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ORIGINAL RESEARCH ARTICLE

Effect of Aqueous Extract of *Cyperus rotundus* on Hyperlipidaemia in Rat Model

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ABSTRACT

Hyperlipidaemia is one of the metabolic disorders which can lead to fatal disease that is atherosclerosis. Long term use of allopathic drugs for hyperlipidaemia can lead to serious side effects. Hence Indian traditional drugs are investigated for treatment of hyperlipidaemia as they are safer. In present study one such plant *Cyperus rotundus* belonging to family Cyperaceae known as Musta or Nagarmotha, was claimed to be effective in medoroga, is investigated for attenuation on serum lipid profile. The hyperlipidaemia was induced to rats by giving high fat diet and the aqueous extract of rhizomes of the drug is given as drug intervention. The results demonstrate promising activity of the drug against hyperlipidaemia.

Key words: Hyperlipidaemia, *Cyperus rotundus*, High fat diet, Serum lipid profile.

INTRODUCTION

Cardiovascular diseases are leading cause of morbidity and mortality in the western world. Its incidence has been increasing lately in developing countries [1]. C.V.D. encompasses a number of different diseases including coronary heart disease like heart attack, heart failure, stroke and peripheral vascular disease. However, the underlying pathology for all of these disorders is atherosclerosis [2]. The increased lipid risk factors are a direct risk factor for atherosclerosis and thereby cardiovascular diseases [3].

A number of allopathic drugs are available for treatment of hyperlipidaemia and atherosclerosis but all these are associated with serious side effects [4]. Hence there is change in focus to the traditional system of medicine. The Indian traditional system of medicine is based on experiences in the use of plant products in amelioration of common diseases [5].

A correlation between biological activity and use in traditional medicine has been demonstrated in several cases of diseases. Hence attempts should made to elevate every traditional remedy to the status of an established medicine, in terms of modern science [6].

In present study we carried out systematic investigation of the aqueous extract of rhizomes of *Cyperus rotundus* family Cyperaceae on hyperlipidaemia. The plant is claimed to be effective in medoroga and is known to affect the lipoprotein metabolism [7]. As systematic investigation yet has not been conducted this plant was selected for evaluation of hypolipidaemic activity.

MATERIALS AND METHODS

Collection and Extraction of Plant Materials:

The dried rhizomes of *Cyperus rotundus* were procured from local market and authenticated from Agarkar Institute Pune (Voucher no. R082). The rhizomes were coarsely powdered and subjected to extraction with water for eighteen hours in soxhlet extractor. The extract is further concentrated using rotavac evaporator and subsequent drying on water bath.

Preliminary Phytochemical Investigation:

Preliminary phytochemical investigation of aqueous extract of *Cyperus rotundus* rhizomes revealed the presence of saponins, carbohydrates, essential oils and phenols.

Animals:

Inbred adult male rats of wistar strain weighing 250-300 grams were selected for the study. The animals were housed in polypropylene cages (6 rats per cage) under good hygienic conditions natural light / dark cycle.

Acute toxicity study:

For the purpose of the test, in bred wistar strain rats (250-300 g) of both sexes were selected. The

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animals were housed in polypropylene cages (6 rats per cage) under good hygienic conditions natural light / dark cycle. The animals were given free access to standard pellet diet and water.

The acute toxicity study was carried out as per OECD guideline [8].

Thus the oral acute toxicity tests revealed that the extract of *Cyperus rotundus* rhizomes was safe up to the administered dose 2000 mg/kg.

Hypolipidaemic Activity:

Wistar rats weighing 250-300 g were selected for the study. Animals were divided into 7 groups, each group comprising of 6 rats. Rats in the group 1 received normal pellet diet and received 0.1% sodium CMC solution and served as vehicle control. The rats belonging to remaining 6 groups received high fat diet for the entire duration of the study that is for 25 days. High fat diet induced hyperlipidaemia is one of the common methods to induce hyperlipidaemia[9]. Hence hyperlipidaemia was induced by oral feeding of high fat diet. The high fat diet was comprised of the chow enriched with high calorie and 1% cholesterol [8]. The animals were given free access to water.

After 10 days induction of hyperlipidaemia group 2 of animals was left untreated and served as high fat diet control. The rest of the groups received following treatment for 15 days.

Group 3 and group 4 treated orally with the standard drugs Simvastatin (5 mg/kg/day) and Fenofibrate (20 mg/kg/day) respectively.

Groups 5, 6, 7 treated orally with aqueous extract at dose level of 100 mg/kg/day, 200 mg/kg/day, 400 mg/kg/day respectively. All the drugs were suspended in 0.1% Na CMC (vehicle).

Blood samples were withdrawn from retro orbital plexus after overnight fasting. Serum was separated from blood by centrifugation for ten minutes at three thousand rpm, subsequently analyzed for total cholesterol, triglycerides and HDL cholesterol using commercially available kits (Erba Diagnostics Germany). The serum LDL was calculated by Friedwald's formula [10].

Statistical Analysis:

The data was analyzed for statistical significance by one way Analysis of Variance (ANOVA) followed by Dunnett's t-test for comparison with the control groups. Bonferroni's t-test was performed for pair wise comparison among the extract and reference standards. The difference was considered to be significant at 5% level ($P<0.05$).

RESULTS AND DISCUSSION

Effect of high fat diet on serum lipid profile in rats:

In the present study hyperlipidaemia was induced by high fat diet as it is always useful for the assessment of agents that interfere with the absorption, degradation and excretion of cholesterol.

Feeding with high fat diet caused significant ($P<0.05$) increase in serum TC, triglyceride and LDL levels with respect to the baseline value which shown in (**Table 1**). Though on high fat diet feeding an increase in HDL levels were seen but they were not found to be statistically significant.

Table 1: Effect of high fat diet on serum lipid profile at the end of 10 days induction period in rats

Blood Parameters	Basal value (N=42)	Induction Value (N=36)
Serum TC (mg/dl)	52.30±0.86	211.57±2.10*
Serum TG (mg/dl)	81.71±0.53	262.12±3.23*
Serum HDL (mg/dl)	26.93±1.37	59.88±0.87
Serum LDL (mg/dl)	6.23±0.77	99.26±2.09*

**P<0.05 considered significant increase when compared with basal values. (Values are mean ± SEM); TC: Total cholesterol, TG: Triglyceride, HDL: High density Lipoprotein, LDL: Low density lipoprotein.*

Effect of aqueous extract of *Cyperus rotundus* rhizomes on serum lipid profile in rats:

In present study treatment with the standards and different doses of extract exerted statistically significant ($P<0.05$) reduction in serum total cholesterol, LDL, TG levels at the end of 15 days of intervention and (**Table 2**) describes those values. There was no significant alteration in HDL levels in rats. This may be due to the fact that lipid metabolism of rats is different than human [11].

Table 2: Effect of aqueous extract of *Cyperus rotundus* rhizomes on serum lipid profile

S. No	Treatment groups	Serum TC(mg /dl)	Serum TG(mg /dl)	Serum LDL(mg /dl)	Serum HDL(mg /dl)
1	Vehicle control	59.79 ± 3.02	70.17± 1.24	10.68± 1.97	35.07 ± 1.43
2	High fat diet control	296.43 ± 4.27**	401.65 ± 14.16**	150.54 ±11.04**	65.57 ± 6.26
3	Simvastatin (5 mg/kg)	260.85 ± 8.08*	331.16 ± 11.47*	132.00 ± 7.09*	62.62 ± 4.62
4	Fenofibrate (20 mg/kg)	230.23 ± 2.55*	336.43 ± 11.40*	99.61 ± 2.70*	63.33 ± 3.43
5	Aqueous extract (100 mg/kg)	280.28 ± 4.87*	340.46 ± 15.55*	148.62 ± 3.48*	63.58 ± 2.58
6	Aqueous extract (200 mg/kg)	268.55 ± 13.92*	331.38 ± 4.57*	138.61 ± 11.13*	63.67 ± 3.61
7	Aqueous extract (400 mg/kg)	258.13 ± 6.23*	299.42 ± 9.58*	131.80 ± 8.40*	66.45 ± 2.67

**P<0.05 considered significant decrease when compared with high fat diet control*

*** P<0.05 considered significant increase when compared with vehicle control. (Values are mean ± SEM) (N=6) TC: Total cholesterol, TG: Triglyceride, HDL: High density Lipoprotein, LDL: Low density lipoprotein*

CONCLUSION

The results found, clearly demonstrated that the bioactive compounds present in *Cyperus rotundus* have promising ability to attenuate the serum lipid profile in high fat diet fed hyperlipidaemic rat model.

Thus the present study assess the hyperlipidaemic action of aqueous extract of *Cyperus rotundus* rhizomes and also validates the claim made in the traditional system of medicine and paves way for potential evaluation of the mediators involved in hyperlipidaemia and discovering new therapeutic targets for the evaluation of lipid lowering medicinal plant.

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