An Elsevier Indexed Journal ISSN-2230-7346

Journal of Global Trends in Pharmaceutical Sciences

HYPOGLYCEMIC POTENTIAL OF ELEPHANTOPUS SCABER EXTRACT ON STREPTOZOTOCIN INDUCED DIABETES RATS

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ARTICLE INFO

Key words

Elephantopus Scaber L
Diabetes Mellitus
Streptozocin

ABSTRACT

Elephantopus Scaber L. is widely used folklore in the treatment of edema, anthralgia, cough, scabies and fever. Diabetes Mellitus is a chronic disease characterized by hypoglycemic effects. The associated side effects of the Diabetes Mellitus motivated the author to carry out this work. The present study aims to evaluate hypoglycemic potential of Elephantopus scaber L. leaves using streptozocin induced diabetic rats. Coarsely powdered leaves of Elephantopus scaber Linn were extracted with distilled water to get the test extract. Type –II Diabetes is induced by injecting streptozotocin by injecting into the tail of rats. A significant percent reduction in blood glucose, total cholesterol, triglycerides and HDL levels were observed. Treatment with test extract and standard were not continued upto 21 days after induction because the aqueous extract of Elephantopus scaber produced hypoglycemic effect and antihypelipidemic activity within a week and blood glucose levels on 7th day was almost to normal range and hence further treatment for 15 days and 21 days were not done. It can be concluded from the experiment that aqueous leaf extract of Elephantopus scaber possesses which justify its traditional use.

INTRODUCTION:

Traditional medicinal practices have remained as a component of health care system of many societies in spite of the availability of well established alternations. Diabetes mellitus is a chronic metabolic disorder characterized by high blood glucose concentrations (Hyperglycemia) caused by insulin deficiency often combined with insulin resistance (Rang & dale 2008). The characteristic symptoms of diabetes mellitus are Polyuria, polydipsia, polyphagia (increased hunger), blurred vision these symptoms may be absent if the blood sugar is mildly elevated. Diabetes mellitus is a major public health problem in the developed as well as developing countries. It is ranked seventh among the leading causes of death and third when all its fatal complications are in to accounts (Burke, 2003). These observations have led to shift in focus to the use of herbal remedies in management of Diabetes mellitus. Elephantopus scaber Linn is a member of Asteraceae family. The whole plant of Elephantopus scaber linn is a perennial herb and is well known as a Chinese folk medicine which is widely used in the treatment of nephritis, edema, and dampness, pain in the chest, fever and cough of pneumonia, scabies and arthralgia due to wounding. It is commonly used as a remedy for the treatment of gastropathy, hepatitis, nephritis, edema, chest pain, fever and cough of pneumonia, bronchitis, arthritis and carbuncle. Elephantopus scaber L. is known to contain a large number of bioactive compounds such as ethyl hexadecanoate, ethyl-(Z)-9-

octadecanoate, ethyl octadecanoate, lupeol, stigmasterol, stegmasterol glucoside, deoxy-elephantopin and two new germacranolide sesquiterpin and *iso*-17, 19-dihydrodeoxyelephantopin. The leaves are reported to have various activities like anticancer, anti bacterial, anti voral, hepatoprotective and anti microbial activity respectively. Therefore, we undertook the study to evaluate the anti-arthriric potential of Elephantopus scaber leaves using complete frounds adjuvant induced arthritic rat model.

MATERIAL AND METHODS

Collection of plant material

The leaves were collectedin west Godavari district. It was authenticated by Dr.D.V.Swamy asst.professor, Dr.Y.S.R.H Horticulture University, Venkataramannagudem-534101, W.G.Dt, A.P. The leaves were air-dried at room temperature. The dried leaves were crushed to powder with the help of mixer grinder. The resultant dried powder was used for extraction process.

Preparation of Extract

The leaves of Elephantopus scaber Linn were dried under shade and then coarsely powdered. The powder was passed through sieve no.40 and stored in an air tight container for further use. The powder was then extracted with distilled water using soxlet apparatus for 72 hours. The extract was dried and stored in desiccator. The extract were subjected for chemical analysis by standard procedures for identification of various phytoconstituents.

Animals used in study

Wistar albino rats of either sex were procured from Mahaveer Enterprises, Hyderabad, India. The animals were maintained on a 12 hour light and 12hour dark cycle. They were fed, ad libitum regular grain chow (Rayans Biotechnologies Pvt. Ltd., Hyderabad). Diet containing 56% grain derived carbohydrate, 21% protein, 6.7% moisture, 3.58% total oil, 2.58% dietary fiber, 5.5% cellulose, 0.8% calcium, 0.6% phosphorus, 0.3 % sodium chloride. The animal housing and handling were in accordance with CPCSCA guidelines. The prior permission for the study was obtained from our Institutional Animal Ethics Committee (IAEC).

DRUGS AND CHEMICALS

Aqueous extract of Elephantopus scaber**,** Streptozotocin (Sigma chemicals ltd. USA) (STZ) Nicotinamide (Sigma chemicals ltd., USA), Citrate buffer pH 4.5 (I.P), Unless otherwise specified all the chemicals and reagents used are of analytical grade.

HYPOGLYCEMIC EFFECT:

Effect of aqueous extract of root bark of Elephantopus scaber in type II diabetic rats

The rats are divided into three groups, each group contains 6 rats. Type II diabetes is induced by STZ and nicotinamide administered as described earlier.

Group 1: consisted of 6 rats which served as normal control and were given orally distilled water daily for 7 days

Group 2: Consisted of 6 STZ induced diabetic rats and served as diabetic control and were given distilled water daily for seven days.

Group 3: consisted of 6 STZ induced diabetic rats and were treated with aqueous extact of root bark of Elephantopus scaber at the dose 200 mg/kg b.w daily for 7 days.

Blood samples were collected from retro-orbital plexus and analyzed for various biochemical parameters like blood glucose, total cholesterol, triglycerides and HDL levels in all the three groups on the 7^{th} day (end of the treatment).

Statistical Analysis:

All values are expressed as MEAN ± S.E.M differences between means were tested using paired T-tests. P values less than 0.05 were considered significant.

$P < 0.05$ is considered*

$P < 0.01$ is considered**

$P < 0.001$ is considered***

Table 1: Effect of root bark of elephantopus scaber (aqueous extract) on glucose, Total cholesterol, triglycerides and hdl levels in type ii diabetic rats

Parameters	Normal control (MEAN± SEM)	Diabetic control (MEAN± SEM)	Diabetic + Elephantopus scaber (200mg/kg b.w)
Blood Glucose(mg/Di)	87.67±1.87	234.50±12.54	102.83±3.99
Total Cholesterol(mg/Di)	186.50±4.66	204.83±4.06	175.17±4.52
Triglycerides(mg/Di)	161.33±3.47	148.20±6.22	159.61±3.99
HDL	36.16±1.22	28.88±1.52	35.64±1.99

RESULTS:

A significant percent reduction in blood glucose levels were observed in type 2 diabetic rats treated with aqueous root bark extract of Elephantopus scaber. A significant percent reduction in TC, TGS and significant increase was observed in HDL levels was observed. Hence aqueous extract of root bark of Elephantopus scaber is producing hypoglycaemic effect and antihyperlipidemic activity within a week and blood glucose levels on 7th day was almost to normal range and hence further treatment for 15 days and 21 days were not done.

DISCUSSION:

Historical literature reveals that knowledge regarding diabetes existed since brahmic period as this was mentioned in ayurvedic text books-Sushrutha Samhita written in fourth and fifth centuries B.C (Dhanukar and Thatte, 1989)[42]. In this ancient text, two forms of diabetes were described: one genetically based and the other as a result of dietary indiscretion (Dhanukar and Thatte, 1989)[42]. Even the treatment in the indian ancient pharmacopeia mentioned specific treatments for the two types including dietary modifications, medicinal plant remedies and minerals. Moreover, the researchers conducted over last several decades has shown plant and plant based therapies have a potential to control and treat diabetes (Oliver and Zahnd, 1979; Bailey and Day1989; Ivorra et al., 1989; Marles and Famsworth, 1995) [39,46,47,50] and its complications (Grover et al., 2001)[44]. Role of Indian medicinal plants as antidiabetics has also been reviewed by Grover et al. (2002)[44]. For testing antidiabetic potential of plants, STZ induced hyperglycaemia in rodents is considered to be a good preliminary screening model (Ivorra et al., 1989)[46] and is widely used. Diabetes is probably the fastest growing metabolic disease in the world and as knowledge of the heterogenous nature of disease increase so does the need for the more challenging and appropriate therapies. Traditional plant remedies have been used for centuries in the treatment of the diabetes (Akhtar and Ali, 1984)[38] but only a few have been scientifically evaluated. STZ is well known for its selective pancreatic islet cell toxicity and has been extensively used in induced diabetes mellitus in animals. STZ is taken up by the β cells via the glucose transporter GLUTZ and causes alkylation of DNA (Delancy et al., 1995)[41] and reduction of ATP and NAD^+ content (Heller et al., 1994)[45]. STZ induces severe and irreversible hyperglycaemia in experimental animals. STZ was used to induce diabetes rather than alloxan, since with STZ there is no incidence of spontaneous revision and generation of islets resulting in more than 90% of rats becoming diabetic (Mitra et al., 1995) [48]. Defects in carbohydrate metabolizing machinery and consistent efforts of the physiological systems to correct the imbalance in carbohydrate metabolism place an over excretion on the endocrine system, which leads to the deterioration of endocrine control. Continuous deterioration of endocrine control exacerbates the metabolic disturbances and leads primarily to hyperglycaemia. This presents a moving therapeutic target that requires a range of different agents to address the different features of the disease at different stages of its natural history. Although biomedical science has unraveled substantially the pathological processes involved in causing/ fostering diabetes and has designed therapeutic agents with a range of action to fight hyper-glycaemia, the efficiency of these therapeutic agents is compromised in several ways. Individual agents act only on part of the pathogenic process and only to a partial extent. This may be the reason that even after so much advancement in understanding the disease process and availability of a wide range of therapeutic agents, the disease is still progressing.

The most significant findings of the present study is that the aqueous leaves extract of Elephantopus scaber, at the dose of 200 mg/kg body weight for seven days have shown beneficial effect in blood glucose levels in streptozotocin induced diabetic rats. Results obtained from the present study are very much promising, Noor et al., (2008) [49]have also mentioned that there are two possible explanations for this finding. Firstly, A.Vera may exert its effect by preventing the death of β cells. Burcelain et al. (1995)[40] reported that the hypoglycaemic action of the extract of herbal plants in diabetic rats may be possible through the insulinomimetic action or by other mechanism such as stimulation of glucose uptake by peripheral tissue, inhibition of endogenous glucose production or activation of gluconeogenesis in liver and muscles.

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