ISSN- 2230-7346
Journal of Global Trends in Pharmaceutical Sciences

HYPOLIPIDEMIC ACTIVITY OF *CARALLUMA ADSCENDENS* WHOLE PLANT: ATHEROGENIC DIET INDUCED HYPERLIPIDEMIC RATS

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ARTICLE INFO

Key words:
Caralluma adscendens
Atherogenic effect
Hyperlipidemia

Access this article online
Website: https://www.jgtps.com/
Quick Response Code:

ABSTRACT

The aim of this study has been to investigate the possible antihyperlipidemic effect of Caralluma adscendens whole plant ethanolic extract in atherogenic diet-induced hyperlipidemic rats. A comparison was made between the action of ethanolic extract of Caralluma adscendens and a known antihyperlipidemic drug simvastatin (4 mg/kg body wt.). Hyperlipidemia was induced by giving atherogenic diet for thirty days. The groups of rats selected for the study were treated with Simvastatin, ethanol extract of Caralluma adscendens whole plant at 100 mg/kg (group IV) and 200 mg/kg (group V) daily for the whole period. On the analysis of serum lipids were carried out at the end of the study. Oral administration of 200 mg/kg body wt. of the ethanolic extract exhibited a significant reduction in serum lipid parameters like total cholesterol, triglycerides, low density lipoprotein (LDL), very low density lipoprotein (VLDL) and increase in high density lipoprotein (HDL) in hyperlipidemic rats as compared to control statistically. Caralluma adscendens ethanolic extract was found to possess better antihyperlipidemic potential activity. The present work indicates that, Caralluma adscendens in a dose of 200 mg/kg effectively suppressed the atherogenic diet induced hyperlipidemia in rats, suggesting the potential protective role in atherosclerosis.

INTRODUCTION

Hypertension, high serum cholesterol and obesity are major risk factors of cardiovascular morbidity and mortality, and a continuing challenge to public health efforts. [1– 4] These disorders of industrialized societies are sensitive to various dietary factors. High intakes of saturated fat and cholesterol increase serum LDL cholesterol, probably by decreasing the amount and/or activity of LDL receptors in the liver. [5, 6] Elevated and modified LDL is one of the principal factors in the development of atherosclerosis. Accumulating in the vascular wall, it induces inflammation and endothelial Dysfunction, leading eventually to permanent lesions. [7, 8] High intake of salt (sodium chloride), another feature of the typical Western diet, elevates blood pressure, aggravates end organ damage and reduces the effect of many antihypertensive drugs.[9–11] Hypertension has proinflammatory effects as well by increasing the formation of hydrogen peroxide and free radicals [7, 12]. These substances impair the function of the endothelium and increase leukocyte adhesion, thus contributing to the process of atherosclerosis [7] which can be amended either by proper lifestyle changes, medical

management or by the combination of both. It has emerged as the most important preventable and modifiable risk factors for coronary heart disease (CHD). Clinical signs of this condition are an increase in the fasting serum cholesterol level (hypercholesterolemia) or the fasting serum triglyceride level (Hypertriglyceridemia) or both. This makes study of lipid profile in the general population very important in society. On the other hand, certain changes in dietary habits have a favorable effect on cardiovascular health; therefore, recent recommendations include reduced intake of salt (sodium chloride), cholesterol and saturated fatty acids, and increased intake of potassium, magnesium and calcium.[13–16] Diets supplemented with these minerals lower elevated blood pressure and also have other beneficial effects in both animal models and hypertensive patients. [17–22] For prevention and treatment of lipid disorders, food products containing plant sterols or stanols have recently been introduced and proven to be useful. [23–25]

Caralluma adscendens, belongs to the family Asclepiadaceae, and is a traditional food consumed in the form of a pickle and vegetable and is also eaten during famines. [26] Traditionally, the juice of the plant is combined with black pepper in treating migraine. The plant is also eaten raw as a treatment for diabetes.[27]

Caralluma species have shown anti-inflammatory, [28, 29] gastric mucosa protecting and antiulcer properties.[30] However, no scientific investigation has so far been conducted on the antihyperlipidemic activity of Caralluma adscendens. The present study was undertaken to verify the claim and evaluate the antihyperlipidemic property of whole plant of Caralluma adscendens.

MATERIALS AND METHODS:

Collection of Plant material and Plant Extraction: The whole plant of *Caralluma adscendens* was collected from the forests of Maisammaguda; Secunderabad situated in the state of Telangana (India) and shade dried and powdered mechanically. The plant specimen was authenticated by botanist of Osmania University and authenticated voucher specimen Number 203 of the plant has been preserved in department for future reference. The dried plant were then milled to coarse powder mechanically and extracted with chloroform in Soxhlet's apparatus and the extract was evaporated to dryness under vacuum and dried in vacuum desiccators. Later stored in refrigerator.

Animals:

An ethical approval of this experimental study was obtained from the Institutional Animal Ethical Committee with an Approval no: CPCSEA/IAEC/JLS/11/11/19/14. Albino rats with average body weight from 150 to 250 g were utilized in this study. They were procured from Sanzyme Bio-analytical lab, Plot no. 8 Sys.No.542, Kothur (V), Shameerpet, and R.R. Dist. The rats were sheathed in polypropylene cages and maintained under standard conditions (12 h light and dark cycles at 25 ± 3°C and35-60 % humidity). Standard pellet feed and tap water were allowed *ad-libitum*.

Experimental methodology:

The rats will be randomly assigned into 5 different groups (n=6).

Group I : Normal diet ad libitum

Group II : Atherogenic diet

Group III : Atherogenic diet + Simvastatin (4mg/kg)

Group IV : Atherogenic diet + Ethanolic Extract of *Caralluma adscendens* (100mg/kg), p.o.

Group V : Atherogenic diet + Ethanolic Extract of *Caralluma adscendens* (200mg/kg), p.o.

After the treatment duration, on 30th day the animals will be sacrificed and the following parameters will be evaluated.

Induction of hyperlipidemia: In order to induce hyperlipidemia, atherogenic diet was prepared by the method reported by Bopanna et al. [31] (Table 1). The animals were divided into 5 groups of 6 rats each and they received the following with or without treatment for 30 days orally with powdered standard animal food. The diet which was prepared as pellets was placed in the cage carefully and was administered for 30days.

Fecal cholesterol excretion: Fecal matter was collected during the last three days of treatment period. The dried and powered

fecal matter was extracted with $CHCl_3$: MeOH (2:1). The resultant extract was then analyzed for cholesterol contents in a manner similar to that the serum. The cholesterol excreted in the fecal matter (mg/g) was calculated.

Biochemical assays for Serum lipid profile:

At the end of the experiment the rats were anaesthetized by Carbon dioxide inhalation method, blood was collected via carotid bleeding allowed to clot at room temperature for 10 min. Centrifuged at 1000 rpm for 10 min the serum was kept at 4°C until used. Serum total cholesterol (TC), triglycerides (TG) was estimated by method of CHOD-PAP and high-density lipoprotein-cholesterol (HDL-c) by the method of GPO-PAP using span diagnostic kits. Serum LDL-c, VLDL-c level and Atherogenic index (AI), which is a measure of the atherogenic potential of an agent, was calculated using the formula and the results were tabulated.

Serum LDL-c was calculated by using the following formula : LDL-cholesterol = total cholesterol − [HDL-C + (triglycerides /5)].

VLDL-cholesterol was either measured directly (after ultracentrifugation) or calculated as total triglyceride concentration/5.

Atherogenic index was calculated by using the following formula: atherogenic index = (total cholesterol − HDL-C)/ HDL-C.

Statistical analysis

Results were presented as mean±SD. The significance of difference among the groups was assessed using one way analysis of variance (ANOVA) followed by Dunnet's test. $P<0.05$ was considered significant.

Table 1. Composition of Control and Atherogenic diet.

Ingredients	Control	Atherogenic
Protein (Milk powder)	20g	15g
Sucrose	3g	----------
Carbohydrate (Wheat flour)	65 g	57.6 g
Fat (Butter)	5g	15g
Salts	4g	4g
Vitamin mix	1g	1 g
Fiber	2g	2g
Coconut oil	-	5 ml
Cholesterol	-	0.4 g
Total weight	**100g**	**100g**

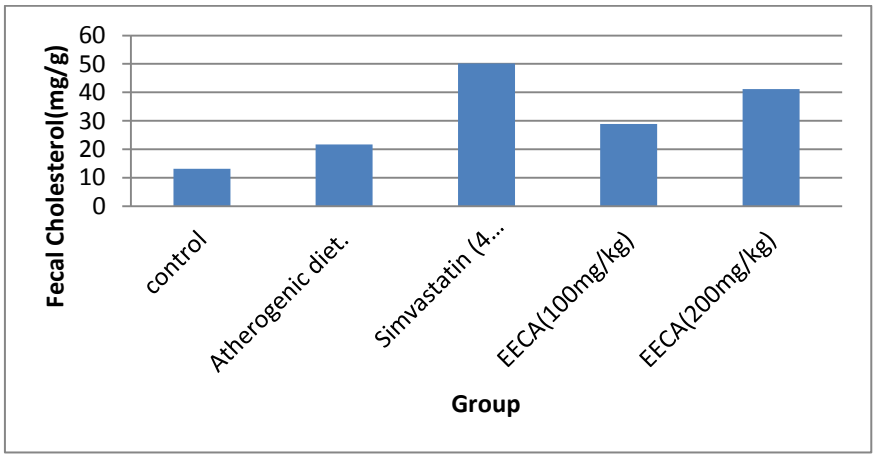

Figure 1: Effect of treatment of Ethanolic extract of Caralluma adscendens whole plant on fecal cholesterol examination of normal and atherogenic diet induced by hyperlipidemic rats

Table 2: Effect of treatment of Ethanolic extract of Caralluma adscendens whole plant on fecal cholesterol examination of normal and atherogenic diet induced by hyperlipidemic rats

Groups	Cholesterol(mg/9)
Control	13.1± 0.16
Atherogenic diet.	21.7±1.01
Simvastatin (4 mg/kg)	50.20±1.74***
EECA(100mg/kg)	28.9±0.56*
EECA(200mg/kg)	41.2±0.31**

Values are expressed as mean ±SEM, n=6. Using t-test, the intergroup variation between various groups was conducted by using one way analysis of variances (ANOVA). Values are expressed as mean ± SEM. $*p < 0.05$, $**p < 0.01$, and $***p < 0.001$.

Table 3: Effect of treatment of Ethanolic extract of Caralluma adscendens whole plant on plasma lipid profile of normal and atherogenic diet induced by hyperlipidemic rats

Groups	Cholesterol (mg / dL)	Triglycerides (mg / dL)	VLDL (mg/dl)	LDL (mg/dl)	HDL (mg/dl)	Atherogenic index
Control	94.4 ± 0.16	90.2±0.78	18.04±1.35	23.16±1.09	53.2±1.50	0.77
Atherogenic diet.	216.8±1.01	172.2±0.31	34.44±1.06	141.76±0.45	40.60±1.29	4.33
Simvastatin (4 mg/kg)	114.20±1.74***	106.60±0.54***	21.32±0.71***	22.68±0.84***	70.20±0.45***	0.62
EECA(100mg/kg)	164.9±0.88*	151.4±0.55*	30.28±0.91*	71.12±1.06*	63.5±0.82*	1.59
EECA(200mg/kg)	131.2±0.64**	127.4±0.51**	25.48±0.91**	36.92±0.46**	68.8±0.52**	0.9

Values are expressed as mean ±SEM, n=6. Using t-test, the intergroup variation between various groups was conducted by using one way analysis of variances (ANOVA). Values are expressed as mean ± SEM. $*p < 0.05$, $**p < 0.01$, and $***p < 0.001$.

RESULTS AND DISCUSSION:

Treatment with ethanolic extract of Caralluma adscendens whole plant produced a remarkable depletion in the serum level of lipids in atherogenic diet induced hyperlipidemia in experimental rats. Atherogenic diet induced hyperlipidemic model has been successfully employed for the evaluation of Hypocholesterolemic effect. In the present study an increase in plasma HDL-cholesterol with a concomitant decrease from other lipid was observed (Table 2). Ethanolic extract at doses of 100 mg/kg (p<0.05), 200 mg/kg (p<0.01) and standard drug simvastatin 4mg/kg (p<0.001) shows significant increase in cholesterol excretion when compared with Atherogenic diet control group (Table 1, figure 1). It can be concluded from the present assessment that the levels of total serum cholesterol, triglyceride which are actually raised in atherogenic diet, can be lowered Significantly with the treatment of ethanolic extract of Caralluma adscendens whole plant. Caralluma adscendens whole plant can be utilized for providing dietary management in the prevention of atherosclerosis in hyperlipidemic patients.

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