

Lipid lowering effects of methanol extract of *Cocculus hirsutus* (L) Diels on STZ-induced diabetic rats

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ABSTRACT

Cocculus hirsutus (Family: Menispermaceae) is considered extensively in the indigenous system of medicine in the treatment of anti-diabetic agent. The present investigation focused attention on the lipid lowering properties of the methanol extract of *C. hirsutus* on experimentally streptozotocin induced diabetic rats. The lipid parameters studied are plasma total cholesterol (TC), low density lipoprotein cholesterol (LDL-C), high density lipoprotein cholesterol (HDL-C), very low density cholesterol (VLDL-C), triglycerides (TG) and phospholipids (PL). Extract was orally administered daily for 15 days at doses of 400 and 800 mg/kg in streptozotocin induced diabetic rats. The levels of TC, LDL-C, HDL-C, VLDL-C, triglycerides and phospholipids were reduced significantly ($p < 0.01$), while HDL-C level was significantly increased when compared to diabetic control. In conclusion, these results showed that *C. hirsutus* extract when administered orally can reduce management of diabetic hyperlipidemia through reducing lipid levels.

Key words: *Cocculus hirsutus*, hyperlipidemia, streptozotocin.

INTRODUCTION

Diabetes mellitus is a group of disorders with different etiologies. It is characterized by derangements in carbohydrate, protein and fat metabolism, caused by the complete or relative insufficiency of insulin secretion and insulin action¹. The disease become a real problem of public health in developing countries, where it prevalence is increasing steadily².

Cocculus hirsutus linn (Menispermaceae) is commonly known as Jal-jammi³. It is a climber found in tropical and sub-tropical regions of India. A decoction of the leaves is taken in eczema, dysentery and urinary problem. Leaves and stem are used for treating eye diseases. Roots and leaves are given for Sarsaparilla, as diuretic and in gout. Ethanolic extract of whole plant showed the

presence of Cohirsinine⁴, Jamtinine⁵, and cohirsutine⁶. Aerial parts of the plant reported to be used as a diuretic; laxative⁷, Pharmacognostical studies⁸, anti-diabetic⁹ and anti-inflammatory¹⁰. Root extract showed analgesic and anti-inflammatory effect¹¹. Since not much study had been done to evaluate the biological activity of the plant, the present study is focused to evaluate the lipid lowering activity of aerial parts of *C. hirsutus*.

MATERIAL AND METHODS

Plant material

The plant parts were collected from the foot hills of Yercaud, Salem, in the month of September 2005. The plant was identified and authenticated by the experts in the department of Botany Govt. Arts College, Salem Tamil Nadu India. A voucher specimen (CHL-03) has been kept in our

museum. The plant material was collected and shade dried at room temperature for 10 d and coarsely powdered with the help of a hand-grinding mill and the powder was passed through sieve No.60.

Preparation of the extract

The powdered aerial part of *C. hirsutus* was extracted with methanol¹². After extraction, the extract was concentrated under reduced pressure. The dried extract was subjected to various chemical tests to detect the presence of different phytoconstituents like iso quinoline alkaloids, triterpens and traces of flavonoids etc.

Animals

Male albino rats of approximately 8-12 weeks, weighing about 150-175 g were used for the study. They were housed in polypropylene cages and fed with standard chow diet and water *ad libitum*. The animals were exposed to alternate cycle of 12 h of darkness and light each. Before each test, the animals were fasted for at least 12h. The experimental protocols were subjected to the securitization of the Institutional Animal Ethics Committee and were cleared by the same (IAC No: P.Cog-1/06).

Streptozotocin-induced diabetic rats

Streptozotocin (STZ), purchased from Sigma Aldrich chemical Co., and it was dissolved in 0.9% ice-cold saline immediately before use. Diabetes was induced in rats by intra peritoneal (i.p) injection of Streptozotocin at a dose of 50 mg/kg¹³.

Treatment

Animals were divided into 4 groups of 6 each. Group I Normal rats received food and water, Group II diabetic control rats received Tween 80, Group III and IV diabetic rats received methanol extract of *C. hirsutus* (400 and 800 mg/kg) per orally daily. The study was carried out for 15 days.

Biochemical analysis

Total cholesterol (TC)¹⁴, High density lipoprotein cholesterol (HDL-C) and Triglycerides (TG)¹⁵ estimation were carried out using respective diagnostic commercial kits Accurex Biomedical Pvt. Ltd., Bombay, India. Phospholipids level was estimated in plasma¹⁶. Very low density lipoprotein cholesterol (VLDL-C) and low density lipoprotein cholesterol (LDL-C) in plasma were also calculated as per Friedewald's equation¹⁷.

Statistical evaluation

All the data are presented as mean \pm SEM. The differences between group were evaluated by one-way analysis of variance (ANOVA) followed by the Dunnette multiple comparisons test. $P < 0.01$ was consider to be significant.

RESULTS AND DISCUSSION

The extract of aerial parts of *C. hirsutus* on lipid levels in streptozotocin induced diabetic rats is shown in Table 1 and 2. In STZ induced diabetic rats serum cholesterol (TC), triglycerides (TG), Phospholipids (PL), low density lipoprotein cholesterol (LDL-C) and very low density lipoprotein

Table 1: Effect of methanol extract of *C. hirsutus* on the lipid profile of STZ induced diabetic male rats

Treatment mg/kg	TC	TG	PL
Normal Control	84.00 \pm 6.79	95.00 \pm 6.19	149.85 \pm 7.66
Diabetic Control	194.50 \pm 9.22'	188.17 \pm 5.67'	245.51 \pm 7.49'
Methanol extract of <i>C. hirsutus</i> 400	157.83 \pm 9.47**	139.17 \pm 4.82**	187.83 \pm 8.12''
Methanol extract of <i>C. hirsutus</i> 800	151.33 \pm 9.47''	131.50 \pm 4.16''	181.33 \pm 8.23''

The values expressed in mg/dl. Values are expressed as mean \pm SEM for six animals in each group. *Values are significantly different from normal group rats. Values are significantly different from control group rats. * $p < 0.001$, ** $p < 0.01$

cholesterol (VLDL-C) were significantly reduced when compared to diabetic control rats, while the HDL levels were significantly increased in the diabetic rats compared to diabetic control rats. Following the treatment with STZ to rats a remarkable rise in the level of plasma TC, LDL-C were observed.

A number of pharmacological and chemical agents act as diabetogenic and produce variety of diabetic complications. Streptozotocin induction of

diabetes is an experimental model widely used to study glycemic and lipidemic changes in plasma. Previous study demonstrated that methanol extract of *C. hirsutus* had hypoglycemic effects in diabetic rats⁹. The present study evaluated the effect of methanol extract of aerial parts of *C. hirsutus* on lipid parameters. Previous reports suggest that, elevated TC and LDL-C levels in the plasma of diabetic rats consider being a prime cause of coronary heart disease (CHD)¹⁸. This observation also indicates the lipid lowering potential of *C. hirsutus*.

Table 2: Effect of methanol extract of *C. hirsutus* on the lipid profile of STZ induced diabetic male rats

Treatment mg/kg	LDL- C	HDL-C	VLDL- C
Normal control	35.01 ± 3.10	24.10 ± 2.09	15.67 ± 2.07
Diabetic control	90.01 ± 5.12 [*]	13.00 ± 1.50 [*]	32.66 ± 2.07 [*]
Methanol extract of <i>C. hirsutus</i> 400	55.16 ± 5.57 ^{**}	20.33 ± 1.03 ^{**}	25.00 ± 2.10 ^{**}
Methanol extract of <i>C. hirsutus</i> 800	50.66 ± 5.32 ^{**}	22.16 ± 1.04 ^{**}	22.16 ± 2.03 ^{**}

The values expressed in mg/dl. Values are expressed as mean ± SEM for six animals in each group. *Values are significantly different from normal group rats. Values are significantly different from control group rats. *p<0.001, **p<0.01

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