Research Article

Anti hyperlipidemic Activity of *Costus Igneus* in Triton X-100 Induced Hyperlipidemic Rats

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ABSTRACT

Hyperlipidemia is the greatest risk factor of coronary heart disease. The present study was designed to investigate the antihyperlipidemic activity of *Costus igneus* in Triton X-100 induced hyperlipidemic rats. Costus igneus extract was administered at different dose of 100mg/kg, 200mg/kg, 400mg/kg (p.o) daily for 7 days to hyperlipidemic rats. Atorvastatin is used as reference standard. The statistical analysis were carried out using one way ANOVA followed by Dunnet's multiple comparison test. *Costus igneus* showed a significant decrease in the levels of serum cholesterol, triglycerides, LDL, VLDL and significant increase in the level of serum HDL at the dose of 400mg/kg (p.o) against Triton induced hyperlipidemic rats. There is also significant improvement in atherogenic index ($p<0.01$) in 400mg/kg extract treated animals. Therefore it effectively suppressed the Triton induced hyperlipidemia in rats, suggesting the potential protective role in Coronary heart disease.

Keywords: *Costus igneus,* Hyperlipidemia, Triton X-100, Atherogenic index.

INTRODUCTION

Hyperlipidemia has been ranked as one of the greatest risk factors contributing to the prevalence and severity of coronary heart diseases.[1] Coronary heart disease, stroke, atherosclerosis and hyperlipidemia are the primary cause of death.[2] Hyperlipidemia is characterized by elevated serum total cholesterol, low density lipoprotein, very low density lipoprotein and decreased high density lipoprotein levels. Hyperlipidemia associated lipid disorders are considered to cause atherosclerotic cardiovascular disease.[3]Among these hypercholesterolemia and hypertriglyceridemia are closely related to ischemic heart disease.[4] The main aim of treatment in patients with hyperlipidemia is to reduce the risk of developing ischemic heart disease or the occurrence of further cardiovascular disease like atherosclerosis or cerebrovascular disease.[5] Currently available drugs have been associated with number of side effects.[6]

Costus igneus is a herbaceous plant and belongs to the family *Costaceae*. It has been used especially in south India to treat Diabetes mellitus. The *Costus igneus* is valued mainly for its tonic, stimulant and antiseptic properties. It is said to be aphrodisiac and to be able to prevent the hair turning grey. Its root is anodyne, antibacterial, antispasmodic, aphrodisiac, carminative, stimulant, stomachic, tonic and vermifuge.

MATERIALS AND METHODS

2.1. Chemicals

Triton X-100 was obtained from Technicho lab chemicals, Coimbatore. Atorvastatin was obtained from Alembic Pharmaceuticals Ltd. Vadodhara, Gujarat. All other chemicals were of analytical grade and obtained locally.

2.2. Experimental Animals

Wistar albino adult male rats weighing 200-250g were obtained from the animal house NGSM institute of Pharmaceutical sciences, Deralakatte, Mangalore, Karnataka, India. The animal were grouped and housed in polypropelene cages (38x 23x 10cm) with not more than five animals per cage and maintained under standard laboratory conditions. They were allowed free access to standard dry pellet diet and water ad libitum.

The experimental protocol was approved by Institutional Animal Ethical Committee (IAEC) constituted under CPCSEA.

3. Acute toxicity studies

The alcoholic extract of plant *Costus igneus* was found to be safe up to 2000 mg/kg body wt. by oral route. After 24hr animals were found well tolerated. There was no mortality and no signs of toxicity. So three dose levels i.e. 100mg/kg, 200mg/kg, and 400mg/kg body weight were selected for the present study.

4. Antihyperlipidemic studies

4.1. Induction of Hyperlipidemia

Hyperlipidemia was induced in Wistar albino rats by single intraperitoneal injection of freshly prepared solution of Triton-X-100 (100 mg/kg) in physiological saline solution after overnight fasting for 18 h (9).The animals were divided into four groups of five rats each. The first group was given standard pellet diet, water and orally administered with 5% CMC. The second group was given a single dose of triton administered at a dose of 100mg/kg, i.p. After 72 hours of triton injection, this group received a daily dose of 5% CMC (p.o) for 7 days. To the third, fourth and fifth group were administered with 100mg/kg, 200mg/kg, 400mg/kg respectively of alchoholic extract of *Costus igneus* p.o., daily for 7 days, after inducing hyperlipidemia. Sixth group was administered with the standard 10 mg/kg, p.o. for 7 days.

4.2. Collection of blood

On the 8th day, blood was collected by retro orbital sinus puncture, under mild ether anaesthesia. The collected samples were centrifuged for 10 minutes. Then serum samples were collected and used for various biochemical experiments. The animals were then sacrificed and the liver collected [8].

4. 3. Biochemical analysis

The serum and liver extract were assayed for total cholesterol[9], triglycerides[10], high-density lipoprotein (HDL)[11,] low-density lipoprotein (LDL)[12], very low-density lipoprotein (VLDL)[12] using standard protocol methods [13].

5. Statistical analysis

The results were expressed as mean + S.E.M. Statistical analysis was carried out by using ANOVA followed by Dunnet's multiple comparison tests using Graph pad PRISM software version. P values <0.05 were considered as statistically significant.

6. RESULTS AND DISCUSSION

Effect of *Costus igneus* on total Cholesterol levels.

In the normal rats the total cholesterol levels were to found be 62.67±1.476. Treatment with Triton-X-100 caused a significant rise in the levels of cholesterol (175.7±3.040). Administration of various doses of the plant extract after the treatment with Titon-X-100 resulted in the lowering of Cholesterol levels in a dose dependant manner. The total cholesterol levels of groups treated with 100, 200 and 400 mg/kg were 161.0±2.75, 148.7±1.28, 92.33±1.116 respectively. The reduction in cholesterol level produced by 400mg/kg extract was significant at ($p<0.05$).

Effect of *Costus igneus* on Triglyceride levels.

Induction of hyperlipidemia resulted in significantly raised triglyceride levels (112.7±2.48) compared to the normal (73.67±2.07). Administration of various doses of the plant extract was able to produce a dose dependant decrease in the triglyceride levels. The respective triglyceride values for rats treated with 100, 200 and 400 mg/kg of extract were 100.7±1.87, 100.7±1.87 and 86±1.461.

Effect of *Costus igneus* on serum LDL levels.

The LDL levels in normal rats were found to be 60.33±1.647. Administration of Triton-X-100 resulted in a rise in LDL levels (98.33±1.28). In Atorvastatin group the LDL was reduced to 65.13±3.43, where as groups treated with 100, 200 and 400 mg/kg of extract showed a dose dependant decrease in the LDL levels (95.33±1.11, 89.33±1.47, 75.87±1.65 respectively)

Effect of *Costus igneus* on serum VLDL levels.
The VLDL levels in normal rats were found to be 14.73±0.41. Administration of Triton-X-100 resulted in a rise in VLDL levels (14.73±0.41). In Atorvastatin group the LDL was reduced to 15.47±0.49, where as groups treated with 100, 200 and 400 mg/kg of extract showed a dose dependant decrease in the VLDL levels (20.13±0.37, 19.20±0.29, 17.20±0.29 respectively)

Effect of *Costus igneus* on serum HDL levels. The HDL levels in normal rats were found to be 46.67±1.52. Administration of Triton-X-100 resulted in a fall in HDL levels (25±1.09). In Atorvastatin group the LDL was elevated to 41±1.31, where as groups treated with 100, 200 and 400 mg/kg of extract showed a dose dependant increase in the HDL levels (41±1.31, 22.67±1.52, 28.33±1.49 respectively)

Effect of *Costus igneus* on artherogenic index
The atherogenic index (AI) which is the measure of the extent of atherosclerotic lesions based on serum lipids is determined in all five groups. The atherogenic index is calculated using the formula AI = TC/HDL. Atherosclerotic index indicates the deposition of foam cells or plaque or fatty infiltration or lipids in heart, coronaries, aorta, liver and kidney. The atherogenic index was significantly reduced by treatment with Atorvstatin. Treatment with the plant extract also resulted in reduction of artherogic index in a dose dependant manner.

CONCLUSION
The present study was designed to investigate the antihyperlipidemic activity of *Costus igneus* extract in Triton X-100 induced hyperlipidemic rats. Administration of triton-X-100 (100mg/kg) to rats caused an elevation of total cholesterol, total triglycerides, VLDL and LDL and reduction in HDL levels. *Costus igneus* was administered at various doses, 100, 200, 400 mg/kg day, (p.o) to Triton induced hyperlipidemic rats. Atorvastatin was used as reference standard. Treatment with plant extract was able to significantly ($p<0.05$) decrease the levels of TC, TG, VLDL and LDL. Also the extract was found to cause a significant ($p<0.05$) increase in the HDL levels. The artherogenic index also was decreased in a dose dependent manner. Therefore it can be concluded that *Costus igneus* extract is able to effectively suppress Triton induced hyperlipidemia in rats, suggesting the potential protective role in coronary heart disease.

AKNOWLEDGEMENTS
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Table 1: Effect of alcoholic extract of *Costus igneus* on serum lipids

Groups	Total Cholesterol	Triglycerides	HDL	LDL	VLDL	AAIs
Normal	62.67±1.476	73.67±2.07	46.67±1.52	60.33±1.647	14.73±0.41	1.34±0.03
Triton	175.7±3.040	112.7±2.48	25±1.09	98.33±1.28	22.53±0.49	7.08±0.29
Atorvastatin	73.00±1.673	80.67±1.87	41±1.31	65.13±3.43	15.47±0.49	1.78±0.06
100mg/kg extract	161.0±2.75 a	100.7±1.87 a	22.67±1.52	95.33±1.11	20.13±0.37 a	7.28±0.54
200mg/kg extract	148.7±1.28 b	96.0±3.57 b	28.33±1.49	89.33±1.47	19.20±0.29 b	5.56±0.38
400mg/kg extract	92.33±1.116 b	86±1.461 b	33.67±1.72	75.87±1.65a	17.20±0.29 b	2.77±0.12 a

Values are expressed as MEAN ± SEM; (n=6) a: $p<0.05$ compared to triton treated group, b:$p<0.01$ compared to triton treated group. Test result of serum lipids in mg/dl and atherogenic index in ratio. The atherogenic index was calculated using the formula AI = TC/HDL

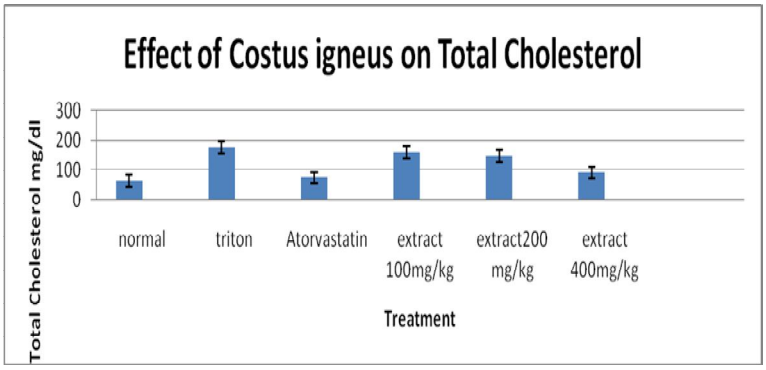

Fig. 1: Effect of alcoholic extract of *Costus igneus* on total cholesterol

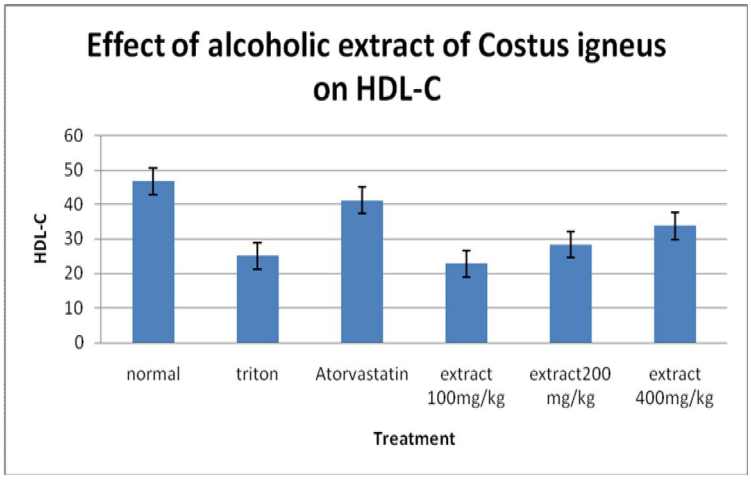

Fig. 2: Effect of alcoholic extract of *Costus igneus* on HDL

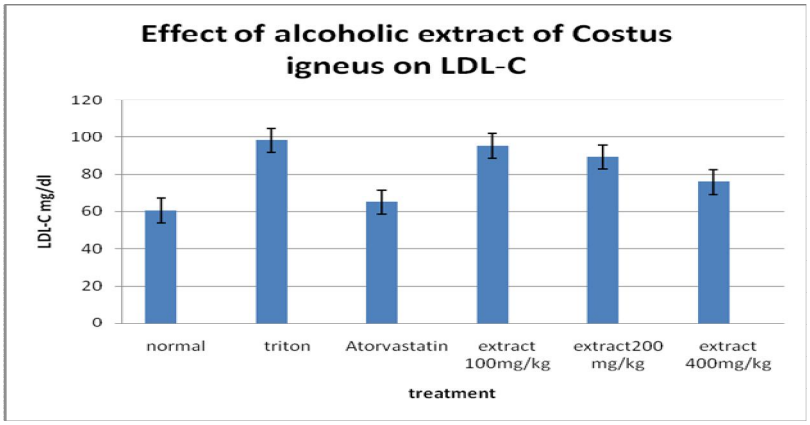

Fig. 3: Effect of alcoholic extract of *Costus igneus* on LDL

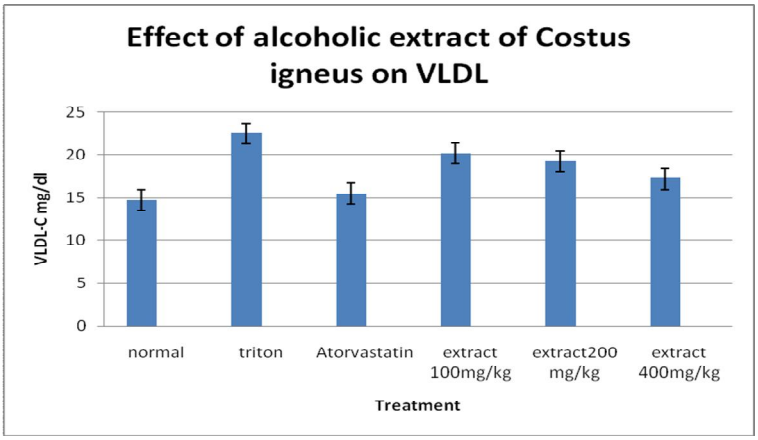

Fig. 4: Effect of alcoholic extract of *Costus igneus* on VLDL

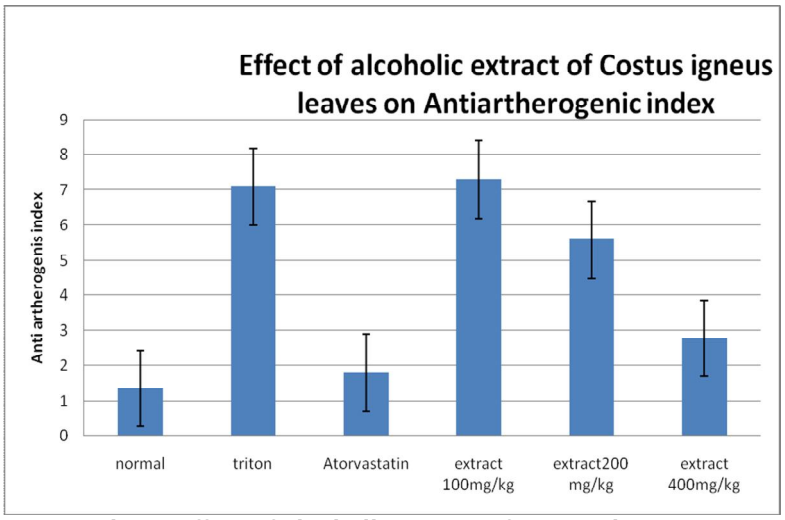

Fig. 5: Effect of alcoholic extract of *Costus igneus* on Antiatherogenic index

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