and Reference Standard. Other three groups of rats were treated by alcoholic extracts of plant drugs at a dose of 250 mg/kg Body weight. All the animal groups were treated for seven days. All the extracts decreased blood

glucose level significantly (P<0.05) when compared to control group. The effect of FB/DL was more and it reduced blood glucose level up to 28.26%. Percentage reduction in blood glucose level by FB/GJ, and FB/UA was 24.21% and 22.62% respectively. While Glibenclamide reduced glucose level up to 39.05%.
Key words:*Ficus bengalensis,*Stem bark, antidiabetic, climatic.

Introduction:

Herbal medicines have been used in medical practice for thousands of years and are recognised as a valuable and readily available resource of healthcare (Memori EL, 2001). *Ficus bengalensis* is an indigenous plant belonging to family Moraceae. It is commonly known as banyan tree or bargad or bar. It is reported to have antidiabetic activity. It is found throughout India (Memori EL, 2001, Goswami et al. 2002).

Diabetes mellitus is a group of syndromes characterized by hyperglycemia, altered metabolism of lipids, carbohydrates and proteins, and an increased risk of complications from vascular disease (Davis et al 1996). Non-insulin dependent diabetes mellitus (NIDDM) is associated with morbidity & mortality, resulting from its microvascular, macrovascular and neuropathic complications. The abnormalities of the lipid metabolism in diabetes mellitus generally leads to elevation in the levels of serum lipids and lipoproteins that in turn play an important role in occurrence of premature and severe atherosclerosis, which affects patients and diabetes (Huse et al 1988). For pharmaceutical purposes, the quality of medicinal plant must be as high as that of the other medicinal preparations. The quality of a vegetable product depends on the geographical origin, time and stage of growth when collections have been done and post harvest handling. The raw material presently available to the industry is procured from more than one geographical region. Vegetable drugs are inconsistent and hence the standardization may be influenced by several factors such as age and origin, harvesting period, method of drying and so on (Sarine YK, 1993). In the present work comparative study for antidiabetic activity and various biochemical parameters has been carried out to evaluate the effects of climatic conditions on antidiabetic activity of stem barks of stem bark of *Ficus bengalensis* Linn. collected from different geographical regions.

MATERIALS AND METHODS

Plant material

The stem barks of F. bengalensis Linn. had been collected from New Delhi, Gujarat and Uttaranchal and the code names to plant materials were given FB/DL, FB/GJ, FB/UA. The age of plant materials at the time of collection was in the range of 25-30 years as enquired from neighboring person. The specimen of collected bark was given for identification and authentication in Raw Material and Laboratory of National Institute of Science Communication and Information Resources (NISCAIR), New Delhi (voucher no. NISCAIR/Consult/RHMD/2008-09/1010/41).

The stem barks of FB/DL, FB/GJ and FB/UA were washing down and dried in an electric hot air oven at a temperature not exceeding 40°C for 48 hours.

Preparation of the extracts

Stem barks after collection were dried and coarsely powdered. Coarse powder of all of the barks were than defatted with petroleum ether by using soxhlet apparatus. Defatted plant drug than exhaustively extracted with 95% ethanol using soxhlet apparatus. All stem barks extracts were concentrated under reduced pressure to obtain dark brown mass. The sticky dark brown extracts were dried in air to get dried powered extract. (Sgrawat, H. et al. 2007, Edwin E. 2008). The percentage yields of ethanolic extracts of FB/DL, FB/GJ and FB/UA was found to be 6.6 % w/w, 9.56 % w/w and 7.0 % w/w respectively. The Phytochemical screening of all the extracts was carried out to ensure the presence of Alkaloids, Proteins & Amino acids, Carbohydrates, Flavonoids, Phenolic group, Glycosides, Saponins, Tannins, Steroids, Triterpinoids. (Cromwell B.T. et al. 1955, Kokate, C.K. et al. 1996, Finar I. L. 1975, Peach K. and Tracey M.V.1955, Geinssman T.A. et al. 1955). Proteins & amino acids, carbohydrates, flavonoids, Phenolic groups, glycosides, saponins, tannins, steroids and triterpenoids were found to be present and alkaloids were absent in all the extracts.

Antidiabetic Activity

Selection of Animals

Albino wistar male rats of weighing between 150 to 200 gm were procured from animal house facility of Shri B. M. Shah College of Pharmaceutical Education & Research, The animals were housed in standard conditions of temperature (25 ± 2 ^{0}C) and relative humidity (30-70%) with a 12:12 light-dark cycle and acclimatized in the animal house facility of the college (CPCSEA Approval and Reg. no./date 194/CPCSEA/1st June 2001). The animals were given food with standard diet (Amrut Rat Feed, India) and water *ad libitum*. The Institutional Animal Ethics Committee approved all the experimental protocols with approval no. IAEC/BMCPER/20/08-09.

Induction of Diabetes: The albino rats 150-200 gm either sex, were kept on fasting overnight prior to experiment and turned into diabetic by injection a single dose of Alloxan 120 mg/kg body weight (Manufactured by Loba Chemie Company). Alloxan was administered as a 5% w/v in distilled water by I.P. route. It produces diabetes by selective necrosis of β - cells of islets of langerhans of pancreas.

After 24 hours of injection of Alloxan, Blood glucose level was measured by using "CONTOUR™ TS" Glucometer from Bayer.The rats which showed blood glucose level more than 200 mg/dl were considered as diabetic and selected for experiment. Animals were maintained for 72 hrs in diabetic condition for well establishment of diabetes. (Ghosh M.N. 1998, Kannur et al. 2006)

Experimental Design:

Various alcoholic extracts of the barks of *F. Bengalensis* viz. FB/DL, FB/GJ, FB/UA were emulsified with 1% Tween-80 and employed for evaluating Antidiabetic activity. Glibenclamide at a dose of 5 mg/kg body weight was used as standard drug.

Animals were divided into six groups of six each.

Group-I: Healthy normal animals received only the water served as Normal control (NC).

Group-II: Alloxan induced diabetic animals kept untreated served as a Diabetic control group (DC) also received water.

Group-III: The Reference Standard group (RS) was treated with Glibenclamide at a dose of 5 mg/kg body weight, per oral.

Group IV: Diabetic animals treated with alcoholic extract of FB/DL (250 mg/kg b.w, p.o/day).

Group V: Diabetic animals treated with alcoholic extract of FB/GJ (250 mg/kg b.w, p.o/day).

Group VI: Diabetic animals treated with alcoholic extract of FB/UA (250 mg/kg b.w, p.o/day).

After 8 days anesthetized animals was sacrificed and blood was subjected for the determination of Blood glucose level.

Estimation of Blood Glucose Level: Blood glucose level was measured by using "CONTOUR™ TS" Glucometer from Bayer. for quantitative determination of blood glucose in the range10-600mg/dl.

Estimation of variations in body weight: Variations in body weight estimated after completion of drug treatment.

Statistical Analysis

All the values are expressed as mean ± S.E.M. Statistical significance between more than two groups was tested using one-way ANOVA followed by the Bonferroni multiple comparisons test or unpaired two-tailed student's t-test as appropriate using computer based fitting program (Prism, Graphpad 3.). Differences were considered to be statistically significant when $p < 0.05$.

RESULT AND DISCUSSION

Pharmacological investigations for Anti-diabetic activity:

Effects of stem bark of *F. bengalensis* viz. FB/DL, FB/GJ and FB/UA and glibenclamide (Std.) of seven days treatment on alloxan-induced diabetic rats are shown in table-1 and figure 1.

Table 1: Effect of *F. bengalensis Linn.*Stem Bark extracts on blood glucose level (mg/dl) in diabetic rats.

Blood Glucose Profile (M±SEM)		
Groups	**0- Day**	**7^{th} – Day**
Normal	78.00±1.958	77.00±3.028
D.C	352.8±4.270	362.0±2.160
Std.	360.3±5.779	219.5±4.770
FB/DL	371.5±6.564	266.5±4.010
FB/GJ	365.5±10.60	277.0±6.245
FB/UA	370.0±8.396	286.3±7.454

All the extracts decreases blood glucose level significantly ($P<0.05$) when compared to control group. The effect of FB/DL was more and it reduced blood glucose level up to 28.26%. Percentage reduction in blood glucose level by FB/GJ and FB/UA was 24.21% and 22.62% respectively. Glibenclamide reduced blood glucose level up to 39.05% after seven days treatment.

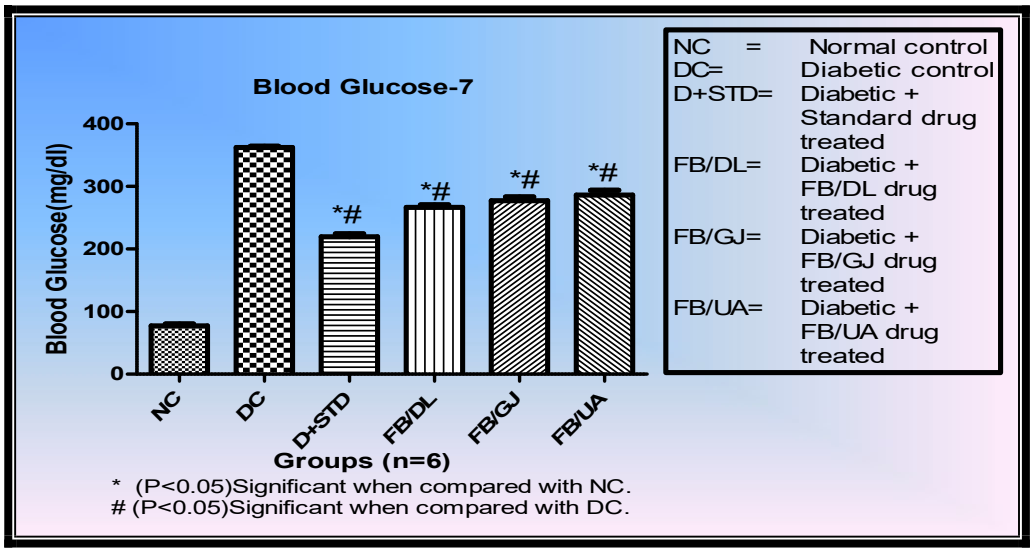

Figure 1: Effect of FB extracts on blood glucose (mg/dl) level at 7th day

Effect on Body Weight

Effects on body weight of stem bark of *F. bengalensis* viz. FB/DL, FB/GJ and FB/UA and glibenclamide (Std.) of seven days treatment on alloxan-induced diabetic rats are shown in table-2 and figure 2.

Table 2: Effect of *F. bengalensis Linn.* Stem Bark extracts on Body Weight in diabetic rats.

Body Weight Profile (gms)		
Groups	**0-Day (M±SEM)**	**7th – Day (M±SEM)**
Normal	187.5±4.787	196.3±6.884
D.C	186.3±5.543	152.5±5.951
Std.	154.8±4.171	161.0±3.937
FB/DL	186.3±9.437	188.8±8.260
FB/GJ	186.3±10.68	180.8±9.789
FB/UA	211.3±9.656	187.5±6.614

Glibenclamide and *F. Bengalensis* collected from Delhi improves body weight significantly (P<0.05) when compared to control group. FB/DL increases the body weight from 186.3±9.437

to 188.8±8.260. Glibenclamide (Std.) increases the body weight from 154.8±4.171 to 161.0±3.937.

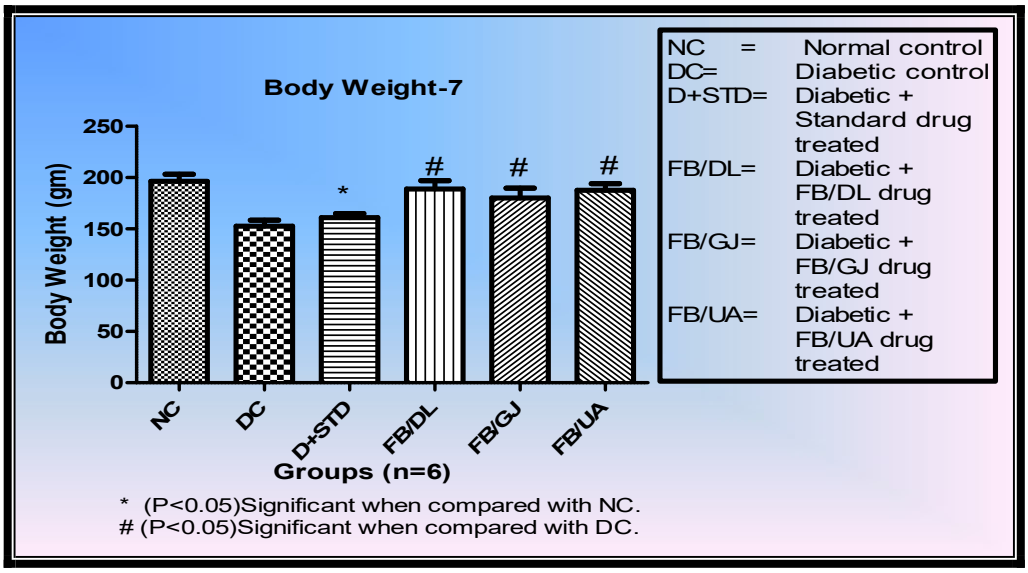

Figure 2: Effect of FB extracts on body weight (gm) at 7-day in diabetic rats

CONCLUSION

On the basis of study carried out it was found that the alcoholic (95% v/v) extracts of stem bark of *F. bengalensis* collected from different geographical regions have different degree of antidiabetic activity on alloxan induced diabetic rats. The effect of FB/DL was more and it reduced blood glucose level up to 28.26%. Percentage reduction in blood glucose level by FB/GJ, and FB/UA was 24.21% and 22.62% respectively. While Glibenclamide reduced glucose level up to 39.05%. Also, Glibenclamide and FB/DL improve body weight significantly when compared to control group. FB/GJ and FB/UA had not improved body weight of diabetic rats. So, it is concluded that, if plant drug of same species is collected from different geographical regions having dissimilar climatic conditions than the drug must be standardized. Our study proves that climatic conditions affect the pharmacological activity of a plant drug.

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