BioGecko Vol 12 Issue 03 2023

ISSN NO: 2230-5807

Anti-diabetic activity of *Leonotis nepetaefolia*(L.) R.Br. in alloxan induced diabetic model

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Abstract
In the conventional medical system, about 75% of the Indian population depends on this local system of care. With such a large population relying on herbal remedies, scientific support for the efficacy of herbal products that have been used for a long time is essential. *Leonotis nepetaefolia* (L) R.Br. belongs to the Lamiaceae family. It is native to tropical Africa and India. The flowers of the plant are used medicinally to treat various disease and disorders. In the present paper, anti-diabetic activity of hydro-alcohol extract of flowers of *Leonotis nepetaefolia* (L) R.Br. was investigated using animal model.

Keywords: Diabetes, Anti-diabetic, Indigenous

Introduction

Diabetes is a chronic disorder of carbohydrate, fat, and protein metabolism characterized by increased fasting and elevated blood sugar levels. The global prevalence of diabetes is expected to increase from 4% in 1995 to 5.4% in 2025. WHO estimates that the main burden will be in developing countries. Studies conducted in India in the past decade have shown that not only is the prevalence of diabetes high, but it is also increasing rapidly among the urban population. It is estimated that there are approximately 33 million adults with diabetes in India. This number will reach 57.2 million by 2025.[1-2] In recent years, there has been rapid progress in the field of herbal medicine and these medicines have become popular in developing and developed countries due to their natural origin and low side effects. Most of the traditional medicines used are derived from medicinal plants, minerals and organic substances. A number of medicinal plants that have been used for more than 1000 years called rasayana are included in the herbal preparations of traditional Indian health care systems. In the Indian system of medicine, most practitioners prepare and dispense their own prescriptions. The World Health Organization has listed 21,000 medicinal plants in the world. Among the 2,500 species found in India, 150 species are used commercially on a large scale. India is the largest producer of medicinal plants and is known as the botanical garden of the world.[3-5]

Leonotis nepetaefolia (L) R.Br. Barchibuti, an unknown medicinal plant, belongs to the Lamiaceae family. It is found almost exclusively in the warmer parts of India. Traditionally, all parts of the plant, especially the roots, leaves and flowers, are used for various diseases of human. Flower heads are used against skin, burns, ringworm and some skin diseases also.[6-7] The present work was aimed on investigation of anti-diabetic activity of flower extract.

Material and Methods

Collection of herbs and their authentication

The flowers of plant were collected in the month of Oct. 2022 and were identified by Dr. S. N. Dwivedi, Retd. Prof. and Head, Department of Botany, Janata PG College, A.P.S. University, Rewa, (M.P.) and was deposited in our Laboratory.

Pharmacological screening

Procurement of experimental animals

The mice were used for acute toxicity study as per OECD guidelines 423. The animals were fed with standard pellet diet (Hindustan lever Ltd. Bangalore) and water *ad libitum*. All the animals were housed in polypropylene cages. The animals were kept under alternate cycle of 12 hours of darkness and light. The animals were acclimatized to the laboratory condition for 1 week before starting the experiment. The experimental protocols were approved by Institutional Animal Ethics Committee after scrutinization.[8]

Experimental animals

The Wister strains of male albino rats weighing between 100 and 150g were taken for the present study. The animals were housed in larger spacious cages and they were fed with commercial pelleted rat chow marketed by Hindustan Lever Ltd., Bangalore, India, under the trade name Gold Mohur Rat Feed and had free access to water ad labium. The animals were well acclimatized to standard environmental conditions of temperature and 12h light dark cycles throughout the experimental period. The animals used in the present study were approved by the Institutional Animal Ethical Committee.

Anti-diabetic activity

Preparation of alloxan monohydrates

Alloxan was prepared by weighing 1 gm of alloxan and dissolving in 20ml of water for injection. Alloxan at this calculated dose is said to have a concentration of 50mg/ml.

Hypoglycemic Activity

Different groups of each six rats were used in the present investigation. The basal concentration of blood glucose level of all the animals was recorded and 6 animals were separated to serve as normal control. The remaining animals received a single injection of Alloxan monohydrate in water for injection at a dose of 150-mg/kg bodyweight given by intra-peritoneal route. After 4 days of Alloxan administration, the blood glucose was estimated and animals with blood glucose levels in the range 280 mg/dl and 380 mg/dl were selected and divided into groups.

Group 1:- Untreated control (Normal saline water)
Group 2:- Diabetic control (Alloxan 150 mg/kg)
Group 3:- Diabetic+ Glibenclaminde (10mg/kg)
Group 4:- Diabetic + HAELNF (250 mg)
Group 5:- Diabetic + HAELNF (500 mg)

Statistical analysis

Data were analyzed by comparing values for different treatment groups with the values for individual controls. The significant differences among values were analyzed using analysis of variance (one-way ANOVA) in latest computer software programme. All the obtained results are expressed as X (Mean) ±SEM, n=6. (One way ANOVA followed by Bonferroni multiple comparison test).

Results and Discussion

The HAELNF were screened for acute toxicity study by OECD guideline no. 423 for determination of LD_{50}. The results showed that at the dose of 5000 mg/kg bw, there were no any mortality, therefore it belongs to category-5(unclassified). Hence, doses of 250 mg and 500 mg were selected for present investigation. The serum glucose level was estimated and the results indicates that that significant lowering of sugar in hydro-alcoholic extract at the dose of 250 and 500 mg/kg bw. The anti-diabetic activity of the extract on the fasting blood sugar levels on diabetic rats is shown in table 1. The blood glucose levels are comparable with that of 10 mg/kg of Glibenclamide.

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Table 1: Estimation of on serum glucose in normal and diabetic rats

Group	Serum glucose (mg/dL)			
	0 day	7th day	14th day	21th day
Control	80.03±0.31	81.11±0.19	81.13±0.22	81.2±0.02
Diabetic control	296.21±0.02	362.21±0.02##	418.21±0.32###	412.20±0.02###
Standard (10mg/kg)	289.10±0.03	210.12±1.02**	168.34±1.20***	118.41±1.11***
HAELNF (250 mg)	292.19±0.02	232.21±0.11*	201.23±1.21***	158.32±1.01**
HAELNF (500 mg)	290.23±0.04	229.30±1.02**	178.32±1.11***	132.02±1.04***

All values are expressed as mean ± S.E.M (n=6), ***P<0.001 as compared diabetic control (normal saline), **P<0.01 as compared diabetic control (normal saline), ###P<0.001 as compared to Control. One-way ANOVA followed by Bonferroni multiple comparison test.

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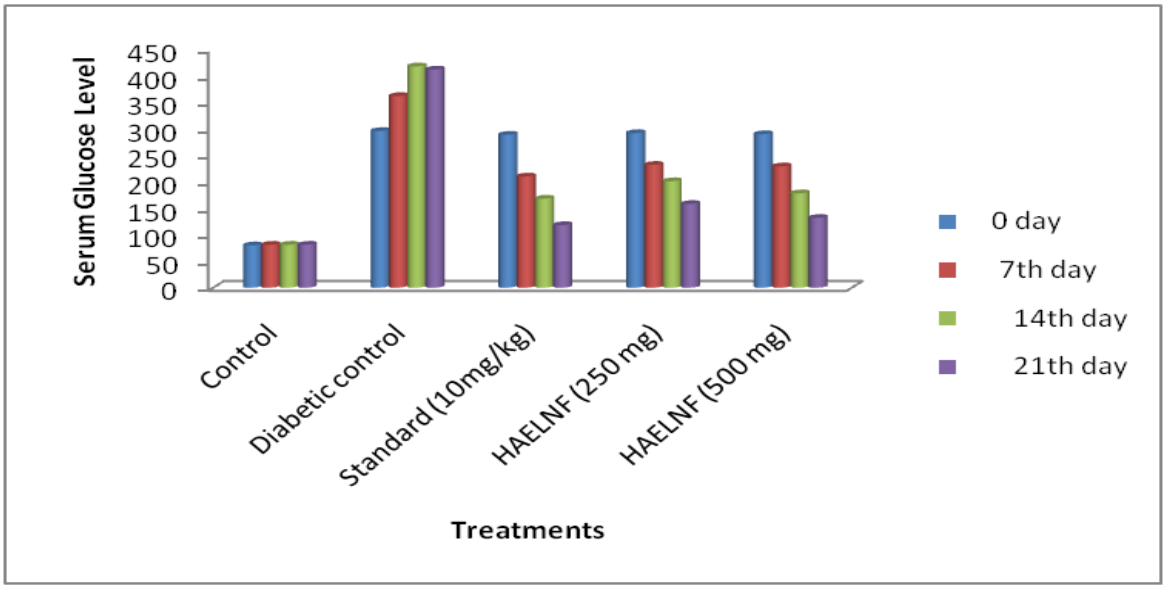

Graph 1: Estimation of serum glucose level

Conclusion

From the results it was concluded that the hydro-alcoholic extract at the dose of 500 mg/kg bw showed better efficacy in lowering the blood glucose levels in alloxan induced diabetic rats, when compared with standard drug.

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