

# Antidiabetic activity of flower head petroleum ether extracts of *sphaeranthus indicus* Linn.

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A study of ancient literature indicates that diabetes was fairly well known and well conceived as an entity in India. The nature has provided abundant plant wealth for all the living creatures, which possess medicinal virtues. Therefore, there is a necessity to explore their uses and to conduct pharmacognostic and pharmacological studies to ascertain their therapeutic properties. In fact, nowadays diabetes is a global problem. Hence, the present study aims to open new avenues for the improvement of medicinal uses of *Sphaeranthus indicus* for the selected area for diabetes. Another important objective of such study is to bring the anti-diabetic medicinal plants sector on a firm scientific footing, raise awareness and add value to the resource. Dried petroleum ether (60-80°C) extracts of flower head of *Sphaeranthus indicus* were subjected for hypoglycemic activity in wistar rats (150-200 g). Blood sugar level was determined using digital glucometer. The oral administration of flower head extracts at doses of 200 mg kg<sup>-1</sup> lead to a significant blood glucose reduction. This laid the foundation to study the active compounds of such anti-diabetic plants that are responsible for the hypoglycemic activities. It also proves the traditional claim of Bundelkhand region with regard to *Sphaeranthus indicus* for its anti-diabetic activity.

**Keywords:** Hypoglycemic activity, *Sphaeranthus indicus*, Alloxan-induced diabetes, Gorakhmundi..

## 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% <sup>[1]</sup>.

Diabetes mellitus, a chronic metabolic disorder, has now become an epidemic, with a worldwide incidence of 5% in the general population. The number of people suffering from diabetes has soared to 246 million and the disease now kills more people than AIDS <sup>[2]</sup>. Decreased physical activity, increasing obesity, stress and changes in food consumption have been implicated in this increasing prevalence in the past two decades <sup>[3]</sup>. In conventional therapy, Type 1 diabetes is treated with exogenous insulin and Type 2 with oral hypoglycemic agents (sulphonylureas, biguani -

des etc) <sup>[4]</sup>. Though different types of oral hypoglycemic agents are available along with insulin for the treatment of diabetes, there is an increased demand by patients to use natural products with antidiabetic activity <sup>[5]</sup>. Since time immemorial, patients with non-insulin dependent diabetes have been treated orally in folk medicine, with a variety of plant extracts. In India, a number of plants are mentioned in ancient literature (Ayurveda) for the treatment of diabetic conditions. *Sphaeranthus indicus* Linn belongs to family Asteraceae. The plant is commonly known as gorakhmundi in Hindi. It is an annual spreading herb, which grows approximately 15-30 cm in height. The plant is distributed through out the plains and wet lands in India, Sri Lanka and Australia <sup>[6]</sup>. In folk medicine, the plant is reportedly used in treating epileptic convulsions, mental illnesses and hemicranias <sup>[7]</sup>.

As per Ayurveda, all parts of the plant are medicinally important <sup>[6]</sup>. It is used to treat vitiated conditions of hemicranias, jaundice, hepatopathy, cough, gastropathy, hernia, hemorrhoids, helminthiasis, dyspepsia and skin

diseases. The external application of a paste of this herb is beneficial in treating pruritus and edema, arthritis, filariasis, gout and cervical adenopathy. It also treats piles and hepatitis<sup>[8]</sup>.

Essential oil obtained by steam distillation of the whole herb, contains ocimene,  $\alpha$ -terpinene, methylchavicol,  $\alpha$ -citral, geraniol,  $\alpha$ -ionone,  $\beta$ -ionone, d-cadinene, p-methoxycinnamaldehyde<sup>[9]</sup> and an alkaloid sphaeranthine<sup>[10]</sup>.

The present study aims at studying the antidiabetic activity of flower head extract of *Sphaeranthus indicus* Linn in the model of alloxan-induced diabetes in rats.

## MATERIALS AND METHODS

### Collection and identification

*Sphaeranthus indicus* flower head were collected from K. C. Jain traders, Lalitpur, U.P. and identification was done by Prof. A. K. Jain, Director, Department of Ethanobiology, Jiwaji University, Gwalior, M.P.

### Preparation of extract

The flower head was shed dried, powered mechanically and sieved by using a mesh no. 10/44. It was extracted with petroleum ether 60-80°C in a soxhlet apparatus. The concentrated material was reduced to a thick mass at room temperature and water was removed by placing it on water bath. The weight of the dried was recorded and used for experimental study<sup>[11]</sup>.

### Experimental animal

Male albino rats of wistar strain (150 – 250 g) were housed under standard conditions of temperature, 12 hours light / dark and fed with standard pellet diet and water *ad libitum*. Animals were acclimatized to laboratory conditions at least 24 hours before conducting the experiments (CPCSEA Registration No. - 915/ac/05/CPCSEA).

### Experimental design

Diabetes was induced using alloxan monohydrate (100 mg/kg). Only alloxanised hyperglycemic animals were used for further studies. Animals were

fasted for 18h before the experiment and divided into 5 groups (6 animals in each group). The first group (Group I) served as control which received normal saline water 2 ml/kg p.o. and the second group (Group II) served as diabetic control received alloxan monohydrate alone. The third group (Group III) received standard drug glibenclamide 10 mg/kg. The three test groups (Group IV, Group V and Group VI) received 50, 100 and 200 mg/kg of petroleum ether extracts of *Sphaeranthus indicus*. All the animals were regularly observed for their general behavior.

### Effects on blood glucose levels

Dried petroleum ether (60-80°C) extracts of flower head of *Sphaeranthus indicus* (50, 100 and 200 mg/kg) were suspended in 1% bentonite and subjected for hypoglycemic activity in wistar rats (150 – 250 g). Diabetes was induced by the intravenous administration of alloxan (100 mg/kg)<sup>[12, 13]</sup> after anesthesia with ethyl ether. Forty-eight hours later, the blood (1 mL) was collected from the orbital sinus into tubes and immediately used for the determination of glucose. Only animals that presented with glycemic levels equal to or above 200 mg/dL were submitted to treatments, which consisted of a single oral administration (by gavages) of extracts of flower head of *Sphaeranthus indicus*. The blood was collected after 1h, 2h, 3h, 4h, 5h and 6h of a single oral treatment of extract for blood glucose measurements using a glucometer<sup>[14]</sup>.

### Statistical analysis

The data was statistically analyzed by one-way ANOVA followed by Dunnett multiple comparison test with equal sample size. The difference was considered significant when  $p < 0.001$ . All the values were expressed as mean  $\pm$  standard deviation (S.D.).

## RESULTS

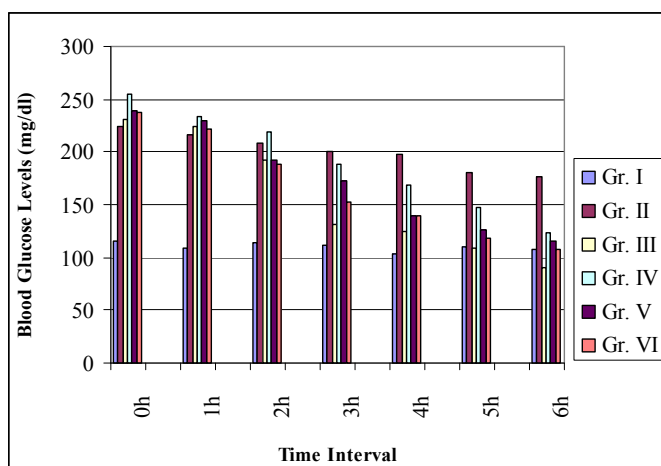
The effect of single oral administration of petroleum ether extracts of *Sphaeranthus indicus* flower head are shown in [Table 1 and Figure 1]. Experimental studies reveals that the petroleum ether extracts from *Sphaeranthus indicus* flower head (50, 100 and 200 mg/kg) orally administered produced a significant decrease in the blood glucose level in the model of alloxan-induced diabetes in rats. Maximum reduction in

blood glucose level was seen at dose of 200 mg/kg of petroleum ether extracts of *Sphaeranthus indicus* flower head.

**Table 1. Antidiabetic effect of petroleum ether extract of flower head of *sphaeranthus indicus* on alloxan induced diabetic rats.**

Time Interval	Blood glucose levels (mg/dL)					
	Group I	Group II	Group III	Group IV	Group V	Group VI
0h	116 ± 4.02	224 ± 5.65	231 ± 8.02	255 ± 5.24	239 ± 6.12	237 ± 5.01
1h	109 ± 1.96	217 ± 3.61	224 ± 3.20	233 ± 5.56	229 ± 4.62	222 ± 2.48
2h	114 ± 7.05	209 ± 6.11	193 ± 9.56	219 ± 4.71	193 ± 2.97	189 ± 8.34
3h	112 ± 5.73	201 ± 6.66	132 ± 1.07*	189 ± 7.09	172 ± 4.98	153 ± 5.86
4h	104 ± 3.85	198 ± 7.45	125 ± 9.01*	168 ± 5.23	140 ± 2.84*	139 ± 4.90*
5h	110 ± 6.90	181 ± 6.87	109 ± 3.83*	148 ± 2.71	126 ± 4.06*	118 ± 6.03*
6h	107 ± 5.71	176 ± 7.75	90 ± 2.06*	124 ± 1.08*	115 ± 6.93*	107 ± 4.09*

n=6; values expressed as mean ± S.D., one way ANOVA followed by Dunnet's test \* p<0.01



**Figure 1.** Effect of petroleum ether extract of flower head of *sphaeranthus indicus* on alloxan induced diabetic rats.

## DISCUSSION

Alloxan causes diabetes through its ability to destroy the insulin-producing beta cells of the pancreas [15, 16]. *In vitro* studies have shown that alloxan is selectively toxic to pancreatic beta cells, leading to the induction of cell necrosis [17, 18]. The

cytotoxic action of alloxan is mediated by reactive oxygen species, with a simultaneous massive increase in cytosolic calcium concentration, leading to a rapid destruction of beta cells [19]. Experimental studies reveals that the petroleum ether extracts from *Sphaeranthus indicus* flower head (50, 100 and 200 mg/kg) orally administered produced a significant decrease in the blood glucose level in the model of alloxan-induced diabetes in rats. It also proves the traditional claim with regard to *Sphaeranthus indicus* for its anti-diabetic activity.

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