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COMPARATIVE ANTIDIABETIC ACTIVITY OF SOME HERBAL PLANTS EXTRACTS

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ABSTRACT

In India, the prevalence of diabetes mellitus is on increase and needs to be addressed appropriately. In this study area, herbal remedies are considered convenient for management of type 2 diabetes with postprandial hyperglycemia due to their traditional acceptability and availability, low costs and lesser side effects. The present study involves comparative screening of leaves of *Grewia asiatica,* fruits of *Luffa acutangula* and bark of *Bombax ceiba* for anti-diabetic activity on alloxan induced diabetic Wister rats using glibenclamide as standard. Ether, chloroform, ethanol and aqueous extracts (200mg/kg b.w.) of leaves of *Grewia asiatica,* fruits of *Luffa acutangula* and bark of *Bombax ceiba* were screened. Among all extracts chloroform and alcoholic extracts of bark of *Bombax ceiba*, and chloroform, alcoholic and aqueous extracts of leaves of *Grewia asiatica* and chloroform and alcoholic extracts of fruits of *Luffa acutangula* shown more significant (p<0.01) reduction in blood glucose level in alloxan induced diabetic Wister rats compared to control and glibenclamide (10 mg/kg b.w.).

Keywords: Antidiabetic, blood glucose, alloxan, *Grewia asiatica, Luffa acutangula, Sesbania sesban.*

INTRODUCTION

A study of ancient literature indicates that diabetes (madhumeha) was fairly well known and well conceived as an entity in India. The knowledge of the system of diabetes mellitus, as the history reveals, existed with the Indians since prehistoric age. 'Madhumeha' is a disease in which a patient passes sweet urine and exhibits sweetness all over the body, i.e. in sweat, mucus, breathe, blood, etc. The practical usage of juices

of various plants achieved the lowering of blood glucose by 10-20%. Diabetes mellitus is one of the common metabolic disorders. Almost 1.3% of the population suffers from this disease throughout the world [1] and number of diabetics is increasing by 6% per year [2]. Approximately 300,000 deaths each year are attributed to diabetes. Its prevalence increases with age, from about 0.2% in persons less than 17 years of age to about 10% in persons aged 65 years and over. Insulin and oral hypoglycemic agents like sulphonylureas and biguanides are still the major players in the management but there is quest for the development of more effective anti-diabetic agents.

Sesbania sesban L. (*Leguminosea*) bark is useful in ulcers, leucorrhoea, vitiated conditions of pitta, anaemia, bronchitis, tumours, dysentery, inflammations, cirrhoses of the liver and hypertension [3]. *Luffa acutangula* L. (Cucurbitaceae) fruit are useful in asthma, haemoptysis, and hemorrhages from internal organs, epilepsy, fever and vitiated conditions of pitta [4, 5, 6]. Leaves of *Grewia asiatica L.*(Tiliaceae) are useful in elephantiasis, inflammations, leprosy, leucoderma,diabetes fever, diarrhea, gout, rheumatoid arthritis and bronchitis [7].

Ayurveda and other traditional system of medicine supports S. sesban bark, Leaves of G. asiatica and L. acutangula fruit as anti-diabetic, which are efficacious and economical, as compared to synthetic drugs, but not evaluated systematically till date. Hence, the present study was aimed towards the comparative screening of the above mentioned plant extracts for anti-diabetic activity by using alloxan induced diabetic model.

MATERIALS AND METHODS

Plant material

The bark of *S. sesban*, leaves of *G. asiatica*, fruit of *L. acutangula* were collected from local market and authenticated at Botanical Survey of India, Pune.

Plant Extractions

Collected leaves bark and fruits were dried and crushed to coarse powder. Powdered material was charged into soxhlet apparatus and continuous hot extraction was carried out using solvents like petroleum ether, chloroform and ethanol successively water.

Animal selection

Healthy adult Wister rats of either sex weighing 150-180 g were selected for the study. The study was carried in accordance with the rules and regulations laid by the Institutional Animal Ethics Committee. The animals were housed with free access to food and water. The basal food intake and body weights to the nearest gram were noted. Rats were starved 24 hr prior to the study. Individual extracts of bark of *S. sesban*, leaves of *G. asiatica* and fruit of *L. acutangula* were evaluated in seven groups of six animals each.

Acute toxicity study

The acute oral toxicity study was carried out as per OECD guidelines. At dose of (2000 mg/kg) 50% mortality was observed. Hence 200 mg/kg b.w. of each extract was taken as effective dose for evaluation of antidiabetic activity [8].

Preparation of doses

All the extracts (200mg/kg b.w.) were suspended in 2% v/w aqueous solution of tween 80 and glibenclamide (10mg/kg b.w.) as standard drug in normal saline was administered orally. The control group received normal saline orally.

Administration of Doses

The test substances were administered in a single dose by gavage using a stomach tube. Animals were fasted 24 hr prior to dosing. During fasting, the animals were weighed and substance was administered. Food was withheld for further 3-4 hr, after the dose administration.

Evaluation of Anti-Diabetic Activity [9, 10, 11]

Before starting the experiment, animals were separated according to their body weight. The animals were injected intraperitoneally (i.p.) at a dose of 150 mg/kg b.w. alloxan monohydrate (S.D. Fine Chemicals Ltd., Boisar) freshly prepared in normal saline solution. After one hour of alloxan administration, animals were given feed *ad libitum* and 1ml of (100 mg/ml) glucose i.p. to combat ensuring severe hypoglycemia after 72 hr of alloxan injection; the animals were tested for evidence of diabetes by estimating their blood glucose level using glucometer (Pulsatum, Pulsatum Health Care Pvt. Ltd., Bangalore).

To the animals, the test extracts (200 mg/kg b.w. orally) and standard drug glibenclamide tablets (10 mg/kg b.w. orally) were administered by dissolving in 2%

Twen-80/water and normal saline respectively. For acute study, 0.2 ml of blood sample was withdrawn through the tail vein puncture technique using hypodermic needle at interval of 0, 2nd, 4th and 6th h of administration of single oral dose. The animals were segregated into seven groups of six rats each for each extract. For all drugs groups of normal, diabetic control and standard glibenclamide were kept same for comparison with ether, chloroform, alcohol and aqueous extracts of drugs. The mean ± SEM were statistically calculated for each parameter [12].

RESULTS AND DISCUSSION

The results of effect of extracts of (*Sesbania Sesban* bark, *Luffa acutangula* fruit, and leaves of *Grewia asiatica*) which are expressed as change in blood glucose level are shown in table no.1, 2 and 3 respectively. More significant (p<0.01) anti-diabetic activity was observed in alcoholic and chloroform extracts of *Sesbania Sesban*, alcohol and chloroform extracts of *Luffa acutangula* and aqueous, alcoholic and chloroform extracts of *Grewia asiatica* in acute model compared with standard glibenclamide. Ether and aqueous extracts of *Sesbania Sesban*, ether extract of *Grewia asiatica* and ether extract of *Luffa acutangula* has not shown significant anti-diabetic activity (p<0.01) in acute study.

In vivo efficiency was performed in healthy normal Wistar rats by measuring the hypoglycemic effect produced after oral administration. Kahn and Shechter[13] have suggested that a 25% reduction in blood glucose levels is considered a significant hypoglycemic effect. The results of the study were satisfactory and revealed that the alcoholic and chloroform extracts of *Sesbania Sesban*, alcohol and chloroform extracts of *Luffa acutangula* and aqueous, alcoholic and chloroform extracts of *Grewia asiatica* has exhibited significant hypoglycemic activity. The reduction of blood glucose level in alloxan induced rat was found highest in alcoholic and chloroform extracts of *Grewia asiatica.*

CONCLUSION

The present study involves comparative screening of leaves *Grewia asiatica,* fruits of *Luffa acutangula* and bark of *Sesbania Sesban* for anti-diabetic activity on alloxan induced diabetic Wister rats using glibenclamide as standard. The *in vivo* study

demonstrated significant hypoglycemic activity was found highest in alcoholic and chloroform extracts of *Grewia asiatica.*

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TABLE 1: EFFECT OF THE EXTRACTS OF *SESBANIA SESBAN* BARK ON BLOOD GLUCOSE OF ALLOXAN DIABETIC ALBINO RATS AFTER ACUTE TREATMENT

Groups (n)	Dose	Blood glucose level mg/100ml (Mean±SEM)			
		Initial	2nd hour	4th hour	6th hour
Normal control	2ml saline	106±3.27	107±4.91	107±2.66	104±3.06
Diabetic control	2ml saline	281±5.03	290 ±4.61	290 ±2.30	292±3.29
Ether extract	200mg/kg b.w.	298±2.01	275±5.22	246±3.16	243±3.09*
Chloroform extract	200mg/kg b.w.	304±4.10	251±3.02	207±7.08**	200±8.10**
Alcohol extract	200mg/kg b.w.	288±4.09	243±3.24	189±4.10**	186±4.0**
Aqueous extract	200mg/kg b.w.	300±6.18	267±9.08	225.33±7.05**	212 ±5.06**
Glibenclamide	10 mg/kg b.w.	296±4.20	207±1.28	166 ±2.14**	159±1.47**

*p<0.05 – **p<0.01 – compared to Diabetic control.
SEM: Standard Error of Mean, n= Number of animals (6)

TABLE 2: EFFECT OF THE EXTRACTS OF *LUFFA ACUTANGULA* FRUIT ON BLOOD GLUCOSE OF ALLOXAN DIABETIC ALBINO RATS AFTER ACUTE TREATMENT

Groups (n)	Dose	Blood glucose level mg/100ml (Mean±SEM)			
		Initial	2nd hour	4th hour	6th hour
Normal control	2ml saline	106 ±3.27	107±4.91	107±2.66	104±3.06
Diabetic control	2ml saline	281±5.03	290±4.61	290±2.30	292±3.29
Ether extract	200mg/kg b.w.	322±2.10	303±7.20	285±1.05	277±1.19
Chloroform extract	200mg/kg b.w.	315±3.51	291±3.65	231±3.06**	217±7.08**
Alcohol extract	200mg/kg b.w.	311±6.08	250±3.02	225±4.10**	218±4.02**
Aqueous extract	200mg/kg b.w.	307±7.15	296±4.70	265±3.08*	260±2.07*
Glibenclamide	10 mg/kg b.w.	296±4.80	207±1.18	166±2.41**	159±1.47**

*p<0.05 – **p<0.01 – compared to Diabetic control.
SEM: Standard Error of Mean, n= Number of animals (6)

TABLE 3: EFFECT OF THE EXTRACTS OF *GREWIA ASIATICA LEAVES* ON BLOOD GLUCOSE OF ALLOXAN DIABETIC ALBINO RATS AFTER ACUTE TREATMENT

Groups (n)	Dose	Blood Glucose level mg/100ml (Mean±SEM)			
		Initial	2nd hour	4th hour	6th hour
Normal control	2ml saline	106±3.27	107±4.91	107±2.66	104±3.6
Diabetic control	2ml saline	281±5.03	290 ±4.61	290 ±2.30	292±3.29
Ether extract	200mg/kg b.w.	298±2.10	277±4.21	248±2.16	241±4.90*
Chloroform extract	200mg/kg b.w.	305±4.02	255±3.10	205±7.05**	195±5.05**
Alcohol extract	200mg/kg b.w.	287±5.30	241±2.12	189±3.02**	181±4.06**
Aqueous extract	200mg/kg b.w.	298±6.08	265±8.20	223±7.05**	210 ±5.61**
Glibenclamide	10 mg/kg b.w.	296±4.51	207±1.08	166 ±2.40**	159±1.47**

*p<0.05 – **p<0.01 – compared to Diabetic control.
SEM: Standard Error of Mean, n= Number of animals (6)

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