Hypolipidemic activity of *Eclipta prostrata* (L.) L. leaf extract in atherogenic diet induced hyperlipidemic rats

R. Dhandapani
Medicinal Plants Research Unit, P.G. & Research Department of Microbiology, Thanthai Hans Roever College, Perambalur 621 212, India

Received 17 November 2006; revised 28 February 2007

In atherogenic diet induced hyperlipidemic model, the rats receiving treatment with the aqueous extract of the leaves of *E. prostrata* showed significant reduction in total cholesterol, triglyceride, total protein and elevation in high density lipoprotein cholesterol. The aqueous extract of *E. prostrata* was found to possess significant hypolipidemic activity. The results also suggest that *E. prostrata* leaf extract at 100 and 200 mg/kg b.wt. concentrations is an excellent lipid-lowering agent.

**Keywords:** Cholesterol, *Eclipta prostrata*, Hyperlipidemia, Triglyceride

*Eclipta prostrata* (Asteraceae) is a perennial herb, distributed in the tropical and sub-tropical regions of the world. It is common weed in moist situations throughout India. It is very common in clayey moist ground, like bunds of paddy fields, water courses and drainages. The leaves contain beta-amyrin (0.06%), wedelolactone (0.02%), triterpenoids, flavonoids, luteolin-7-o-glucoside (0.04%), 1-terthienyl methanol and stigmasterol. The herb is used as tonic and deobstructive in hepatic and spleenic enlargements and in skin diseases and the plant juice is administered in catarrhal jaundice in Ayurvedic system of medicine. The expressed leaf juice along with honey is a popular remedy for catarrh in infants. Its hypolipidemic activity has not yet been explored. The present study has been undertaken to establish the hypolipidemic effect of an aqueous extract of *E. prostrata* on normal and atherogenic diet induced hyperlipidemia in rats.

**Materials and Methods**

*Plant material*—Fresh leaves of *E. prostrata* were collected from Villamuthur village, Perambalur district, Tamilnadu, India (Latitude 11°23′N; Longitude 78°8′E). The plant was verified with the help of specimens available at the Rapinat Herbarium, St. Joseph’s College, Tiruchirappalli, Tamilnadu, India.

*Preparation of leaf powder*—Leaves were first shade-dried for four days, then sun-dried for a day and stored in block polythene bags. The leaves were powdered in pulverize as and when required, sieved, labeled and stored in PET bottles.

*Preparation of the aqueous extract*—Leaf powder was boiled in distilled water. After filtration through Whatmann No.40 filter paper the extract was evaporated to dryness by slow heating and continuous stirring in a water bath. The residue left behind was collected and was used as the drug.

*Phytochemical investigation of the extract*—In order to detect the various constituents present in the aqueous extract of *E. prostrata* it was subjected to the tests as per Kokate.

*Animals*—Wistar albino adult male rats (150-200g) randomly bred in the animal house of Periyar Pharmacy College for Girls, Trichirappalli, Tamilnadu, India were used. The animals were kept on standard environmental conditions and fed on pellet diet and water was provided *ad libitum*. The composition of atherogenic diet used during the study was as given in Table 1.

*Induction of hyperlipidemia*—In order to induce hyperlipidemia, the method reported by Bopanna et al. was followed. The animals were divided into four groups of 6 rats each and they received the following diets with or without treatment for 45 days orally:

**Group I:** Normal diet
Group II: Atherogenic diet containing 1% cholesterol.

Group III: Atherogenic diet + aqueous extract of *E. prostrata* (100 mg/kg/day).

Group IV: Atherogenic diet + aqueous extract of *E. prostrata* (200 mg/kg/day).

At the end of the treatment the rats were fasted overnight, blood was drawn from retro orbital plexus. Serum was separated and stored in refrigerator until assay.

Measurement of serum lipid profile—Total cholesterol (TC), total triglyceride (TG), total protein (TP) and total high density lipoprotein (HDL) were estimated by using standard kits of Randox, Mumbai. The atherogenic index was calculated by using the following formula.

\[
\text{Atherogenic index} = \frac{\text{Total serum cholesterol}}{\text{Total serum HDL} - \text{Cholesterol}}
\]

Statistical analysis—Statistical analysis was carried out by Student’s *t*-test.9

Results

Phytochemical screening revealed the presence of alkaloids, phytosterols, flavonoids, saponins, tannins, sugars and gums and mucilages in the aqueous extract of *E. prostrata*. The results reveal that feeding of atherogenic diet increased serum total cholesterol, triglyceride and total protein and decreased serum HDL-cholesterol level when compared to normal group over a period of 45 days (Table 2). Administration of 100 and 200 mg/kg per day of aqueous extract of *E. prostrata* showed statistically significant decrease in total cholesterol (*P*<0.05), triglyceride (*P*<0.001) and total protein (*P*<0.001) level as compared to hyperlipidemic animals (Table 2). At this time an increase of HDL-cholesterol level was also observed. Both 100 and 200 mg/kg body wt. aqueous extract treated animals showed decrease in the atherogenic index and increased percentage of protection (Table 3).

Discussion

Treatment with *E. prostrata* extract produced a significant decrease in the serum level of lipids in atherogenic diet induced hyperlipidemia in rats. Atherogenic diet induced hyperlipidemic model has been successfully employed for the evaluation of hypocholesterolemic effect of protein10 and S-allyl cysteine sulfoxide of *Allium sativum*11 in albino rats. Ahluwalia and Amma12 found that feeding of oleoresin of gum guggal (*Commiphora mukul*) lowered the total cholesterol and its fractions in lipoproteins. Reshma *et al.*13 have reported hypolipidemic activity of the saponins from *Acorus calamus*. Cell culture derived from *Hemidesmus indicus* (CCH) contain

<table>
<thead>
<tr>
<th>Groups</th>
<th>Total cholesterol</th>
<th>Total triglyceride</th>
<th>Total protein</th>
<th>Total HDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I (Normal)</td>
<td>160.0 ± 14.4a</td>
<td>51.68 ± 1.09b</td>
<td>5.41 ± 0.07b</td>
<td>50.41 ± 2.96b</td>
</tr>
<tr>
<td>Group II (Control)</td>
<td>240.0</td>
<td>182.48</td>
<td>12.42</td>
<td>55.81</td>
</tr>
<tr>
<td>(Atherogenic diet only)</td>
<td>139.1 ± 16.0</td>
<td>84.71</td>
<td>5.74</td>
<td>72.89</td>
</tr>
<tr>
<td>Group III (Atherogenic diet + Aqueous extract 100 mg/kg)</td>
<td>139.1 ± 34.8a</td>
<td>84.71 ± 0.98b</td>
<td>5.74 ± 0.06b</td>
<td>72.89 ± 0.98b</td>
</tr>
<tr>
<td>Group IV (Atherogenic diet + Aqueous extract 200 mg/kg)</td>
<td>130.2 ± 30.0a</td>
<td>36.23</td>
<td>5.43</td>
<td>97.41</td>
</tr>
</tbody>
</table>

Statistical significance in comparison to group – III, IV with group II

*P* values: a<0.05, b<0.001
Aqueous extract of *E. prostrata* have been reported by several authors. The effect of the proteins, gums, saponins and beta-sitosterol is reported as useful in the treatment of hyperlipidemia and hyperglycemia. Hypolipidemic effects have also been observed in developing countries since past few decades. Coronary heart disease (CHD) is being observed in the developed countries, in which are rich in saturated fats, an increase in CHD is being observed in the developing countries since past few decades. Faulty diet is a very common cause of heart disease. Particularly, an increase in inclination towards fast foods, which are rich in saturated fats, an increase in coronary heart disease (CHD) is being observed in the developing countries since past few decades. A 1% decrease in HDL-cholesterol is associated with a 3-4% increase in the risk of heart disease. For male and females, concentration of HDL-cholesterol below 1.0 and 1.2 mmol/L (39, 46 mg/dl) and especially below 0.8 and 1.0 mmol/L (31,39 mg/dl), confer an increased risk of CHD, whereas concentration exceeding 1.5 and 1.7 mmol/L (58,66 mm/dl) diminishes the influence of other risk factors. In the present study an increase in plasma HDL-cholesterol with a concomitant percentage decrease from other lipid was observed. It can be concluded from the present data that the levels of total serum cholesterol, triglyceride and total protein which are actually raised in atherogenic diet, can be lowered significantly with the aqueous extract of *E. prostrata*. Aqueous extract of *E. prostrata* can be utilized for providing dietary management in the prevention of atherosclerosis in hyperlipidemic patients.

**Acknowledgement**

The author is grateful to Dr A Jaswanth, Department of Pharmacology, Periyar Pharmacy College for Girls, Trichirappalli, India for facilities and constant encouragement.

**References**