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ANTIHYPERLIPIDEMIC ACTIVITY OF *VICOA INDICA* IN ATHEROGENIC DIET-INDUCED HYPERLIPIDEMIC RAT

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ABSTRACT

The objective of this study was to explore the potential antihyperlipidemic effect of *Vicoa Indica* (*Compositae*) extract in atherogenic diet induced hyperlipidemic rats. Methanol and ethyl acetate extracts of *V. Indica* is evaluated for antihyperlipidemic activity. Antihyperlipidemic drug simvastatin (3mg/kg /bw) was used as a standard. In atherogenic diet induced model, methanol extract exhibited significant serum lipid lowering effect in total cholesterol, triglycerides, low density lipoprotein (LDL), very low density lipoprotein (VLDL) and rise in high density lipoprotein (HDL) in hyperlipidemic rats as compared to hyperlipidemic control statistically. The results of the study were confirmed that methanol extract of *Vicoa Indica* exposed a significant antihyperlipidemic activity and it could be a possible herbal therapy as adjuvant with prevailing therapy for the treatment of high cholesterol in blood.

KEYWORDS

Hyperlipidemia, Cholesterol, Atherogenic, Simvastatin and Lipoprotein.

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INTRODUCTION

Hyperlipidaemia is a life-threatening disorder and it causes about 16-17 million demises worldwide every year¹ it is also a main role for the development of heart and coronary vascular diseases and atherosclerosis in blood vessels. Atherosclerosis (plaque formation) is a prolonged inflammatory disease activated by several factors, with strong impact of endothelial damage in blood vessels related to lipid peroxidation and platelet aggregation. This endothelial damage increases the

generation and permeation of low-density lipoproteins (LDL) cholesterol through the inner layer of the blood vessel, resultant in oxidation and development of atherosclerotic plaque in the injured blood vessel^{2,3}. In addition hyperlipidemia with elevated the normal level of cholesterol, triglycerides carrying lipoproteins is measured to be the cause of thrombosis and myocardial infraction⁴. In order to regulate this inequality of fat level, the biological system has enzymatic and no enzymatic antioxidant defense mechanisms by inhibiting lipid peroxidation, free radicals scavenging, and retaining redox balance in cellular level⁵.

Vicoa indica is a medicinal herbal plant belonging to the family Compositae. Leaves are alternate arrangement and 7-12 x 2-3.5cm length. *V. indica* is elliptic ovate in shape, acuminate at apex area, attenuate at base part, margins are serrate, hairy above and on nerves below, white cottony between the prominently reticulated veins below and upper leaves sessile to marginally petioled, lower ones of *V. indica* as long petioled. Corolla campanulate is in purple colour and tube slender is 0.5-0.6cm long, widened at mouth region. Achenes of *V. indica* are 0.1-0.2cm long and barbellate of *V. indica* hairs are 0.25-0.3cm (*long.www.kerala plants.in*) *V. indica* is used by tribal population in northern states of India. It acts as a contraceptive agent and used as female anti-fertility drug. The ethno botanical assessments showed the infusion of whole plants was used in abortion, reduce the cholesterol⁶, *V. indica* roots are therapy for cough, atherosclerosis and jaundice⁷.

In this circumstance, the aim of this study was to evaluate the hypolipidemic activity of the methanolic and ethyl acetate extract of *V. indica* on rats with hyperlipidemia induced by high-atherogenic diet.

MATERIAL AND METHODS

Collection of Plant Materials

The *Vicoa indica* leaves were collected from the Kanyakumari District, Tamil Nadu, India. The plant was authenticated by Mr. Chelladurai, Research Botanist (Rtd), CCRAS Tirunelveli, Tamil Nadu.

Preparation of extracts

About 1kg of air-dried leaves of plant was extracted in sox let assembly methanol 70% and ethyl acetate. The extract was concentrated by using rotary vacuum evaporator. The extract obtained with each solvent was weighed and the percentage yield was calculated in terms of dried weight of the plant material. The color and consistency of the extract were also noted. All the solvents used for this entire work were of analytical reagent grade (Merck, Mumbai). The yield of the extract was 27.46 % and 23.31% (w/w). In each experiment, the extract was diluted with water to desired concentration.

Animals

Adult male albino rats weighing about 200-250g were used in this study. Rats were maintained in clean, sterile, polycarbonate cages and fed with commercial pellet rat chow (M/S Hindustan lever limited, Bangalore, India) and water ad libitum. This study was approved by IAEC of Cape Bio Lab and Research Centre, CSI Complex, Marthandam - 629 165 and the study approval number is CBLRC/IAEC/06/01 - 2020.

Statistical analysis

The results are presented as mean \pm standard error of mean and analyzed using the one-way analysis of variance test with the Dunnet post-hoc test, with $p < 0.05$ as the limit of significance.

Qualitative chemical tests

The methanol and ethyl acetate extract subjected to qualitative chemical analysis to test the presence of alkaloids, carbohydrates, proteins and amino acids, phytosterols, glycosides, saponins, flavonoids, triterpenoids and fixed oils^{8,9}.

Hypolipidemic study

Animals were divided into seven groups of five animals in each group and fed with normal diet, cholesterol diet for 7 weeks and collected blood samples from all animals for check the initial lipid profile. Then animals were subjected to treatment for 4 weeks. After that, the animals were sacrificed after collection of blood to examine the lipid profile of the each rats.

RESULTS AND DISCUSSION

V. indica leaves extracts were subjected to qualitative chemical tests for the detection of various phytoconstituents such as alkaloids, carbohydrates, proteins and amino acids, glycosides, flavonoids, tannins, phenolic compounds, saponins. The phytochemical screening results are shown in [Table No.1].

Acute oral toxicity studies

The acute oral toxicity studies of extracts were carried out as per the OECD guidelines 423. Administration of the various doses of all 2 extracts of *V. indica* from 50mg/kg up to the dose 5000mg/kg showed no significant signs of toxicity in the tested animals. Hence one tenth of upper limit dose were selected as the levels for investigation of antihyperlipidemic activity¹⁰.

Hypolipidemic study

The result of methanol and ethyl acetate extracts of *V. indica* is exhibited a dose depended Hypolipidemic activity in atherogenic rats and the methanol extract of *V. indica* showed a significance effect than ethyl acetate extract of *V. indica* as compared to standard and control group.

Values are expressed as mean \pm standard mean error. *Data differed significantly at $p < 0.05$ when compared with the normal control group and standard group.

Discussion

Rats served with atherogenic diet for 28 days show increase in their body weight as compare to normal animal. Treatment with methanol extract of *V. indica* at the dose of 200mg/kg/day showed significant ($P < 0.05$) decrease in total cholesterol to 62.79 respectively as compared to positive control group (92.16) the values are represented in [Table No.2].

There was noticeable rise in the level of serum TC and LDL-c and decrease in the level of good cholesterol HDL in the animal treated with atherogenic diet. Raised level of blood cholesterol particularly LDL-c was the key risk factor for the coronary heart diseases (CHD) and HDL-c as cardio defensive lipoprotein for protect the heart from the thrombosis. Therapy with *V. indica* extract

(100 and 200mg/kg/day, p.o.) significantly decreases the level of TC and LDL-c as compared to control group of animals [Table No.2] and also it showed a significant increase in the HDL-c as compared to control group of animals.

The hypolipidemic effect of *V. indica* extract may be due to increase in the action of Lecithin component and Cholesterol acetyltransferase (LCAT) enzyme which includes free cholesterol level, free LDL-c into HDL-c and moved back to VLDL-c and intermediate density lipoprotein (IDL-C).

Treated with *V. indica* extract (100 and 200mg/kg/day, p.o.) exhibited a reduction in TG level as compared to control standard group of animals. This effect of *V. indica* extract may be due to increase in action of the endothelium containing lipoprotein lipase enzyme it hydrolyses the triglycerides into fatty acid and glycerol and also it may due to inhibition of the conversion of fatty acids in to triglyceride by inhibition of lipolysis¹¹. In the present study *V. indica* extract (100 and 200mg/kg/day, p.o.) reduced LDL: HDL-c ratio and atherogenic manifestation.

Groups	Treatment for 28 days
Group I	Control group feed with normal diet for 28 days
Group II	Positive control with High fat diet for 28 days
Group III	Standard group treated with Simvastatin 3mg/Kg orally for 28 days
Group IV	Test group treated with Ethyl acetate extract 100mg/kg at oral route daily for 28 days
Group V	Test group treated with Ethyl acetate extract 200mg/kg at oral route daily for 28 days
Group VI	Test group treated with Methanol extract 100mg/kg at oral route daily for 28 days
Group VII	Test group treated with Methanol extract 200mg/kg at oral route daily for 28 days.

Table No.1: Qualitative Chemical Analysis of Phytoconstituents of the methanol and ethyl acetate Extract of *V. indica*

S.No	Tested Components	<i>V. indica</i>	<i>V. indica</i>
1	Alkaloids	+	+
2	Carbohydrates	+	+
3	Glycosides	+	+
4	Terpenoids	-	-
5	Proteins	+	+
6	Amino acids	+	+
7	Steroids	+	+
8	Flavonoids	+	+
9	Phenols	+	+
10	Tannins	+	+
11	Saponins	+	+

+ = Presence - = Absence

Table No.2: Effect of methanol and ethyl acetate Extract of *V. indica* on serum lipid level of hyperlipidemic rats

S.No	Group	Dose mg/kg	Total cholesterol	Triglycerides	HDL-c	LDL-c	VLDL-c
1	Normal Saline	10ml/kg	57.13 ± 5.21	37.13 ± 4.32	19.14 ± 0.76	30.23 ± 4.23	7.54 ± 1.32
2	Positive Control	-	92.16 ± 10.23	76.34 ± 10.12	16.45 ± 1.42	67.36 ± 10.31	17.52 ± 2.13
3	Simvastatin	3mg/Kg	58.47 ± 6.21*	45.47 ± 11.12*	18.37 ± 0.93*	34.96 ± 12.23*	10.99 ± 3.14*
4	Ethyl acetate extract of <i>V. indica</i>	100mg/kg	73.79 ± 11.24	63.11 ± 13.42	26.79 ± 1.63	42.31 ± 3.42	21.56 ± 2.12
5	Ethyl acetate extract of <i>V. indica</i>	200mg/kg	66.79 ± 10.13*	57.11 ± 14.31*	21.79 ± 2.12*	40.31 ± 3.56*	18.56 ± 1.23*
6	Methanol extract of <i>V. indica</i>	100mg/kg	71.79 ± 11.12	61.11 ± 13.34	23.79 ± 1.32	41.31 ± 5.36	17.56 ± 2.35
7	Methanol extract of <i>V. indica</i>	200mg/kg	62.79 ± 9.31*	50.11 ± 14.23*	20.79 ± 2.34*	38.31 ± 3.13*	14.56 ± 2.45*

VI-V. *indica*

CONCLUSION

The present study corroborated that the *V. indica* extract revealed a hypolipidemic activity against atherogenic diet induced cholesterol in rats and need a further extensive studies for confirmation of the hypolipidemic effect.

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CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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