IJPSR (2012), Vol. 3, Issue 11 **(Research Article)**

INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES AND RESEARCH

Received on 23 July, 2012; received in revised form 17 September, 2012; accepted 30 October, 2012

ANTIDIABETIC POTENTIAL OF BERBERIS ARISTATA BARK IN ALLOXAN INDUCED DIABETIC RATS

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Keywords:
Berberis aristata,
Alloxan,
Glibenclamide,
Diabetes

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UICK RESPONSE CODE

IJPSR:
ICV (2011)- 5.07

Website:
www.ijpsr.com

ABSTRACT

The present study was designed to investigate the antidiabetic potential of different extracts of *Berberis aristata* bark, in alloxan induced diabetic male wister albino rats (150-250g), Diabetes was confirmed after 5 days of single intraperitoneally injection of alloxan (140 mg/kg of body wt.) in 12 hours previously fasted rats. Petroleum ether extract of *Berberis aristata* (PEBA) (100 & 400 mg/kg, body wt.) & Ethanolic extract of *Berberis aristata* (EEBA) (100 & 400 mg/kg, body wt.) and the standard drug glibenclamide (10 mg/kg, body wt.) were given orally in 0.5% Tween 80 after 5 days of alloxan treatment daily for 20 days, except the normal and diabetic control group (n=6). Blood was collected from the retro orbital sinus of the rats for glucose, total cholesterol and triglyceride level determination on 1st, 5th, 10th and 20th days. PEBA (100 & 400 mg/kg, body wt.) showed significant reduction in blood glucose level (266.3 ± 0.9700 to 118.1 ± 0.9375mg/dl & 271.3 ± 0.6983 to 111.6 ± 0.8072 mg/dl, respectively), total cholesterol (92.40±0.7711mg/dl & 88.95±0.8144mg/dl, respectively) and triglycerides (78.58±0.9250mg/dl & 69.30±0.8963mg/dl, respectively) and EEBA (100 & 400 mg/kg, body wt.) showed significant reduction in blood glucose level (264 ± 0.7881 to 115.8 ± 0.8931 mg/dl & 278.9 ± 0.6906 to 101.80 ± 0.7490 mg/dl, respectively), total cholesterol (87.80±0.4683 mg/dl and 83.55±0.7680 mg/dl, respectively) and triglycerides (74.47±0.5748 mg/dl & 67.52±0.6833 mg/dl, respectively) that comparable to glibenclamide showed significant reduction in blood glucose level (251.8±0.6009 to 99.17±0.5283 mg/dl), total cholesterol (82.66±0.5845 mg/dl) and triglycerides (62.07±0.5175 mg/dl). It is concluded that PEBA & EEBA (400 mg/kg) possess better antidiabetic potential in alloxan induced diabetic rats.

INTRODUCTION: Diabetes mellitus (diabetes = overflow, mellitus = honeyed) is the most common pancreatic islet disorder caused by an inability to produce insulin or a defect in its utilization. The hallmark of diabetes mellitus is polyuria-excessive urine production, polydipsia-excessive thirst and polyphagia-excessive eating. It is also characterized by chronic hyperglycemia and glucosuria caused by an absolute or relative deficiency of insulin.

This derangement may results into the development of further metabolic and anatomic disturbances, among which the lipemia, hypercholesterolemia, loss of weight, ketosis, arteriosclerosis, gangrene, pathologic changes in the eye, neuropathy, renal disease and coma are more common [1]. The prevalence in patients over 20 years of age may be as high as 53%. This heterogeneous disorder afflicts an estimated 6% of the adult population in Western society; its worldwide

frequency is expected to continue to grow by 6% per annum, potentially reaching a total of 200-300 million cases in 2010 [2]. Further more prevalent and considered to be a world-wide epidemic, which is projected to affect 366 million people by 2030. According to estimates, the numbers of persons with diabetes in India will be rise from 31.7 million to 79.4 million by 2030 [3]. In few years there has been an exponential growth in the field of herbal medicine and these drugs gaining popularity both in developing and developed countries because of their natural origin and less side effects [4].

The plant of *Berberis aristata* has been reported to possess Antimicrobial, Hepatoprotective, Diabetes mellitus (Type-2), Inotropic, Immunomodulatory, Influence on T-cell mediated immunity, Hepatic Amoebiasis, Anti-carcinogenic activity, Antidepressant activities due to its main alkaloids that are Berberine, Berbamine, Oxyberberine, Oxyacanthin, Aromoline etc. Traditionally plant is used in all types of inflammations, dysentery, uterine and vaginal disorders, diaphoretic, laxative and also used to treat skin diseases, diarrhea, jaundice, affections of the eyes, liver and gallbladder, high blood pressure, bitter tonic, stomachic, cholagogue, antiperiodic and alterative, fevers, periodic neuralgia and menorrhagia, enlargement of spleen, antipyretic and antiseptic, ulcers and hemorrhoids, leprosy, in blood purification etc, in various health ailments [5].

MATERIAL AND METHODS:

Collection and Authentication of the plant: The bark of *Berberis aristata* was collected from the local surrounding area of Meerut India, in the month of September-October 2011 and authenticated at B.I.T School of Pharmacy, Partapur by-pass Meerut.

Preparation of the bark extract: The bark of *Berberis aristata* was collected and dried at room temperature and coarsely powdered. The dried powder was defatted using petroleum ether and the subjected to extraction by ethanol in a Soxhlet apparatus. The extracts were distilled and concentrated under reduced pressure until all solvent has been removed to give an extract sample and dried completely**.**

Chemical and reagents: Alloxan, Glibenclamide (Abbortt health care Pvt. Ltd, India), Glucose estimation kit (Span diagnostic, India), Triglyceride estimation kit (Span diagnostic, Surat, India), Total cholesterol estimation kit (Span diagnostic, India), were used. Other chemicals and reagents used for the study were of analytical grade.

Experimental animals: Male Albino Wistar rats (150-250gm) were obtained from the approved animal house of B.I.T School of Pharmacy, Meerut, (India) after obtaining approval of animal house from Institute's Ethics committee. They were housed in standard environmental condition (at room temperature 23±2^{o}C and 50-55% relative humidity) in standard polypropylene cage and maintained on standard pellets, germinated grams and water *ad libitum*. Prior to experimentation the animals were fasted for 12 hours but free access to drinking water [6].

Acute toxicity: Acute toxicity study was determined as per OECD (Organization of Economic Corporation and Development) guideline No. 425. The animals were observed continuously for 2 hours.

- Behavioral profile, Alertness, restlessness, irritability, and fearfulness.
- Neurological profile. Spontaneous activities, reactivity, touch response, pain response and gait.
- Autonomic profile. Defecation and urination [7].

Induction of diabetes: The animals were fasted for 12 hours prior to the induction of diabetes. Alloxan monohydrate freshly prepared in 0.5 % Tween 80 was administered intraperitoneally (i.p) at single dose in 140 mg/kg. Development of diabetes was confirmed by measuring blood glucose concentration 5 days after the administration of alloxan. Rats with blood glucose level of above 200 mg/dl were considered to be diabetic and used for the studies.

Experimental design of antidiabetic activity: Male Albino Wistar rats (150-250g) were randomly divided into seven groups with six animals in each group:

Group I: Normal control rats received 0.5% Tween 80 once daily was administered orally.

Group II: Diabetic control rats received Alloxan (140 mg/kg of body wt.) was injected intraperitoneally as a

single dose and kept without any treatment to study the diabetic nature of rat.

Group III: (Standard) Diabetic rats received glibenclamide (10 mg/kg of body wt.) once daily, orally after 5 days of Alloxan treatment.

Group IV: Petroleum ether extract (100 mg/kg of body wt.) of *Berberis aristata* once daily, orally after 5 days of Alloxan treatment.

Group V: Petroleum ether extract (400 mg/kg of body wt.) of *Berberis aristata* once daily, orally after 5 days of Alloxan treatment to study the diabetic nature of rats.

Group VI: Ethanolic extract (100 mg/kg of body wt.) of *Berberis aristata* once daily, orally after 5 days of Alloxan treatment.

Group VII: Ethanolic extract (400 mg/kg of body wt.) of *Berberis aristata* once daily, orally after 5 days of Alloxan treatment to study the antidiabetic nature of rats [6].

The study was carried out for 20 days to determine the blood glucose, total cholesterol, and triglyceride level using commercial available kits (Span diagnostic Pvt. Ltd. Surat, India).

Blood collection and serum separation: Blood from the retro-orbital plexus was collected and centrifuged at 3000 rpm for 10 minutes [8].

Estimation of biochemical parameter: Serum glucose, serum cholesterol and serum triglyceride were estimated by commercially available kits (Span diagnostic Pvt. Ltd. Surat, India) by using Auto-analyzer (RMS, model no. BCA-201) [9].

RESULT AND DISCUSSION:

TABLE 1: EFFECT OF DIFFERENT EXTRACTS OF *BERBERIS ARISTATA* BARK ON SERUM GLUCOSE LEVEL IN ALLOXAN-INDUCED DIABETIC RATS

Group	Time (days) serum glucose (mg/dl)			
	1st day	5th day	10th day	20th day
Normal	90.67±0.7601	97.13±0.5631	102.23±0.6989	97.6±0.7844
Diabetic-control	269.7±0.8819	267.7±0.8433	278.8±0.7032	84.3±0.8819
Glibenclamide (10 mg/kg)	251.8±0.6009	187.2±0.8565	126.2±0.6791	99.17±0.5283
PEBA (100 mg/kg)	266.3±0.9700	215.6±0.7830	161.4± 0.9673	118.1 ± 0.9375
PEBA (400 mg/kg)	271.3±0.6983	208.9±0.7242	156.8± 0.9340	111.6 ± 0.8072
EEBA (100 mg/kg)	264 ± 0.7881	218.7±0.8559	149.1± 0.7645	115.8 ± 0.8931
EEBA (400 mg/kg)	278.9±0.6906	210.5±0.6530	142.8± 0.6350	101.80±0.7490

Dunnett's values are expressed as the mean ± SEM., (n=6), statistic significant Vs control, p<0.05

TABLE 2: EFFECT OF DIFFERENT EXTRACTS OF *BERBERIS ARISTATA* BARK ON SERUM TOTAL CHOLESTEROL AND TRIGLYCERIDES

Group (mg/dl)	Cholesterol (mg/dl)	Triglyceride
Normal	79.95±0.6571	55.23±0.8233
Diabetic-control	110.2±0.6955	84.83±0.7706
Glibenclamide (10 mg/kg)	82.66±0.5845	62.07±0.5175
PEBA (100 mg/kg)	92.40±0.7711	78.58±0.9250
PEBA (400 mg/kg)	88.95±0.8144	69.30±0.8963
EEBA (100 mg/kg)	87.80±0.4683	74.47±0.5748
EEBA (400 mg/kg)	83.55±0.7680	67.52±0.6833

Dunnett's values are expressed as the mean ± SEM., (n=6), statistic significant Vs control, p<0.05

TABLE 3: EFFECT OF DIFFERENT EXTRACTS OF *BERBERIS ARISTATA* BARK ON BODY WEIGHT OF ALLOXAN-INDUCED DIABETIC RATS

Group	1st day	5th day	10th day	20th day
Normal	184.3±1.892	185.8±2.535	188.3±1.585	187.3±2.216
Diabetic-control	189±2.517	186.7±2.512	185±3.044	180±2.422
Glibenclamide 10 mg/kg	173.3±1.764	176.7±2.906	178.3±2.390	181.3±2.352
PEBA 100 mg/kg	181.7±1.745	183.3±3.127	185±2.517	188.7±2.459
PEBA 400 mg/kg	177.3±2.231	184.7±1.333	187.3±1.687	192.3±1.202
EEBA 100 mg/kg	181.7±1.406	183±1.528	186.3±1.202	191.3±0.9888
EEBA 400 mg/kg	184.3±1.202	187.3±1.606	190.3±1.667	195.7±0.6146

Dunnett's values are expressed as the mean ± SEM., (n=6), statistic significant Vs control, p<0.05

Diabetes mellitus is a leading chronic endocrine disease and is an important cause of morbidity and mortality all over the globe [10]. Management of diabetes with the agents devoid of any side effects is still a challenge to the medical system. This concern has led to an increased demand for natural products with antihyperglycaemic activity, having fewer side effects [1]. The present experimental studies revealed that PEBA (100 mg/kg & 400 mg/kg) and EEBA (100 mg/kg & 400 mg/kg) extracts administered orally for 20 days produced a significant decrease in the blood glucose, total cholesterol and triglyceride levels in the model of alloxan-induced diabetes (Table 1 & 2).

PEBA (100 & 400 mg/kg, body wt.) showed significant reduction in blood glucose level (266.3±0.9700 to 118.1±0.9375 mg/dl & 271.3±0.6983 to 111.6±0.8072 mg/dl, respectively), total cholesterol level (92.40± 0.7711mg/dl & 88.95±0.8144 mg/dl, respectively) and triglycerides level (78.58±0.9250 mg/dl & 69.30±0.8963 mg/dl, respectively) and EEBA (100 & 400 mg/kg, body wt.) showed significant reduction in blood glucose level (264±0.7881 to 115.8±0.8931 mg/dl & 278.9±0.6906 to 101.80±0.7490 mg/dl, respectively), total cholesterol level (87.80± 0.4683 mg/dl and 83.55±0.7680 mg/dl, respectively) and triglycerides level (74.47±0.5748 mg/dl & 67.52±0.6833 mg/dl, respectively) that comparable to glibenclamide showed significant reduction in blood glucose level (251.8±0.6009 to 99.17±0.5283 mg/dl), total cholesterol level (82.66±0.5845 mg/dl) and triglycerides level (62.07± 0.5175 mg/dl).

PEBA (100 & 400 mg/kg) & EEBA (100 & 400 mg/kg) show the significant result in body weight (181.7±1.745to 188.7±2.459gm & 177.3±2.231to 192.3±1.202 gm, respectively) & (181.7±1.406 to 191.3±0.9888 & 184.3±1.202 to 195.7±0.6146 gm, respectively). The comparable effect of the plant extracts with glibenclamide (173.3±1.764 to 181.3±2.352 gm) show in table 3. That all the doses listed 400 mg/kg of PEBA & EEBA were found to be the more effective in lowering the blood glucose, total cholesterol and triglyceride levels in rats as shown in table 1 & 2.

The results obtained are comparable to standard drug. Thus, result support the traditional claim regarding *Berberis aristata* for its anti-diabetic activity.

The present study, for the first time looked into the diabetes activity of *Berberis aristata* bark interact. Further studies need to be carried out to explore its full potential.

CONCLUSION: The data of our study revealed that the Petroleum ether & Ethanolic extracts (400 mg/kg) of *Berberis aristata* bark have significant antidiabetic activity in alloxan induced diabetic rats in a dose dependent manner. However, our results are supporting its use as folklore medicine for the treatment of diabetes. Further investigations are needed to explore its full potential.

ACKNOWLEDGEMENT: Authors are highly thankful to Prof. (Dr.) R.L. Khosa, director, P&D (Pharmacy), B.I.T, School of pharmacy, Partapur by-pass meerut-250103. For providing his kind support and facilities to accomplish the present research project work with in time.

REFERENCES:

1. Sharma US and Kumar. A: Anti-diabetic effect of Rubus ellipticus fruit extracts in alloxan induced diabetic rats. Journal of Diabetology 2011; 2 (4)
2. Narender T, Khaliq T and Madhur G: Naturally occurring antihyperglycaemic and antidyslipidemic agents. Opportunity, Challenge and Scope of Natural Products in Medicinal Chemistry 2011; 155-185.
3. Syiem D and Warjri P: Hypoglycemic and antihyperglycemic effects of aqueous extract of *Ixeris gracilis* dc. on normal and alloxan-induced diabetic mice. Diabetologia Croatica 2011; 40-3.
4. Akhtar MS, Ahmed M, Gulzar K and Adnan H: Hypoglycemic activity of *Dodonaea viscosa* leaves in normal and alloxan-induced diabetic rabbits. Diabetologia Croatica 2011; 40-3.
5. Mazumder PM, Das S, Das S and Das MK: Phyto-Pharmacology of *Berberis aristata* Dc: A Review, Journal of Drug Delivery & Therapeutics 2011; 1(2): 46-50.
6. Kumar BSA, Lakshman K, Jayaveea KN, Shekar DS, Khan S. Thippeswamyf BS and Veerapur VP: Antidiabetic, antihyperlipidemic and antioxidant activities of methanolic extract of *Amaranthus viridis* Linn in alloxan induced diabetic rats. Experimental and Toxicologic Pathology 2012; 64: 75-79.
7. Jain S, Bhatia G, Barik R, Kumar P, Jain A and Dixit VK: Antidiabetic activity of *Paspalum scrobiculatum* Linn. In alloxan induced diabetic rats. Journal of Ethnopharmacology 2010; 127: 325-328.
8. Sousa Lino CD, Luz Diogenes JP, Pereira BA, Gomes Faria RAP, Neto MA, Alves RS, Queiroz de MGR, Sousa de FCF and Viana Barros GS: Antidiabetic Activity of *Bauhinia forficata* extracts in alloxan-diabetic rats. Biol. Pharm. Bull. 2004; 27(1): 125-127.
9. Semwal BC, Gupta J, Singh S, Kumar Y and Girl M. Antihyperglycaemic activity of root of *Berberis aristata* D.C in alloxan-induced diabetic rats. International Journal of green pharmacy 2009; 259-262.
10. Akhtar MS, Nadeem M, Rashid HU and Bashir S. Hyoglycaemic activity of different fractions of berberis aristata root-bark in normal and alloxan diabetic rabbits. Canadian Journal of Applied Sciences 2011; 1(2): 16-28.

How to cite this article:
Ahmad A, Pandurangan A, Koul S and Sharma BM:Antidiabetic Potential of *Berberis aristata* Bark in Alloxan Induced Diabetic Rats. *Int J Pharm Sci Res*. 3(11); 4425-4428.