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Research Article

ANTI HYPERLIPIDEMIC ACTIVITY OF ACALYPHA INDICA LINN. ON ATHEROGENIC DIET INDUCED HYPERLIPIDEMIA

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ABSTRACT

Objectives: *Acalypha indica Linn. L.* (family: Euphorbiaceae) is a weed widely distributed throughout the plains of India. It has been reported to be useful in treating pneumonia, asthma, rheumatism and several other ailments. As there is no indication of publications regarding the Anti hyperlipidemic activity of the plant,the present study was designed to investigate the Anti hyperlipidemic activity of ethanolic, aqueous extracts of *Acalypha indica Linn.*

Method: Hyperlipidemia was induced *by* Atherogenic diet in Wistar albino rats. . Drugs were administered in two different dose levels (200mg/Kgbwt, 400mg/ Kgbwt).

Results: Though two extracts of *Acalypha indica Linn, dose* dependently reduced, the elevated levels of TC, TG and LDL-C condition has shown considerable decline. Ethanolic extract (400mg/kg) of *Acalypha indica Linn* leaves was more significant as compared to aqueous extract. A preliminary phytochemical analysis revealed the presence of different phytoconstituents such as lignands, flavonoids, glycosides, sterols, sugars, amino acids and triterpenoids etc which may important for these activity

Conclusion: The present result suggests *Acalypha indica Linn*. improved the serum lipid profile in rats by decreasing serum TC, TG, LDL-C and increasing serum HDL-C, thus improving the atherogenic index. This finding provides some biochemical basis for against hyperlipidemia. Further, studies are required to again more insight in to the possible mechanism of action.

Keywords: *Acalypha indica Linn* , Hyperlipidemia, AGD, Simvastatin, Lipidprofile.

INTRODUCTION

Hyperlipidemic is a condition which can be found to be associated with overweight and obesity. Overweight and obesity are the main risk factors in diseases such as hypertension, gallbladder and some types of cancer.[1]It has been established that "Western diets" known for their high fat, high cholesterol, excess energy and low fiber contents, increase serum cholesterol and other lipid levels[2] Which usually predisposes the individual to the aforementioned complications and diseases. It has been reported that complications and diseases associated with hyperlipidemic cause almost 12 million deaths each year all over the world.[3]

In addition hyperlipidemia is induced by secondary effect of diabetes, therefore ,the agent having some antioxidant and anti-diabetic effect also showed favorable effect to hyperlipidemia.HMG Co A reductase inhibitor has been used in the treatment of hyperlipidemia, and simvastatin is one of the most perevalently used HMG CO A reductase inhibitors[4] Based on this information present study was designed to investigate the Anti hyperlipidemic effect of *Acalypha indica Linn* extracts (ethanolic and aqueous) serum lipid and lipoprotein profile in Atherogenic diet (AGD) induced hyperlipidemia. *Acalypha indica Linn. L.* (family: Euphorbiaceae) is a weed widely distributed throughout the plains of India. It has been reported to be useful in treating pneumonia, asthma, rheumatism and several other ailments. The dried leaves of *Acalypha indica Linn.* was made into a poultice to treat bedsores and wounds and the juice of *Acalypha indica Linn.* is added to oil or lime and used to treat a variety of skin disorders[5]. The leaves of Acalypha grandis have also been reported to possess contraceptive activity.[6] Several chemical and biological investigations have been carried out on this plant.

MATERIALS AND METHODS

Plant material

Fresh leaves of *Acalypha indica Linn* .Were collected from kaaripatti, Salem (Dt) Tamilnadu. The plant was then authenticated by the Botanist A. Balasubramanium, consultant-central Siddha Research, salem-Tamilnadu.

Preparation of the extract/ drug

The fresh leaves of *Acalypha indica Linn* collected and dried under shade, sliced into small pieces with mechanical grinder. The powder was passed through sieve no.30 and stored in a container.Then the marc was defatted with Ethanol 95% (75-78oC) by using hot percolation method (soxhlet apparatus). The marc was then subjected to cold maceration using distilled water for 72hrs. The extracted was concentrated using a rotary vacuum evaporator and then dried under reduced pressure and kept in the dessicator. The extracts were suspended in Tween80 for presented study. The extract obtained was subjected to various Preliminary Phytochemical Screening tests as per the procedure mentioned in the standard reference books.[7].[8] The extract was used for pharmacological evaluation.

Atherogenic diet and chemicals (AGD)

Experimental hyperlipidemic diet

Experimental diet consists of well pulverized mixture of cholesterol (2%), cholic acid (1%), peanut oil (10%), sucrose (40%) and normal laboratory diet (47%). Simvastatin (Dr. Reddy's Laboratories, Hyderabad), Diagnostic kits for estimation were purchased from Merck Diagnostics India Ltd. Anesthetic ether (Ozone International, Mumbai), and all other chemicals were of analytical grade.

Animals

Adult albino rats of Wistar strain (150-200g) of either sex were procured and housed in the animal house of vinayaka mission's College of Pharmacy, with 12 hrs light and 12 hrs dark cycles. Standard pellets obtained from Goldmohar rat feed, Mumbai, India, were used as a basal diet during the experimental period. The control and experimental animals were provided food and drinking water ad libitum. All the animal experiments were conducted according to the ethical norms approved by CPCSEA, Ministry of social justice and empowerment, Government of India and ethical clearance was granted by institutional ethical committee in resolution no. (P.COL/59/2010/IEAC/VMCP).

Preparation of dose for dried extracts

Alcohol and aqueous extracts were formulated as suspension in distilled water using Tween-80 as suspending agent. The strength of the suspension was according to the administration of dose

Preparation of standard drugs

Simvastatin 10 mg/kg was used as the reference standard drug for evaluating the antihyperlipidemic activity which was made into suspension in distilled water using Tween-80 as a suspending agent.

Acute toxicity test:[9]

The ethanol and aqueous extract of *Acalypha indica Linn* was screened for acute toxicity, following the standard method (OECD/OCDE No: 423). Albino mice of female sex weighing 20-25 gm were used in this study. Animals were maintained on normal diet and water prior to and during the course of experiment. The dose of ethanol and aqueous extract was prepared with saline and was administered by oral. The acute toxicity was tested at the doses of 5, 50 300 and 2000mg/kg.

Diet-induced hyperlipidemic model

The animals were selected, weighed then marked for individual identification. In this model, rats were made hyperlipidemic by the oral administration of atherogenic diet (AGD) was for 10 days by mixing with regular pellet diet and rats were given free access to the feed ad libitum. The rats were then given plant extracts suspended in 0.2% tween 80 at the dose of 200mg,400mg /kg b.w once daily in the morning through by oral for 10 consecutive days. During these days, all the groups also received atherogenic diet in the same dose as given earlier. The control animals received the hyperlipidemic diet and the vehicle.

Biochemical assay

At the end of treatment period, the animals were used for the study of various biochemical parameters. Blood was collected by orbital plexus of rat under ether anesthesia and centrifuged by using centrifuge at 2000 rpm for 30 min to get serum.[10] Serum total cholesterol, triglyceride HDL-C was estimated by using diagnostic kits. Low and respectively. Atherogenic index was calculated from TC and HDL-C.

Statistical analysis

One way analysis of variance (ANOVA) followed by Dunnets t-test was carried out and P<0.005 was considered significant.

RESULTS

A significant increase in body weight was detected in AGD feed rats compare to normal control.In present study, however no favorable changes in body weight were detected after *Acalypha indica Linn* leaves extract dosing. Feeding animal with Atherogenic diet (AGD) enriched with peanut oil (10%) and cholesterol (2%), produced a significant elevation in serum CHOL concentration (135.73%; P<0.05), as well as increase in TG and LDL-C concentrations (112.28 %, 109.15%, p<0.05 respectively) with decrease in the level of good cholesterol carrier, HDL (-46.82%). Supplementation of the AGD with 400mg/kg ethanolic and aqueous extracts of leaves of *Acalypha indica Linn* reduced the serum TC by about 30.00%, 20.01% respectively compared to rats fed AGD alone. There was marked decline in serum TG condition has shown by 24.29%, 19.68% in ethanolic and aqueous extracts treated group respectively. Elevated level of HDL-C is considered as cardioprotective effect. Treatment with extracts of ethanolic and aqueous shown increase in HDL-C by 51.8%, 43.97% respectively. extracts treated groupsvshowed marked reduction in atherogenic index. Atherogeni index which is most important indicator of coronary heart disease (CHD) at both high and low serum cholesterol level.

Table 1: Effect of ethanolic and aqueous extracts of leaves of *Acalypha indica Linn* . on lipidprofile in AGD induced hyperlipidemic rats.

S. No.	Groups	HDL (mg/dl)	LDL (mg/dl)	VLDL (mg/dl)	TC (mg/dl)	TG (mg/dl)
1	Control	34.81+-1.58	27.08± 2.91	14.03± 1.23	77.77± 4.05	70.15± 6.16
2	AGD	18.51± 1.36 ↓46.82	135.04± 5.47 (↑1041.40)	29.77± 1.30 (↑112.18)	183.33 ± 6.67 (↑135.73)	148.92± 6.53 (↑112.28)
3	AGD+ Simva.(10mg/kg)	31.47± 2.54* (↑70.01)	51.80± 3.97* (↓61.64)	19.60± 1.03* (↓34.16)	103.33± 7.13* (↓43.64)	97.22± 5.28* (↓34.71)
4	AGD+ Eth.200mg	25.92± 1.58* (↑40.03)	99.77± 9.85* (↓26.57)	24.41± 0.75* (↓18.00)	150.00±10.33* (↓18.19)	121.54±3.29* (↓18.38)
5	AGD+ Eth.400mg	28.10± 2.19* (↑51.80)	77.67± 3.97* (↓42.48)	22.51± 1.12* (↓24.38)	128.33± 6.01* (↓30.00)	112.74± 5.56* (↓24.29)
6	AGD+ Aqu.200mg	22.58± 1.66 (↑21.98)	105.96 ±6.06 (↓21.53)	24.86± 1.21* (↓16.49)	153.33±7.60* (↓16.37)	124.36±6.05* (↓16.49)
7	AGD+ Aqu.400mg	26.65± 1.72* (↑43.97)	96.15± 4.88* (↓28.79)	23.86± 1.52* (↓19.85)	146.66± 6.15* (↓20.01)	119.60± 7.54* (↓19.68)

Table 2: Effect of ethanolic and aqueous extracts of leaves of *Acalypha indica Linn*. on body weight AGD induced hyperlipidemic rats

Days	Mean Body weight (gm)(% change in body weight)						
	Normal	AGD	STD	Eth.200mg	Eth.400mg	Aq.200	Aq.400mg
0th	148.33	138.66	146.33	144.83	144.44	145.00	146.66
5th	161.33 (↑8.76)	164.66 (↑18.75)	165.33 (↑12.98)	166.50 (↑14.96)	167.44 (↑15.92)	170.50 (↑17.58)	169.66 (↑15.68)
10th	169.10 (↑14.00)	179.66 (↑29.56)	181.66 (↑24.14)	181.00 (↑24.97)	180.00 (↑24.61)	182.66 (↑25.97)	179.00 (↑22.05)

DISCUSSION

Hyperlipidemia a well known risk factor for cardiovascular disease ,especially atherosclerotic coronary artery disease (CAD) is one of the major cause of premature death globally and it is expected to be the most important cause of mortality in India by the year 2010[11] It has been well established that nutrition plays an important role in the etiology of hyperlipidemias and atherosclerosis. Several animal and human studies have confirmed the hypercholesterolemic properties of saturated fatty acids and cholesterol which include increasing total cholesterol and altering lipoprotein pattern and whose mechanisms remain under study.Cholesterol feeding has been often used to elevate serum or tissue cholesterol levels to hypercholesterolemia-related metabolic disturbances in different animal models.[12]Rats fed with a diet supplemented with 100g cholesterol and 50gm Cholic acid in coconut oil with egg for 20 days served as the experimental model. This is in accord with previous finding reported by Na Young Yoon et al; 2008 who showed that

feeding rats with high cholesterol diet for 7 days induced hyperlipidemia. Similar results have been reported by Hossam M.M. Arafa 2005, feeding rats with an HCD for 7 consecutive days resulted in marked hypercholesterolemia. Also Palaninathan Varalakshmi et al;2006 have demonstrated that feeding Wistar rats for 30 days a high cholesterol diet increased the serum lipids. The mechanism of action of cholic acid is two fold: an increase in cholesterol absorption and a concomitant suppression of cholesterol 7a-hydroxlyase activity that results in decreased cholesterol excretion[13].Cholicacid improves cholesterol absorption by its emulsifying property. From obtained result it was observed that keeping the animal on AGD significantly increased the TC, TG, LDL-C level in serum ($P<0.05$) as compared to rats on normal diet. When AGD was coadministered with extracts, the elevated levels of TC, TG and LDL-C condition has shown considerable decline. It was noted that TC, TG and LDL-C lowering activity of ethanolic extract (400mg/kg) of *Acalypha indica Linn* leaves was more significant as compared to aqueous extract. There was significant elevation in plasma HDL-C in *Acalypha indica Linn* treated rats as compared to AGD rats, thus indicating the efficacy of *Acalypha indica Linn* extract in preventing the elevation seen in various components of lipid profile under experimentally induced hyperlipidemia. Ample of evidence exists with respect to the fact that HDL cholesterol is inversely related to total body cholesterol and a reduction of plasma HDL cholesterol concentration may accelerate the development of atherosclerosis leading to ischaemic heart diseases, by impairing the clearing of cholesterol from the arterial wall[14]. Flavonoids are reported to increase HDL-C concentration and decrease in LDL and VLDL levels in hypercholesteremic rats[15]. Flavonoids and polyphenols found in our extracts could therefore be considered favorable in increasing HDL and decreasing LDL and VLDL in extracts treated rats. Simvastatin which was used as positive control in this study, is a HMG-CoA reductase inhibitor. HMG-CoA reduce serum triglyceride levels through the modulation of apolipoprotein C-III and lipoprotein lipase. Rats treated with Simvastatin showed marked reduction in all serum lipoproteins and increase in HDL level as compared with AGD group.

CONCLUSION

Result of present study revealed that the aqueous and ethanolic extract of leaves of *Acalypha indica Linn*. improved the serum lipid profile in rats by decreasing serum TC, TG, LDL-C and increasing serum HDL-C, thus improving the atherogenic index. This finding provides some biochemical basis for the use of leaves extract of *Acalypha indica Linn*. as antihyperlipidemic agent having preventive and curative effect against hyperlipidemia. Further, studies are required to again more insight in to the possible mechanism of action.

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