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MANAGEMENT OF HYPERGLYCEMIC OF METHANOLIC ROOT EXTRACT OF *LIPPA NODIFLORA*

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ABSTRACT

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. More than 400 species of plants have been reported to display hypoglycemic effects, but only a few of them have been investigated. Although many drugs are available to control the diabetes but has several adverse effects. *Lippa nodiflora* highly reputed plant in ayurvedic system of medicine for the treatment of various ailments. The plant was reported to have activities such as purgative, anti-asthmatic, antihelmintic, used in the treatment of headaches, antioxidant and anti-diabetic. This study was undertaken to investigate the anti-diabetic activity of extract of stem bark of *Lippa nodiflora* in alloxan induced diabetic rats. The present study is undertaken to standardize the *Lippa nodiflora* and to evaluate its anti-diabetic activity with emphasize to its mechanism of action. The validation of anti-diabetic property is correlated with various biochemical parameters involved therein.

Keywords: Antihyperglycemic Activities, Methanolic Root, *Lippa Nodiflora*, Phytoconstituents.

INTRODUCTION

There are many drugs used in treatment of various disorders, most of the drugs are having adverse reactions. Thus there is a need of more effective and less toxic agents for the treatment of various ailments. Plants are some of most attractive sources and have been shown to produce promising result for the treatment of various disorders (Sanjukta and Rai, 2016).

Poly herbal formulations are the formulation which contains multiple ingredients of different herbal origin. The plant ingredients may have wide spectrum of biological activities. In ayurvedic system of medicine, poly herbal formulations were frequently used to enhance the activity or to counteract the toxic effects of compounds from the other plants, but may also act synergistically with other constituents from the same or other plants. Poly herbal therapies have synergistic, potentiative, agonistic/antagonistic pharmacological agents within themselves that work together in dynamic way to produce therapeutic efficacy with minimum side effects. The therapeutic output may be due to the various active constituents with different mechanism, which can produce a combined action against various ailments including metabolic disorders (Parasuraman *et al.*, 2014).

Diabetes mellitus is a metabolic disorder characterized by glycosuria, hyperglycemia, and negative nitrogen balance sometime

ketonemia. Resulting either inadequate secretion of insulin, an inadequate response of target cells to insulin, or combination of these factors. Insulin deficiency is due to functional disorder of the pancrease (McCarthy, 2010).

Lippa nodiflora highly reputed plant in ayurvedic system of medicine for the treatment of various ailments. The plant was reported to have activities such as purgative, anti- asthmatic, antihelmintic, used in the treatment of headaches, antioxidant and anti-diabetic (Khalil *et al.,* 1995). This study was undertaken to investigate the anti-diabetic activity of extract of stem bark of *Lippa nodiflora* in alloxan induced diabetic rats. The present study is undertaken to standardize the *Lippa nodiflora* and to evaluate its anti-diabetic activity with emphasize to its mechanism of action. The validation of anti-diabetic property is correlated with various biochemical parameters involved therein.

MATERIALS & METHODS

Plant collection and authentication

The stem part of the plant *Lippa nodiflora* (family Verbenaceae) was collected from Palakkad District of Kerala and authenticated from Department of Botany, Saifia College, Bhopal. Soon after collection, the stems were cleaned and shade dried. After drying, these stems were crushed to a coarse powder, stored in air tight plastic container for further use.

Phytochemical analysis

The plant material when fresh was subjected to macroscopic analysis in order to confirm its identify air dried plant material was finely ground in a suitable mill in to a powder. Extraction was carried out with soxhlet apparatus using solvent of increasing polarity and the extract was highly concentrated (Harborne, 1984).

Extraction process

Extraction may be define as the treatment of the plant or animal tissues with solvent, where by the medicinally active constituents are dissolved and most of the inert matter remains undisolved. The solvent used for extraction is known as menstrum and the inert insoluble material that remains after extraction is called marc. The various process used for extract.

Evaluation of anti-diabetic activity

Diabetes Mellitus is a chronic condition characterized by major derangements in metabolism of glucose and abnormalities in metabolism of fat, protein. Management of diabetes without any side effects is still a challenge to the medical system. This leads to increasing demand for natural products with ant diabetic activity having fewer side effects. Many herbal products, including several metals and minerals have been described for the cure of diabetes mellitus in ancient literature.

Induction of diabetes

Alloxan monohydrate induced diabetes mellitus was induced in the normoglycaemic male albino rats (Ighodaro *et al.,* 2017). Animals were allowed to fast 24 hrs and were injected intraperitonially with freshly prepared alloxan monohydrate in Sterile Normal Saline in dose of 150 mg/kg body weight. Blood glucose was measured after 24 hr of alloxanisation and it was confirmed that the given dose was sufficient for inducing diabetes in the animals. The animals were maintained in the diabetic state over a period of 21 days. Rats showing fasting blood

glucose levels (>250 mg/dl) were selected for the study. Mortality rate of the animals were Nil.

Collection of Blood Sample

A small amount of blood without sacrificing the animals was collected from the tail vein by snipping off the tip of the tail.

Determination of Blood Glucose

The blood from the tail vein was used to determine the glucose level. As bleeding starts, the animals were held close to the Pulsatum blood glucose test strip and allowed the drop to fall on the strip. The Pulsatum Glucometer was switched on and the test was allowed to react with the blood. After few seconds the blood glucose level was displayed on the screen.

Collection of Blood and Centrifugation

After the experimental regimen, the bloods were collected through the retro-orbital puncture of eye of animals under mild chloroform anesthesia and serum was separated by centrifugation at 2500 rpm. The serum collected was used for biochemical experiments (Ibrahim *et al.*, 2021).

Statistical evaluation

Statistical evaluation was done using one way analysis of variance (ANOVA) followed by Dunnet' T- test. Statistical significance was set at $p< 0.001$, $p< 0.01$, $p<0.05$.

RESULTS AND DISCUSSION

Table showed the levels of Glucose and Total Protein in rats of different groups. The glucose level was significantly ($p <0.01$) high in alloxan control rats compared with normal control. But the level of serum glucose was significantly ($p<0.01$) decreased in diabetic rats CLEated with extract as compared with alloxan control rats. On repeated administration of the extract for 21 days, a significant decrease in the glucose level was observed in the diabetic rats as compared to diabetic control. There was no significant difference between normal control and rats CLEated only with extract.

It was evident from the Table that unCLEated diabetic rats has elevated blood glucose levels and that the Roots extract were able to correct this metabolic deviation from the Diabetic Control significantly since there was no significant difference between Normal Control and Diabetic Control the extract has antihyperglycemic activity and no hypoglycemic activity.

The total protein content was significantly ($p<0.01$) decreased when compared to the Normal Control in diabetic rats and the level was restored to nearly normal after the CLEatment. There was no significant difference between Normal control and rats only CLEated with extract.

The level of lipid profiles in Normal Control, Diabetic Control and experimental rats was depicted in Tables. In alloxan induced diabetic rats, there was a significant ($p<0.01$) increase of Cholesterol, Triglycerides, Phospholipids, LDL and VLDL Cholesterol and significant decrease in HDL Cholesterol in serum compared to Normal Control. The plant extract used in the experimental study significantly ($p<0.01$) decrease the level of Cholesterol, Triglycerides, Phospholipids, LDL and VLDL Cholesterol and increase the level of HDL.

Table 1: Effect of Roots extract of *Lippa nodiflora* on Serum Glucose and Total Protein of control and experimental rats

Groups of Animals	Serum Glucose (mg/dl)	Total Protein (g/dl)
Normal control (2 ml normal saline)	115.07 ± 1.4	6.46 ± 0.8
Diabetic control (150 mg/kg Alloxan & 2ml NS)	337.82± 2.4**	2.3 ± 0.58**
Diabetic rat given LN(200 mg/kg)	233.6±1.2*	4.0 ± 1.1*
Diabetic rat given LN (400 mg/kg)	196.85 ± 1.2**	6.14 ± 0.9**
Diabetic rat given GLB (10 mg/kg)	188.09 ± 5.62***	7.16 ± 0.80**

Data represents mean ± S.D. (n=5).

*p< 0.05 Significant as compared to Alloxan control.

**p< 0.01 Significant as compared to Alloxan control.

***p< 0.001 Significant as compared to Alloxan control.

ns: non significant compared to normal control

Table 2: Effect of Roots extract of *Lippa nodiflora*on Serum Cholesterol, Triglycerides, Phospholipids, of control and experimental rats

Groups	Cholesterol (mg/dl)	Triglyceride (mg/dl)	Phospholipids (mg/dl)
Normal control (2 ml normal saline)	180.2 ± 1.15	127.49 ± 0.94	9.27 ± 0.35
Diabetic control (150 mg/kg Alloxan & 2ml NS)	238.7 ± 2.9	152.38 ± 2.5	12.27 ± 0.55
Diabetic rat given LN (200 mg/kg)	215.2 ± 1.4**	142.88 ± 1.2*	10.93 ± 0.36*
Diabetic rat given LN (400 mg/kg)	190.6 ± 0.99*	130.38 ± 0.91**	8.68 ± 0.41**
Diabetic rat given GLB (10 mg/kg)	185.08 ± 1.79**	126.24 ± 1.85**	11.02 ± 0.13**

Table 3: Effect of Roots extract of *Lippa nodiflora*on serum HDL, LDL and VLDL of control and experimental rats

Groups	HDL (mg/dl)	LDL (mg/dl)	VLDL (mg/dl)
Normal control (2 ml normal saline)	53.28 ± 1.8	101.42 ±1.6	25.5 ±1.5
Diabetic control (150 mg/kg Alloxan & 2ml NS)	33.71 ±1.2	164.56 ± 1.8	30.48 ±1.4
Diabetic rat given LN (200 mg/kg)	37.09 ±1.6*	148.61 ± 0.8**	25.58±1.8**
Diabetic rat given LN (400 mg/kg)	45.09±1.8**	119.37± 1.5**	26.08±2.5*
Diabetic rat given GLB (10 mg/kg)	48.21 ±1.18**	110.62 ± 1.1**	24.25±2.6**

Table 4: Effect of Roots extract of *Lippa nodiflora* on ALP, SGOT and SGPT of control and experimental rats

GROUPS	ALP (IU/L)	SGOT (IU/L)	SGPT (IU/L)
Normal control (2 ml normal saline)	285.26 ± 2.63	34.16 ± 0.80	41.76 ± 0.49
Diabetic control (150 mg/kg Alloxan & 2ml NS)	552.76 ± 1.71**	71.52 ± 0.52**	88.52 ± 1.88**
Diabetic rat given LN (200 mg/kg)	371.54 ± 1.16**	62.36 ± 0.89**	73.00 ± 1.58**
Diabetic rat given LN (400 mg/kg)	283.60 ±2.26ns	35.12± 2.88ns	40.35 ± 1..54ns
Diabetic rat given GLB (10 mg/kg)	358.12 ± 0.82**	56.37 ±1.60**	68.53 ± 1.42**

CONCLUSION

Table showed the levels of Glucose and Total Protein in rats of different groups. The glucose level was significantly ($p < 0.01$) high in alloxan control rats compared with normal control. But the level of serum glucose was significantly ($p<0.01$) decreased in diabetic rats CLEated with extract as compared with alloxan control rats. On repeated administration of the extract for 21 days, a significant decrease in the glucose level was observed in the diabetic rats as compared to diabetic control. There was no significant difference between normal control and rats CLEated only with extract. It was evident from the Table that unCLEated diabetic rats has elevated blood glucose levels and that the Roots extract were able to correct this

metabolic deviation from the Diabetic Control significantly since there was no significant difference between Normal Control and Diabetic Control the extract has antihyperglycemic activity and no hypoglycemic activity. The total protein content was significantly ($p<0.01$) decreased when compared to the Normal Control in diabetic rats and the level was restored to nearly normal after the CLEatment. There was no significant difference between Normal control and rats only CLEated with extract. The level of lipid profiles in Normal Control, Diabetic Control and experimental rats was depicted in Tables. In alloxan induced diabetic rats, there was a significant ($p<0.01$) increase of Cholesterol, Triglycerides, Phospholipids, LDL and VLDL Cholesterol and significant decrease in HDL Cholesterol in serum compared to Normal Control. The plant extract used in the experimental study significantly ($p<0.01$) decrease the level of Cholesterol, Triglycerides, Phospholipids, LDL and VLDL Cholesterol and increase the level of HDL.

DECLARATION OF INTEREST

The authors declare no conflicts of interests. The authors alone are responsible for the content and writing of this article.

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