ISSN 0976 – 3333

Available Online at www.ijpba.info

International Journal of Pharmaceutical & Biological Archives 2012; 3(4):853-857

ORIGINAL RESEARCH ARTICLE

Comparative Antidiabetic Studies of Leaves of *Ipomoea carnea* and *Grewia asiatica* on Streptozotocin Induced Diabetic Rats

Kadiyawala Abdul Latif .A*, A K Prasad, Shankul kumar, Satish V Iyer, Hitesh A Patel, Jatin A Patel

G.H.B. College of Pharmacy, Aniyad, Gujarat, India

Received 09 May 2012; Revised 07 Aug 2012; Accepted 15 Aug 2012

ABSTRACT

The plants *Ipomoea carnea* and *Grewia asiatica* are ethnobotanically used in the treatment of various diseases including diabetes and heart diseases. Diabetes mellitus is a disease characterized by hyperglycaemia, and hyperlipidaemia which leads to an increased risk of atherosclerosis and other cardiovascular diseases. The leaves of *Ipomoea carnea and Grewia Asiatica* was shade dried and powdered. It was subjected to extraction with water . The aqueous extracts of both leaves were administered orally at two different doses of 250mg/kg and 500mg/kg. In the present study the hypoglycaemic and antihyperglycemic property of *Ipomoea carnea* leaves and *Grewia asiatica* leaves was carried out in normal rats, and in streptozotocin (50mg/kg.i.p) induced diabetic rats. In addition, the plant extract was evaluated by oral glucose tolerance test (OGTT) model for their influence at different doses on blood glucose levels in normal rats fed with overload of glucose. Glibenclamide (10mg/kg p.o) was used as a reference drug for antihyperglycemic activity.

The interpretation of the results was done after subjecting the data obtained from various studies to statistical analysis which included one way ANOVA followed by post tests like Dunnet't'. Oral admisntration of *Ipomoea carnea* leaves and *Grewia asiatica* leaves for 21 days significantly reduced blood glucose level in STZ induced diabetic rats.

Key words: Hyperglycaemia, Hyperlipidaemia, Streptozotocin, and Glibenclamide.

INTRODUCTION

Diabetes mellitus (DM) is a very anciently-known disease of mankind. This disease was known to Indian and Arabian physicians some 5,000 years ago. Sushuruta, the great ancient Indian physician, in his treatise has mentioned not only this disease but also its symptomatology, etiology and classification which hold good even today, in spite of great advances in the field of medicine. It is he who first detected that the taste of the urine of a diabetic is sweet and coined the name for the disease as '*Madhu Meha'* Similarly in Latin, this disease is called Diabetes Mellitus.'Diabetes' means siphoning out and 'mellitus' means honey. Diabetes mellitus is a complex syndrome that affects multiple organ systems. There is still much to learn about the diabetes mellitus [1-3].

Diabetes mellitus (DM) is one such type which is a major health problem around the globe in recent time, Asia and Africa are the most viable areas where the disease is feared to raise 2-3 folds. DM is a metabolic disorder characterized by hyperglycemia with impairment of carbohydrate, fat and protein metabolism [4-6].

Hyperglycemic condition causes increase glycosylation leading to biochemical and morphological abnormalities due to altered protein structure which over a period of time develops diabetic complications such as nephropathy, retinopathy, neuropathy and cardiomyopathy. Traditional medicine derived mainly from plants play major role in the management of diabetes mellitus [7-8].

World health organization (WHO) has recommended the evaluation of traditional plant treatments for diabetes as they are effective, non-toxic, with less or no side effect and are considered to be excellent candidates for oral therapy. Recently there are many medicinal plants possessing experimental and clinical antidiabetic activity that have been used in traditional systems of medicine [9-10].

***Corresponding Author:** Shankul Kumar**, Email:** Kumar.sankul@gmail.com, **Phone No:** +91-9978242498

Plants have always been an exemplary source of drugs and many of the currently available drugs have been derived directly or indirectly from them. The ethnobotonical information reports that about 800 plants that may possess antidiabetic potential. Several such herbs have show antidiabetic activity when assessed using presently available experimental techniques [11-16]. The discovery of widely used hypoglycemic drugs, metfomin came from the traditional approach of using Gollega officinalis [17]. Thus it shows that plants are potential source of antidiabetic drugs, but this fact was not gained enough momentum in the scientific community. The reasons may be many including lack of medicine over alternative medicine, alternative forms of medicine are not very well defined, and natural drugs may vary tremendously in content, quality and safely. Although oral hypoglycemic agents/insulin or the mainstay of treatment of diabetes and are effective in controlling hyperglycemic, they have prominent side effects and fail to significantly after the course of diabetic complications. As the knowledge of heterogenecity after disorder there is a need to look for more efficacious agents with lesser side effects [18].

Plants have been used for health and medical purpose from several thousand of years. They are one of the rich sources of medicine since human civilization. Now a days a person prefers plant based medicines over synthetic medication for the treatment of different disease because of their safety and economy. Herbal medicines are particularly used by the traditional practiceners since the ancient time but they do not have scientific data. Hence considering the above mentioned points, we have selected one of the plant *Ipomoea carnea* belongs to the family convolvulaceae. After the through literature survey, it is clear that, only few scientific publications are available and since much less work has been done and no report is available regarding *Ipomoea carnea* leaves which made us to take up present investigation of this plant and report the antidiabetic effect of its different extracts.

MATERIALS AND METHODS

Collection of plant materials:

The plant *Ipomoea carnea* and *Grewia Asiatica* is widely found throughout India. The leaves of *Ipomoea carnea* and *Grewia asiatica* were collected in January 2012 from Nandasan – Mehsana district. The plant herbarium specimen was identified and Authenticated by Dr. K J bhatt ,Botany department, Pramukh swami science college ,Kadi, North Gujarat University.

Preparation of extract:

The leaves were dried in shade at room temperature. The dried leaves were coarsely powdered and extracted successively by using soxhlet apparatus. The extracts were then concentrated in a rotary evapourator and dried in an oven at temperature of 40^{o}C to constant weights. The aqueous extracts were used for antidiabetic activity.

Experimental animals:

Albino wistar male rats of 150 – 200gm were used throughout the experiments. The animals were procured from TRC, Ghandhinagar . Before imitation of experiment, the rats were acclimatized for a period of seven days. Standard environmental conditions such as temperature (26± 2°C) relative humidity (45 – 55%) and 12 hrs dark / light cycle was maintained in the quarantine. All the animals were fed with the rodent pellet diet and water was allowed ad labium under strict hygienic conditions.

Antidiabetic activity on diabetic rats:

Induction of diabetes:

Streptozotocin has been widely used to induce type 2 diabetes in animal models especially rats and mice. It has been reported that STZ induce dose dependent diabetes administered either intravenously or intraperitonearlly.

The rats which have body weight 150 – 200 gm , were selected for the diabetogenic activity. The animals were deprived for food for 18 hours prior to administration of streptozotoin. Streptozotocin was freshly dissolved in 0.9% normal saline solution. Streptozotocin was given intraperitoneally 50 mg/kg body weight [19,20,21]. The streptozotocin solution was injected within 15 minutes of dissolution in a vehicle with 1ml of tuberculin syringe fitted with 26 number gauge needles. Diabetes was confirmed by the determination of fasting glucose concentration on the third day post administration of streptozotocin. After the seven day stabilization period the animals which have blood glucose level more than 250mg/dl they were selected for studies.

Acute studies on normal rats [22,23]:

For acute study, normal rats were divided into six groups contained six rat in each group. The animals were deprived for food for 16 hours before the experiment, and water is allowed to them, but on the day of experiment water is withdrawn.

Group I – Received vehicle 5% tween 80 p.o.

Group II- Received standard drug 10mg/kg of Glibenclamide p.o.
Group III – Received 250mg/kg aqueous extract of *Ipomoea carnea* leaves p.o
Group IV – Received 500mg/kg of aqueous extract *Ipomoea carnea leaves* p.o.
Group-V – Received 250mg/kg of aqueous extract *Grewia asiatica* leaves p.o.
Group-VI – Received 500mg/kg of aqueous extract *Grewia asiatica* leaves p.o.
Blood glucose level was determined at 0 hour i.e. before drug administration, 0.5, 1, 2, 4, 8, 12, 16 and 24 hours after drug administration. Blood was collected from tail vein by snipping tail with sharp razor.Blood glucose level were estimated by using an electronic Glucometer[24,25].
The percentage reduction in blood glucose levels at time‘t’ was calculated by using the following equation.

% Blood sugar reduction at time ‘t’ = (A – B)/A × 100

Where; A = Initial blood glucose level before drug administration.
B = Blood glucose levels at time ‘t’ after the drug administration.
Comparison among all groups was performed by using ANOVA.

Acute study on STZ induced diabetic rats:

The diabetogenic rats, having blood glucose level more than 250 mg/dl they were selected for the study. The rats were deprived for food 18 hours before the experiment and water is allowed, but on the day of experiment water is withdrawn. Animals were divided into six groups, contained six rats in each group. The blood samples were withdrawn at interval of initial 0 (zero hour). 0.5, 1, 2, 4, 8, 12, 16 and 24 hours of administration of single dose and Blood glucose level were estimated by using an electronic Glucometer [24, 25].
Rats were divided into following groups.
Group I- Normal control were given 5% tween 80 p.o.
Group II- treated orally with standard drug Glibenclamide (10mg/kg).
Group III- treated orally with aqueous extract of *Ipomoea carnea* leaves at the dose of 250 mg/kg.
Group IV- treated orally with aqueous extract of *Ipomoea carnea* leaves at the dose of 500 mg/kg.
Group V- treated orally with aqueous extract of *Grewia asiatica* leaves at the dose of 250 mg/kg.
Group VI- treated orally with aqueous extract of *Grewia asiatica* leaves at the dose of 500 mg/kg.

The percentage reduction in blood glucose levels at time ‘t’ was calculated by using the following equation.

% Blood sugar reduction at time ‘t’ = (A – B)/A × 100

Where; A = Initial blood glucose level before drug administration.
B = Blood glucose levels at time ‘t’ after the drug administration.

Statistical analysis:

Statistical analysis were performed with one way analysis of variance (ANOVA) followed by Dennett’s‘t’test.

RESULTS AND DISCUSSION

In the present study the Antidiabetic property of *Ipomoea carnea* leaves and *Grewia asiatica* leaves were carried out in normal rats, and in streptozotocin induced diabetic rats.The selection of doses of test drug is based upon previous research work carried out in both plant. Acute 24 hours study for antidiabetic effect of extract was carryout in normal rats, and in STZ induced diabetic rats respectively. The detailed results with the onset of action, duration of action, and maximum percentage of blood glucose reduction of aqueous extracts of *Ipomoea carnea* leaves and *Grewia asiatica leaves* at a dose of 250 mg/kg and 500 mg/kg in normal and diabetic rats are given in (**Figure 1&2 ; Tables 1 to 4**) and the peak effect of these extracts on the blood glucose levels in glucose over load rats are compared.

Fig 1: Percentage reduction in blood glucose level of *Ipomoea carnea* leaves and *Grewia asiatica* leaves extract in normal albino rats

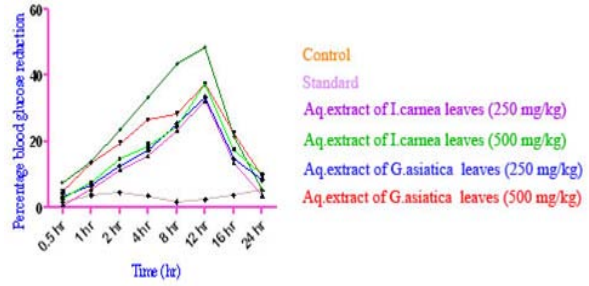

Figure 2: Percentage reduction in blood glucose level of *Ipomoea carnea* leaves and *Grewia asiatica* leaves extract in STZ induced diabetic rats (Acute study)

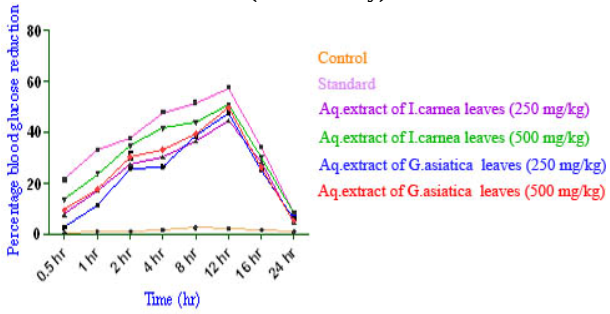

Table 1: % Reduction in blood glucose level of *Ipomoea carnea* leaves and *Grewia asiatica* leaves extract in normal albino rats

Groups	Percentage blood glucose reduction mg/dl								
	0	0.5	1	2	4	8	12	16	24
Control	88.97±0.71	1.73±0.01	3.63±0.05	4.61±0.15	3.50±0.15	1.64±0.10	2.38±0.10	3.60±0.14	5.36±0.16
Standard Glibenclamide 10 mg/kg	93.02±1.27	7.36±0.01	13.66±0.15	23.58±0.13*	33.48±0.15**	43.36±0.11**	48.64±0.09**	21.55±0.15	6.55±0.95
Aqueous extract of *I.CARNEA* leaves 250 mg/kg	91.11±1.89	0.86±0.07	5.62±0.10**	11.48±0.10**	15.66±0.11*	23.44±0.11**	32.40±0.01**	13.52±0.15	.67±0.10
Aqueous extract of *I.CARNEA* leaves 500 mg/kg	96.13±0.60	4.87±0.01	13.50±0.12**	19.50±0.15**	26.55±0.15*	28.47±0.13**	37.54±0.14**	22.54±0.14	9.54±0.12
Aqueous extract of *G.ASIATICA* leaves 250 mg/kg	94.90±1.48	3.54±0.9	6.54±0.14*	12.62±0.15*	17.57±0.84**	25.34±0.08**	33.59±0.01**	14.54±0.52	8.40±0.14
Aqueous extract of *G.ASIATICA* leaves 500 mg/kg	93.82±1.32	3.23±0.08	7.60±0.12**	14.62±0.11**	18.46±0.87**	24.48±0.11**	37.37±0.07**	17.56±0.33	9.41±0.12

*Values are mean SEM; n=6, *P<0.05, **P<0.01 compared with normal control*

Table 2: Hypoglycemic effect of *Ipomoea carnea* leaves and *Grewia asiatica* leaves extract in normal albino rats at 250mg/kg & 500mg/kg dose level

Group	Dose (mg/kg)	*Onset of action (hrs)	More than 15% reduction in blood glucose levels maintained up to (hrs)	Duration of action (hrs)	Max reduction of time seen at time 't' (peak effect)
Standard Glibenclamide	10	2	16	14	48.64±0.09 at 12 hr
Aqueous extract of *Ipomoea carnea* leaves	250	4	16	12	32.40±0.01 at 12 hr
Aqueous extract of *Ipomoea carnea* leaves	500	2	16	14	37.54±0.14 at 12 hr
Aqueous extract of *Grewia asiatica* leaves	250	4	16	12	33.59±0.01 at 12 hr
Aqueous extract of *Grewia asiatica* leaves	500	2	16	14	37.37±0.07 at 12 hr

**Time taken to show> 15% blood glucose level reduction is considered as onset of action*

Table 3: Percentage reduction in blood glucose level of *Ipomoea carnea* and *Grewia asiatica* leaves extracts in STG induced diabetic albino rats (Acute study)

Groups	Percentage blood glucose reduction mg/dl								
	0	0.5	1	2	4	8	12	16	24
Control	250.6±0.33	0.51±0.04	0.97±0.02	1.14±0.04	1.48±0.16	2.66±0.13	2.44±0.14	1.67±0.11	0.81±0.60
Standard Glibenclamide 10 mg/kg	263.1±0.26	21.27±0.01	32.96±0.12**	37.56±0.12**	47.67±0.12**	51.56±0.10**	57.52±0.15**	34.38±0.11	7.50±0.13
Aqueous extract of *I.carnea* leaves 250 mg/kg	261.2±0.43	8.55±0.07	18.06±0.01*	28.62±0.07*	31.50±0.01*	37.53±0.17*	45.75±0.15	29.52±0.12	4.63±0.13
Aqueous extract of *I.carnea* leaves 500 mg/kg	265.1±0.37	13.35±0.05	23.73±0.02**	34.61±0.13**	41.50±0.12*	43.59±0.20**	50.52±0.13**	30.45±0.13	8.51±0.16
Aqueous extract of *G.asiatica* leaves 250 mg/kg	252.4±0.66	2.76±0.07	11.31±0.12*	25.82±0.10*	26.39±0.13*	38.70±0.14*	47.61±0.15**	25.59±0.13	6.29±0.86
Aqueous extract of *G.asiatica* leaves 500 mg/kg	257.5±0.90	9.34±0.09	17.75±0.06**	30.38±1.01**	33.48±0.14*	39.51±4.90**	49.60±0.11**	26.53±0.15	5.36±0.12

*Values are mean SEM; n=6 *P<0.05, **P<0.01 compared with normal control*

Table 4: Antidiabetic activity of *Ipomoea carnea* leaves and *Grewia asiatica* leaves extractions in STZ induced diabetic rats at 250 mg /kg and 500 mg/kg level

Group	Dose (mg/kg)	*Onset of action (hrs)	More than 15% reduction in blood glucose levels maintained up to (hrs)	Duration of action (hrs)	Max reduction of time seen at time 't' (peak effect)
Standard Glibenclamide	10	0.5	16	15.5	57.52±0.15 at 12 hr
Aqueous extract of *Ipomoea carnea* leaves	250	1	16	15	45.75±0.15 at 12 hr
Aqueous extract of *Ipomoea carnea* leaves	500	1	16	15	50.52±0.13 at 12 hr
Aqueous extract of *Grewia asiatica* leaves	250	2	16	14	47.61±0.15 at 12 hr
Aqueous extract of *Grewia asiatica* leaves	500	1	16	15	49.60±0.11 at 12 hr

**Time taken to show> 15% blood glucose level reduction is considered as onset of action*

CONCLUSION

From the acute study of antihyperglycemic activity was carried on normal and streptozotocin induced diabetic rats it can be concluded that the aqueous extracts has significantly reduced the blood glucose level in a dose dependant manner. From the results it is concluded that aqueous extracts significantly increased the glucose tolerance in normal rats. In this study, the aqueous leaves extracts of *Ipomoea carnea* and *Grewia asiatica* possessed potential antidiabetic activities in Streptozotocin-induced diabetic rats. *Grewia asiatica* was found to be a more potent antidiabetic agent than *Ipomoea carnea* to reduce the blood glucose levels in diabetic rats.

ACKNOWLEDGEMENT

The authors wish to thank Chairman, Executive Director, Gopalak vikas mandal; GHB College of Pharmacy, Aniyad for their facilities provided for this study.

REFRENCE

1. Anderson R. Clin Physiol Biochem, 1986; 4(1):31-41.
2. Gilman, AG, Goodman. LS, Laurence L, Brunton, John S Lazo, Keith L Parker.The Pharmacological basis of therapeutics MCGraw-Hill Medical publishing Division XI edn, 2006; 1613-1624.
3. Bever B and Zahnd G. Quart J Crude Drug Res, 1979; 17:139-96.
4. King H, Aubert RE, Herman WH. "Global burden of diabetes 1995-2025: prevalence, neumerical stimates, and projections. Diabetes care "1998; 21: 1414-1431.

5. Amos AF, McCarty DJ, Zimmet P." The rising global burden of diabetes and its complications: estimates and projection to the year 2010". Diabetic Medicine Journal 1997; 14: pp 1-85.
6. Alberti KG, Zimmet PZ. "New diagnostic criteria and classification of diabetes again?" Diabetic medicine journal 1998; 15: pp .535-536.
7. Arky RA. "Clinical correlates of metabolic derangements of Diabetes Mellitus". In: kozak, G.P. (Ed.), "Complications of diabetes mellitus". Philadelphia; W.B. Saunders; 1982. P.16-20.
8. Ahmed I, Adeghate E, Cummings E, Sharma AK, Singh J. "Beneficial effects andmechanism of action of *Momordica charantia* juice in the treatment of streptozotocin- induced diabetes mellitus in rats". Mol. Cell. Biochem journal - 2004; 261:pp. 63-70.
9. Day C. "Traditional plant treatments for diabetes mellitus": pharmaceutical foods. Journal 1998; 80: pp.203-208.
10. Mankil J, Moonsoo P, Hyun CL, Yoon-Ho K, Eun SK, Sang KK. "Antidiabetic agents from medicinal plants". Curr. Med. Chem journal 2006; 13: pp.1203-1218.
11. Alarcon AFJ,Roman RR, Perez GS, Aguilar CA, Contrears W, Flores SJL. "Study of the antihyperglycemic effect of plants used as antidiabetics". Ethnopharmacology Journal 1998; 61(2): pp.101-10.
12. Saifi AQ, Shinde S, Kavishwar WK, Gupta SR. "Some aspects of phytochemistry and hypoglycemic actions of Pterocarpus marsupium." Res Med Journal 1971; 6(2):pp.205-07.
13. Mukerjee K, Ghosh NC, Datta T. "Coccinia Indica Linn. As potential hypoglycemic agent", Ind Journal of Exp Biol 1972; 10 (5): pp.347-49.
14. Coimbra TC, Danni FF, Blotta RM, da Periara CA, Guedas MD, Graf RG. "Plants employed in the treatment of diabetes mellitus"; results of an ethnopharmacological survey in Pirto Alegre, Brazil. Fitoterapia 1992; 63 (4) pp.320 – 22.
15. Ajitkar, Chaudhary BK, Bandhopadhyay NG. "Preliminary studies on the inorganic constitutents of some indigenous hypoglycemic herbs on oral glucose tolerance test". Ethnopharmacology Journal 2000; 70(3):pp.309-14.
16. Jafri MA, Aslam M, Javed K, Singh S. "Effect of Punica granatum Linn (flowers) on blood glucose level in normal and alloxan induced diabetic rats". Journal of ethnopharmacology 2000; 70(3):pp. 309-14.
17. www.ibismedical.com/503-523,1972.
18. Rang HP, Dale.M.M., The endocrine system pharmacology, Longman Group Ltd.UK; 2004. p. 504.
19. Mukhtar HM, Ansari SH, Ali M, Naved T, Bhat ZA." Anti-hyperglycemic activity of *Psidium guajava* barks extract." J Nat Rem 2004; 4(2): pp.150-54.
20. S.Manoharan,and R. Anish kumar " Effect of *Punica Granatum* flowers on Carbohydrate metabolising enzyme, lipid peroxidation and antioxidant status in Streptozotocin induced diabetic rats" Journel of Open Nutraceuticals ,2009 – pp 113-117.
21. Senthilkumar M and K Sivakumar "Evaluation of Antidiabetic activity of *Bambusa Valgaris* in Streptozotocin induced diabetic rats". International Journal of Pharmaceutical Science and Drug Research. 2011, pp 208.
22. Joy KL, Kuttan R." Anti-diabetic activity of *Picrorrhiza kurroa* extract". Journal of Ethnopharmcology 1999; 167: pp.143-148.
23. Urmila.C.kumavat, sharddha.N Shimpi,. "Hypoglycaemic activity of *Cassia javanica* linn in Normal and Streptozotocin induced diabetic rats.". Journal of Advanced Pharmaceutical Technology and Research.vol.2 year 2012, pp.47-51.
24. A R das, M.Mostopha "Comparative efficacy of Neem and Metformin in Streptozotocin induced diabetes mellitus in rats", Bang.journal of Vet.Med (2010).8(1).pp.75-80.
25. Shukla S, Mehta A "Evaluation of Antidiabetic effect of Ethanolic extract of *Caesalpinia bouncucella* and *Stevia rebaudiana* in Normal and Alloxan induced experimental rats.", Romanian biotechnological letter vol.16 no.3 2011.