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Lipid lowering activity of *Eclipta prostrata* in experimental hyperlipidemia

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Abstract

The plant *Eclipta prostrata* is used in the traditional medical practices of India to treat hepatic diseases and hyperlipidemia. The total alcoholic extract of the plant when tested for antihyperlipidemic potential, exhibited a dose-dependent activity in albino rats when compared to standard drugs. The activity was assessed by studying the lipid profiles of serum, liver and heart of the control and drug-treated animals. The results lend support to the traditional use of *Eclipta prostrata* in the treatment of hyperlipidemia.

Keywords: *Eclipta prostrata*; Lipid lowering activity; Experimental hyperlipidemia

1. Introduction

Eclipta prostrata Linn. [syn: *Eclipta alba* (L) Hassk. Family: Astraceae] is a common plant growing in moist soils throughout India upto a height of 6000 ft. It is used in the traditional medical systems of India as a tonic and deobstruant and to treat hepatic disorders, spleen enlargement and skin diseases (Anon., 1952). In Ayurvedic system of medicine, the plant is considered to be the best in treating cirrhosis of the liver and infective hepatitis (Dixit and Achar, 1981). In some places of Tamil Nadu State, India, traditional medical practitioners use this plant in the treatment of obesity and hypercholesterolemia (Dr. K.S. Kalaimani, pers. comm.).

Earlier studies on this plant showed its effectiveness in preventing CCl_4-induced liver damage in guinea-pigs (Ma-Ma et al., 1978) and in the clinical studies, the powdered drug was found to be useful in the treatment of jaundice in children (Dixit and Achar, 1981). Phytochemical investigations revealed the presence of coumastanes, polypeptides, polyacetylenes, thiophene-derivatives, steroids, triterpenes, flavonoids and nicotine (Pal and Narasimhan, 1943; Krishnaswamy et al., 1966; Bhargava and Seshadri, 1974; Sarg et al., 1981; Wagner et al., 1986).

The present study was undertaken to scientifically elucidate the antihyperlipidemic activity of *Eclipta prostrata* in albino rats.

2. Materials and methods

2.1. Plant material

The whole plant of *Eclipta prostrata* was procured in and around the city of Chennai in the months of October–November and authenticated by Mr. M. Rajendran, Botanist, TN Medicinal Plant Farms and Herbal Medicine Corporation (TAMPCOL), Chennai. A voucher specimen has been retained in the Central Research Institute for Siddha.

2.2. Preparation of alcoholic extract

Shade dried and coarsely powered plant (2.5 kg) was extracted exhaustively with 90% ethanol by cold percolation method (3 × 72 h). The solvent was distilled off over boiling water-bath and the extract so obtained (EPE) was dried in a vacuum desiccator till free from moisture (yield: 5.3%). Phytochemical screening of the extract revealed the presence of steroids, terpenoids, phenolic compounds and alkaloids (Harborne, 1973).

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2.3. Animals

Wistar male albino rats (150–200 g) maintained in the Experimental Animals Laboratory of the Department of Biochemistry, University of Madras were used for the experiments. They were housed at a room temperature of 25 ± 2 °C, relative humidity of 75 ± 5% and 12 h dark–light cycle and provided basal diet in the form of pellets supplied by M/s. Hindustan Lever Ltd., Bangalore and water ad libitum. Necessary permission from the Departmental Ethical Committee was obtained for the study and the experiments were conducted in accordance with the principles prescribed for laboratory animal use.

2.4. Preliminary screening

Five groups of rats each containing six animals, were fed with EPE in hydrogenated groundnut oil in different doses (50, 100, 200, 400 and 800 mg/kg, p.o.) and continuously observed for 2 h to detect autonomic and behavioral responses, if any. They were further observed for the following 7 days for any mortality. Based on the above study, four doses (50, 100, 150 and 200 mg/kg) were chosen for the experiment.

2.5. Antihyperlipidemic activity

Rats were divided into eight groups each consisting of six animals. The first group received only the vehicle, viz. hydrogenated groundnut oil (HGNO) while the second group was administered vehicle + cholesterol (500 mg/kg, p.o.). Groups III and IV were given standard drugs, clofibrate (10 mg/kg) and guggul (50 mg/kg, p.o.), respectively in addition to HGNO + cholesterol. EPE was given orally using gavage to groups V–VIII in the graded doses of 50, 100, 150 and 200 mg/kg along with HGNO and cholesterol. The experiment was continued for 30 days and the body weight changes were recorded every 5 days from day 0.

On the 31st day, the animals were sacrificed and the blood was withdrawn by retro-orbital method. Serum was separated by centrifugation and refrigerated. The vital organs liver and heart were removed quickly, washed with normal saline to remove the extraneous matter and weighed prior to storing in deep freezer for further analysis.

2.6. Biochemical studies

The lipid profiles such as total lipids, total cholesterol, triglycerides, phospholipids and free acids of serum, liver and heart were studied by standard methods (Fiske and Subba Row, 1925; Folsch et al., 1957; Parekh and Jung, 1970; Foster and Dunn, 1973; Horn and Menahan, 1981).

2.7. Statistical analysis

The results of the study were subjected to analysis of variance followed by Dunnett's *t*-test for multiple comparisons. Values with $P < 0.05$ were considered to be significant.

Table 1
Effect of alcoholic extract of *Eclipta prostrata* on lipid profile of serum, liver and the heart in rats

Treatment (mg/kg)	Serum					Liver					Heart				
	TL	TC	TG	PL	FFA	TL	TC	TG	PL	FFA	TL	TC	TG	PL	FFA
Vehicle	249.0 ± 8.5	80.4 ± 4.2	70.6 ± 3.2	88.0 ± 4.5	10.13 ± 0.9	41.00 ± 1.9	8.9 ± 0.9	4.9 ± 0.6	28.9 ± 1.2	0.82 ± 0.1	22.60 ± 1.08	3.47 ± 0.05	3.37 ± 0.14	17.00 ± 1.03	0.62 ± 0.06
Cholesterol	479.2 ± 12.3***	195.2 ± 7.1***	120.4 ± 4.5***	148.3 ± 8.9***	21.3 ± 1.0***	80.0 ± 2.3***	38.5 ± 2.9***	11.1 ± 0.9***	52.2 ± 2.1***	2.40 ± 0.2***	36.62 ± 1.18***	7.38 ± 0.03***	6.0 ± 0.09***	24.41 ± 0.30***	2.74 ± 0.12***
Clofibrate (10) + cholesterol	252.6 ± 7.1$^{\#\#\#}$	82.5 ± 3.6$^{\#\#\#}$	72.2 ± 2.5$^{\#\#\#}$	89.0 ± 5.1$^{\#\#\#}$	9.9 ± 0.5$^{\#\#\#}$	41.2 ± 2.1$^{\#\#\#}$	8.6 ± 0.9$^{\#\#\#}$	4.8 ± 0.5$^{\#\#\#}$	27.0 ± 1.1$^{\#\#\#}$	0.81 ± 0.1$^{\#\#\#}$	22.01 ± 1.28$^{\#\#\#}$	3.08 ± 0.05$^{\#\#\#}$	3.31 ± 0.06$^{\#\#\#}$	16.50 ± 0.27$^{\#\#\#}$	0.60 ± 0.05$^{\#\#\#}$
Guggul (50) + cholesterol	272.0 ± 6.0$^{\#\#\#}$	88.2 ± 4.8$^{\#\#\#}$	76.0 ± 5.1$^{\#\#\#}$	90.9 ± 5.2$^{\#\#\#}$	11.0 ± 1.2$^{\#\#\#}$	44.0 ± 1.6$^{\#\#\#}$	10.0 ± 0.7$^{\#\#\#}$	5.2 ± 0.4$^{\#\#\#}$	26.0 ± 0.9$^{\#\#\#}$	0.95 ± 0.07$^{\#\#\#}$	31.25 ± 1.44$^{\#}$	3.20 ± 0.07$^{\#\#\#}$	4.10 ± 0.08$^{\#\#\#}$	20.00 ± 0.43$^{\#\#\#}$	0.90 ± 0.04$^{\#\#\#}$
EPE (50) + cholesterol	429.0 ± 11.0$^{\#}$	170.0 ± 8.9$^{\#}$	111.5 ± 6.2	129.8 ± 7.2	16.5 ± 1.0$^{\#}$	66.0 ± 2.8$^{\#\#}$	26.8 ± 1.9$^{\#}$	6.6 ± 1.0$^{\#}$	30.2 ± 2.1$^{\#\#\#}$	1.91 ± 0.3	33.29 ± 1.31	6.80 ± 0.02$^{\#\#\#}$	5.20 ± 0.11$^{\#\#}$	23.30 ± 0.20$^{\#}$	1.80 ± 0.60
EPE (100) + cholesterol	361.0 ± 6.0$^{\#\#}$	135.0 ± 4.9$^{\#\#\#}$	95.0 ± 3.2$^{\#\#}$	114.0 ± 3.9$^{\#\#}$	14.2 ± 0.8$^{\#\#}$	47.0 ± 2.7$^{\#\#\#}$	12.5 ± 0.7$^{\#\#\#}$	5.6 ± 0.5$^{\#\#}$	27.5 ± 2.0$^{\#\#\#}$	1.10 ± 0.07$^{\#\#\#}$	29.53 ± 1.14$^{\#\#}$	5.98 ± 0.12$^{\#\#\#}$	4.32 ± 0.13$^{\#\#\#}$	21.72 ± 0.11$^{\#\#\#}$	1.06 ± 0.06$^{\#\#\#}$
EPE (150) + cholesterol	257.6 ± 6.1$^{\#\#\#}$	85.2 ± 3.1$^{\#\#\#}$	75.0 ± 4.0$^{\#\#\#}$	86.0 ± 2.8$^{\#\#\#}$	9.2 ± 0.7$^{\#\#\#}$	40.0 ± 2.1$^{\#\#\#}$	8.9 ± 0.6$^{\#\#\#}$	4.7 ± 0.3$^{\#\#\#}$	25.0 ± 1.1$^{\#\#\#}$	0.83 ± 0.1$^{\#\#\#}$	27.21 ± 1.09$^{\#\#\#}$	3.82 ± 0.09$^{\#\#\#}$	3.95 ± 0.05$^{\#\#\#}$	20.74 ± 0.07$^{\#\#\#}$	0.82 ± 0.05$^{\#\#\#}$
EPE (200) + cholesterol	254.0 ± 6.0$^{\#\#\#}$	86.0 ± 3.0$^{\#\#\#}$	73.3 ± 2.7$^{\#\#\#}$	85.0 ± 4.0$^{\#\#\#}$	8.2 ± 0.7$^{\#\#\#}$	38.0 ± 1.7$^{\#\#\#}$	8.1 ± 0.7$^{\#\#\#}$	4.6 ± 0.5$^{\#\#\#}$	24.0 ± 1.5$^{\#\#\#}$	0.79 ± 0.09$^{\#\#\#}$	27.15 ± 1.12$^{\#\#\#}$	3.05 ± 0.04$^{\#\#\#}$	3.82 ± 0.05$^{\#\#\#}$	20.63 ± 0.14$^{\#\#\#}$	0.77 ± 0.33$^{\#\#\#}$

TL: total lipids; TC: total cholesterol; TG: triglycerides; PL: phospholipids; FFA: free fatty acids (all mg/dl). Each value represents the mean ± S.E.M. of six observations.
*** $P < 0.001$ compared to vehicle treatment.
$^{\#}$ $P < 0.05$ compared to cholesterol treatment.
$^{\#\#}$ $P < 0.01$ compared to cholesterol treatment.
$^{\#\#\#}$ $P < 0.001$ compared to cholesterol treatment.