Antihyperlipidemic activity of methanolic extract of flowers of *Sphaeranthus indicus* Linn. In rat

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Abstract
The present study was designed to investigate the Antihyperlipidemic activity of methanolic extract of *Sphaeranthus indicus L.* flower heads in atherogenic diet induced hyperlipidemia. *Sphaeranthus indicus* extract was administered in a dose of 250 and 500 mg/kg body wt. suspended in DMSO, p.o, for 7 days, after inducing hyperlipidemia. A marked increased in a level of serum cholesterol, triglycerides and LDL were found in the animals which received Triton-X 100 and HDL levels were decreased. Administration of methanolic extract of *S. indicus* at the dose of 250 and 500 mg/kg body weight shows significant reduction (***P*<0.01 and ****P*<0.001) in the level of serum cholesterol, triglycerides and LDL and increase in HDL level which was almost near to the standard Lovastatin. In accordance with these results, it may be confirmed that due to the presence of phyto constitutions such as flavonoids, steroids, saponons, glycosides and alkaloids in the methanolic extract of *S. indicus* at a dose of 250 and 500 mg/kg body weight exhibited significant hypolipidemic activity in Triton-X 100 induced hyperlipidemic rats.

Keywords: *Sphaeranthus indicus*, methanolic, hyperlipidemia activity

1. Introduction
Hyperlipidemia has been ranked as one of the greatest risk factors contributing to the prevalence and severity of coronary heart disease. Coronary heart disease, stroke, arthrosclerosis and hyperlipidemia are the primary cause of death. Hyperlipidemia is characterized by elevated serum, total cholesterol, low density and very low density lipoprotein and decreased high density lipoprotein levels [1]. Hyperlipidemia is predisposing factor to the development of arthrosclerosis, coronary artery disease and several cardiac manifestations such as myocardial infarction, ischemia and angina and leads to morbidity and mortality. Hyperlipidemia specifically characterized by alterations occurring in serum liquid and lipoprotein profile. It has been reported that abdominal obesity, impaired postprandial lipid metabolism and insulin resistance are all interrelated risk markers for coronary heart diseases. Impairment in insulin sensitivity due to high concentration of lipids in the cells is responsible for the elevated risk in diabetes mellitus. Thus, in this condition there is a possibility of increase in the blood glucose level [2]. Irregular metabolic processes results in the severities and abnormalities in biochemical homeostasis. The changes worsen the normal physiological functioning of the body and become the cause of debilitating health outcomes like hyperlipidemia, diabetes, coronary heart disease etc. Due to the broad consequences and complications of hyperlipidemia, researches establish it as one of the significant contributor of death all over the world. In spite of many advancement in the pharmaceutical preparation, there are studies available which support the use of herbal and homeopathic methods for management of diseases such as hyperlipidemia, dyslipidemia associated cardiovascular disorders and others life threaten ailments due to the it safest and affordable properties with significant effectiveness [3]. The use of complimentary/alternative medicines and especially the consumption of phytochemicals have been rapidly increasing worldwide in the days. Currently available drugs have been associated with number of side effects [4]. Hyperlipidemia associated lipid disorders are considered to cause the atherosclerotic cardiovascular disease. Hyperlipidemia is defined as an elevation of one or more of the plasma lipids, including cholesterol, cholesterol esters, triglycerides and phospholipids. An elevation of plasma lipids may be caused by a primary genetic defect or secondary to diet, drugs or diseases. Despite of differences in lipoprotein distribution and metabolism between humans and rats hyperlipidemic rat models are extensively used in lipid research [5]. More than thirteen thousand plants have been studied for various pharmacological properties. An herbal treatment for hypercholesterolemia has no side effects and is relatively cheap, locally available. They are effective in reducing the lipid levels in the system [6]. Cardiovascular diseases are leading of death in both industrialized and developing nations. Disorders of lipid metabolism, following oxidative stress are the prime risk factors for initiation and progression of these diseases. Thus, there is a considerable interest on development of lipid lowering drugs from natural products in the recent years [7].

2. Materials and Method
2.1 Sphaeranthus indicus Linn (Asteraceae)
Vernacular Name: Eng: East Indian globe-thistle; Hin: Mundi; Kan: Gorakundi; Mal: Atakkamaniyan; San: Mundi, Sravani; Tam: Visnukkarantai, Kottakkarantai; Tel: Bodasaramu, Boddatarapu.
Description: A spreading aromatic herb.
Habitat: Throughout India.
Propagation: By seeds.
Parts Used: Whole plant.

2.2 Chemical Constituents
Essential oil containing methyl chavicol, α-ionone, d-cadinene, p-methoxycinnamaldehyde as major constituents and a- terpinene, citral, geraniol, geranyl acetate, β-ionone, sphaerene indicusene and sphaeranthol as minor constituents. Leaves contain alkaloids.
Part used in present Study: Flowers

2.3 Medicinal properties and other uses
According to Ayurveda, this herb shows following medicinal properties such as Laxative, Vermicide, Diuretic, Nervine,

Epilepsy, Blood purification, Bronchitis, Asthama, Pain in uterus and vagina, act as Alterative and effective in Anthelmintic, Alexipharmic, Insanity, Elephantiasis, Piles, Leucoderma, Filariassis, and Obesity.

Part used in present Study: Flowers

Collection of plant:

The plant is collected from North Maharashtra Region in the period of January 2011. The plant *Sphaeranthus indicus Linn* is identified by Dr. Tanveer Khan, Department of Botany and deposited a voucher specimen in the Department of Zoology.

2.4 Preparation of extract

The plant material was collected from North Maharashtra Region Jalgaon District, Maharashtra State, India. The plant flower was shade dried. After complete drying the material was crushed and grinded to form coarse powder. One kg of dried powdered plant material was exhaustively extracted in Soxhlet apparatus with methanol. The solvent extract So obtained was then filtered to remove any suspended impurities. Extract was concentrated under reduced pressure and controlled temperature (55 ^{0}C to 60 ^{0}C). The obtained methanolic extract was preserved in dry, cool condition in desiccator. Thus, the methanolic extract was screened for its Hypolipidemic activity in rat model.

2.5 Animal used

The albino rat (*Ratus norvegicus)* of either sex and of approximately the same age, weighing between 180-200gm (Photo plate 2) were procured and they were individually housed, maintained in clean polypropylene cages under standard environmental conditions of temperature 27 ± 2 ^{0}C, 12 h light/dark cycle in a registered animal house of Moolji Jaitha College, Jalgaon. The animals were fed with standard pellet diet and water *ad libitum*.

2.6 Biochemical analysis

The serum was assayed for cholesterol, triglycerides, high-density lipoprotein (HDL), low-density lipoprotein (LDL), very low-density lipoprotein (VLDL) using commercially obtained kits. All other chemicals were of analytical grade.

2.7 Experimental Design for hypolipidemic activity

The hypolipidemic activity of the methanolic extract of *S. indicus* was evaluated by the method described by Sudha [8]. Hyperlipidemia was induced in rats by single intraperitoneal injection of freshly prepared solution of Triton-X-100 (75mg/kg) in physiological saline solution after overnight fasting for 18h. The rats were divided into six groups, each group consisting three animals. The first group was given standard pellet diet and saline. The second group was given a single dose of Triton-X-100 administered at a dose of 75 mg/kg, i.p. After 72 hours of triton injection, this group received a daily dose of DMSO (p.o) for 7 days. The third group was administered with daily dose of DMSO. Fourth group was administered with the standard lovastatin 10 mg/kg, p.o. for 7 days. The fifth and sixth groups were administered a daily dose of methanolic extract of *S. indicus* 250 and 500 mg/kg body wt. suspended in DMSO, p. o., for 7 days, after inducing hyperlipidemia.

2.8 Collection of blood

On the 8th day, blood was collected by cardiac puncture, under mild ether anesthesia. The collected samples were centrifuged for 10 minutes at 3000 rpm. Then serum samples were collected and used for various biochemical experiments.

2.9 Statistical analysis

Data are reported as mean ± SEM and were analyzed statistically using one way ANOVA followed by Dunnet's multiple comparison test and values of $P< 0.01$ were considered significant.

Table 1: Effect of methanolic extract of flower of *S. indicus* Linn on serum total cholesterol, triglyceride, HDL and LDL.

Groups	Cholesterol	Triglyceride	HDL	LDL
Normal control	49.17 ± 1.50	50.07 ± 1.68	32.00 ± 1.74	10.01 ± 0.33
Vehicle control	49.08 ± 1.83	54.32 ± 1.33	29.92 ± 1.65	10.86 ± 0.26
Triton control	59.18 ± 1.57	131.8 ± 1.41	24.60 ± 0.46	26.35 ± 0.28
Standard	25.57 ± 1.44	40.32 ± 1.46	34.05 ± 0.98	8.06 ± 0.29
MeOH I	40.97 ± 1.69***	94.03 ± 1.22***	32.70 ± 1.41**	18.81 ± 0.24***
MeOH II	29.49 ± 2.13***	54.02 ± 1.48***	33.07 ± 1.15**	10.80 ± 0.29***

MeOH I=250, MeOH II= 500 mg/kg body wt. of *S.indicus.* Each value expressed as mean ± SE, n=6, **P<0.01 and ***P<0.001 Vs. Triton control

3. Results

A marked increased in a level of serum cholesterol, triglycerides and LDL were found in the animals which received Triton-X 100 and HDL levels were decreased. Administration of methanolic extract of *S. indicus* at the dose of 250 and 500 mg/kg body weight shows significant reduction (**P<0.01 and ***P<0.001) in the level of serum cholesterol, triglycerides and LDL and increase in HDL level which was almost near to the standard Lovastatin (Table 1).

4. Discussion

Hyperlipidemia is associated with heart disease, which is the leading cause of death in the world. The lowering of the levels of harmful lipids to satisfactory values has been confirmed by several experimental animal and interventional studies indicating lowerd morbidity and mortality in coronary heart diseases. The present invesigation shows that after the administration of methanolic extracts of *S. indicus* all triton induced rats displayed significantly reduction in their elevated levels of serum cholesterol, triglycerides and LDL and increase in HDL level. This results are in It is interesting to

note that, the results obtained by Pande and Dubey on the same plant as they evaluated the potency of *S. indicus* in rat as hypolipidemic agent, in atherogenic diet induced hyperlipidemia in rats [9]. The results obtained by them are confirmed by our study. In fact, flavonoids, steroids, saponons and alkaloids, a heterogeneous group of ubiquitous (everywhere) plant polyphenols have exhibited a variety of pharmacological activities including the atherogenesis. The plant steroids reduce the absorption of cholesterol and thus increase faecal excretion of cholesterol [10]. Interestingly, the results of the present study show that methanoilc extract of *S. indicus* reduces the level of serum cholesterol, triglycerides and LDL and increase the level of HDL, which may probably be due to the presence of steroids, flavonoids and triterpinoids.

5. Conclusion

In accordance with these results, it may be confirmed that due to the presence of phyto constitutions such as flavonoids, steroids, saponons, glycosides and alkaloids in the methanolic extract of *S. indicus* at a dose of 250 and 500 mg/kg body weight exhibited significant hypolipidemic activity in Triton-X 100 induced hyperlipidemic rats. Efforts are in progress to isolate and characterised the active principle, which is responsible for the hypolidemic efficacy of this valuable medicinal plant and further studies are required to establish the efficacy of *S. indicus* as a hypolipidemic drug.

6. References

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