

# Antihyperlipidemic activity of *Sphaeranthus indicus* on atherogenic diet induced hyperlipidemia in rats

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The present study was designed to investigate the Antihyperlipidemic activity of alcoholic extract of *Sphaeranthus indicus L.* flower heads in atherogenic diet induced hyperlipidemia. *Sphaeranthus indicus* extract was administered in a dose of 500 mg/kg/day, p.o. for eight days. Marked decrease in body weight, total cholesterol, triglyceride, and low-density lipoprotein and very low density lipoprotein whereas significant increases in the level of high-density lipoprotein were obtained after treatment with *Sphaeranthus indicus* extract. The present work indicates that, *Sphaeranthus indicus* extract in a dose of 500 mg/kg/day effectively suppressed the atherogenic diet induced hyperlipidemia in rats, suggesting the potential protective role in atherosclerosis.

**Key words:** *Sphaeranthus indicus*, atherogenic diet, hyperlipidemia

## INTRODUCTION

Hyperlipidemia is the most prevalent indicator for susceptibility to atherosclerotic heart disease. It is characterized by abnormally elevated lipid (triglyceride and cholesterol) and lipoprotein (LDL-c, VLDL-c) levels in the blood. This is supported by an abundance of congruent result from genetic, epidemiological, experimental animal studies and clinical trials that the presence of high plasma lipid cholesterol increases the incidence of coronary heart diseases (CHD). Atherosclerosis is the preliminary lipid disorder that affects the arteries and many factors contributing to its etiology, among them diabetes, glucocorticoid, diet, psychological factors are the major one. A crucial step in the pathogenesis of atherosclerosis is believed to be oxidative modification of LDL-c.<sup>[1-3]</sup>

Medicinal plants are an indispensable part of the traditional medicine practiced all over the world due to low costs; easy access and ancestral experience. Traditional ayurvedic grantha like Bhavaprakash Nighanta described. *Sphaeranthus indicus Linn.* (*Asteraceae*) commonly known as 'Gorakhmundi' is distributed throughout the plains in India in wet places. The plant is reported to be useful for epilepsy, anemia, diabetes, gout etc. Extract of flower contain the principal essential oil, alkaloid, tannin, glycoside, reducing sugar, semidrying fatty oil, albumin.<sup>[4]</sup> Although Tannins have been reported for their hypolipidaemic activity.<sup>[5]</sup>

All parts of the plant found medicinal uses. The juice of the plant is styptic and said to be useful in liver and gastric disorders.<sup>[6]</sup> The paste of the herb made with oil is applied in itch.<sup>[7]</sup> The herb has a bitter sharp flavor with bitter taste.<sup>[8]</sup> It increases the appetite, enriches the blood, cools the brain and gives luster to the eye.<sup>[9,10]</sup>

Based on this information present study was designed to investigate the antihyperlipidemic effect of *Sphaeranthus indicus* extract (alcoholic), serum lipid and lipoprotein profile in atherogenic diet induced hyperlipidemia.

## MATERIALS AND METHODS

### Plant Materials and Chemicals

The flowers of *Sphaeranthus indicus* collected at Wardha (M.S.) were authenticated from Regional Research Institute, Kothrud, Pune. The plant specimen is available in Regional Research Institute. Specimen voucher No. is 812 for future reference. Lovastatin was obtained as gift sample from Dr. Reddy's Laboratories, Hyderabad. Diagnostic kits for estimation of cholesterol (Merck), Triglyceride (Merck) and High density lipoprotein (CDR Diagnostic) were purchased from Mediequip, Nagpur, India. Atherogenic diet was purchased from local market.

### Plant Extracts

The flower heads of *Sphaeranthus indicus* were dried in shade, under normal environmental condition and then subjected to size reduction to get coarse powder.

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Such powdered material was charged into the Soxhlet apparatus, and extraction was carried out successively with the following solvents like Benzene, carbon tetrachloride, petroleum ether, chloroform, ethanol and water. Each time before extracting with the next solvent, the powdered material was air dried below 50°C and then each extract was concentrated by distilling off the solvent to obtain the crude residue. The drug was extracted with each solvent till complete extraction was effected (about 30 cycles). All the extracts were stored in desiccators over phosphorous pentoxide and self indicating silica gel G.

About 125 g of the powder was taken in soxhlet extractor and extracted with Benzene (2000 ml) for 72 hrs. The solvent recovered by distillation was concentrated to yield a residue. The process of extraction was repeated with used marc and same volume of Chloroform, petroleum ether, ethanol etc. The aqueous extract was prepared after ethanol extraction by same procedure and evaporated at 40°C to give dark brown color solid mass.

### **Experimental**

Male albino rats (Wistar strain) weighing between 150-200 gm were maintained at 25 to 30°C and kept in well ventilated animal house under natural photoperiodic condition in large polypropylene cages and were fed standard rats chow and water *ad libitum*. The animal experiment was approved by animal ethical committee of institute. (650/02/c/CPCSEA)

### **Preparation of doses**

#### **Oral Administration of Extract**

Dissolved 500 mg/kg, body weight of *Sphaeranthus indicus* extract in fresh distilled water and prepared suspension of extract was given orally with the help of baby feeding tube to albino rats.

Animals were divided into different groups with six animals in each group. Group I served as normal control and received standard diet throughout experimental period. Group II, III and IV received atherogenic diet (79% standard diet + 21% Butter fat) throughout the treatment period. Group III received alcoholic extract of *Sphaeranthus indicus* extract (500 mg/kg/day, p.o.). Group IV received Lovastatin (5mg/kg/day p.o.). Treatment periods for all these groups were eight days.

### **Biochemical assay**

At the end of treatment period to all these groups, the animals were used for various biochemical parameters. Blood was collected by orbital plexus of rat under ether anesthesia and centrifuged by using table top centrifuge at 2000 rpm for 30 minute so as to get serum.

Serum total cholesterol, triglyceride was estimated by the

method of CHOD-PAP and high density lipoprotein by the method of GPO-PAP. Low density and very low density cholesterol were calculated by using Friedwald formula and VLDL: TG/5 respectively. Atherogenic index and LDL: HDL ratio was calculated.

### **Statistical analysis**

One way analysis of variance (ANOVA) followed by Dunnett's *t*-test was carried out and  $P < 0.05$  was considered significant.

## **RESULTS AND DISCUSSION**

Rats fed with atherogenic diet for sixty days display increase in their body weight as compare to normal. Treatment with alcoholic extract of *Sphaeranthus indicus* at the dose of 500 mg/kg/day showed significant ( $P < 0.05$ ) decrease in body weight to 17.34% respectively as compared to control group (34.12%) [Table 1].

There was marked increase in the level of serum TC and LDL-c and decrease in the level of good cholesterol carrier, HDL in the animal treated with atherogenic diet. Elevated level of blood cholesterol especially LDL-c was the major risk factor for the coronary heart diseases (CHD) and HDL as cardio protective lipoprotein. Treatment with *Sphaeranthus indicus* extract (500 mg/kg/day, p.o.) significantly decreases the level of TC and LDL-c as compared to control [Table 2]. There was significant increase in the HDL as compared to control. This effect of *Sphaeranthus indicus* extract may be due to increased in the activity of Lecithin: Cholesterol acetyl transferase (LCAT) which incorporates free cholesterol free LDL into HDL and transferred back to VLDL and intermediate density lipoprotein.

Treatment with *Sphaeranthus indicus* extract (500 mg/kg/day, p.o.) showed marked reduction in TG level as compared to control. This effect might be due to increase in activity of the endothelium bound lipoprotein lipase which hydrolyses the triglyceride into fatty acid or may due to inhibition of lipolysis so that fatty acids do not get converted into triglyceride.

There was marked reduction in LDL: HDL-c ratio and atherogenic index. LDL: HDL-c ratio is effective predictor of coronary risk and atherogenic index is most important

**Table 1: Effect of *Sphaeranthus indicus* alcoholic extracts on body weight in hyperlipidemic rats**

Groups	Body weight in gm compared with weight first day
Normal	+8.20
Control (Atherogenic diet)	+38.35
Alcoholic extract of <i>Sphaeranthus indicus</i>	-19.42
Lovastatin (5mg/kg/day)	-20.10

**Table 2: Effect of *Sphaeranthus indicus* alcoholic extracts on serum lipid level of hyperlipidemic rats**

Groups	Dose (mg/kg)	Total cholesterol	Triglycerides	HDL-c	LDL-c	VLDL-c
Normal	-	52.24 ± 4.35	35.18 ± 5.92	17.12 ± 1.98	31.14 ± 6.12	8.78 ± 2.35
Control	Atherogenic diet	90.25 ± 11.47	73.65 ± 12.07	14.64 ± 1.96	65.74 ± 11.58	15.87 ± 3.45
<i>Sphaeranthus indicus</i> extract	500	65.79 ± 13.22	54.11 ± 15.61	15.79 ± 3.45	40.31 ± 4.64	12.56 ± 3.01
Lovastatin	5	58.47 ± 7.59	45.47 ± 13.43	18.37 ± 1.88	34.96 ± 15.11	10.99 ± 4.13

indicator of CHD at both high and low serum cholesterol level. In the present study extract reduced LDL: HDL-c ratio and atherogenic index.

From our study we can conclude that alcoholic extract of *Sphaeranthus indicus* showed significant Antihyperlipidemic activity.

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