Hepatoprotective effect of *Eclipta alba* on paracetamol induced liver toxicity in rats

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**ABSTRACT**

In the present investigation the plant *Eclipta alba*, commonly known as Bhringraj is used as a hepatoprotective agent. It is one of the most celebrated herbs in the Indian traditional medicinal system, Ayurveda Bhringraj is considered a powerful liver tonic, rejuvenative and especially good for the hair. The hepatoprotective activity of the leaf of this herb has been demonstrated against a paracetamol. In the present study was carried out to investigate the possible protective effect of leaf extract of *Eclipta alba* on paracetamol induced toxicity in liver.

**Key words:** *Eclipta alba*, AST, ALT, ALP, LDH and GGT.

**INTRODUCTION**

The liver is the key organ regulating homeostasis in the body. It is involved with almost all the biochemical pathways related to growth, fight against disease, nutrient supply, energy provision and reproduction (Ward *et al*.1999). An estimated 70% of population around the world use traditional medicines derived from plant species for their treatment and cure (SK Sharma *et al*. 2010). Many plant products have been reported to protect against hepatic injury (Zhen *et al*.2007). The liver is expected not only to perform physiological functions but also to protect against the hazards of harmful drugs and chemicals. In spite of tremendous scientific advancement in the field of hepatology in recent years, liver problems are on the rise. Jaundice and hepatitis are two major hepatic disorders that account for a high death rate (Pang *et al*. 1992). Presently only a few hepatoprotective drugs and that too from natural sources (there is not a single effective allopathic medication), are available for the treatment of liver disorders.

*Eclipta alba* (L.) Hassk.(syn. Eclipta prostrata), commonly known as false daisy, yerba de tago, and bhringraj, is a plant belonging to the family Asteraceae. Root well developed cylindrical,
greyish. Floral heads 6-8mm in diameter, solitary, white, achene compressed and narrowly winged. In ayurvedic medicine, the leaf extract is considered a powerful liver tonic. The herb *Eclipta alba* contains mainly coumestans i.e., Wedelolactone (I) and demethylwedelolactone (II), Polypeptides, Polyacetylenes, thiophene derivatives, steroids, triterpenes and flavanoids. Coumestans are known to possess estrogenic activity. (Bickoff *et al.*1969). Wedelolactone possesses a wide range of biological activities and is used for the treatment of hepatitis and cirrhosis. (Wagner *et al.*1986), as an antibacterial, anti-hemorrhagic (Kosuge *et al.*1985) and for direct inhibition of IKK complex resulting in suppression of LPS-induced caspase-II expression (Kobori *et al.*2004).

**MATERIALS AND METHODS**

**Drugs and chemicals**
Paracetamol was obtained as a gift sample from Janatha pharmacy Vaniyambadi. Silymarin was obtained as a gift sample from Apollo pharma Ltd., Chennai. All other chemicals, solvents and other biochemicals used in the experiments were of analytical grade.

**Preparation of plant materials**
The fresh leaves of *Eclipta alba* were collected from Agricultural farmhouse. (Vanaiyambadi, Vellore district). Then the leaves were thoroughly washed with water. Freshly collected leaves were shade dried and coarsely powdered in a grinder.

**Dosage of hepatotoxic agent**
Paracetamol (2gm/kg body weight)

**Dosage of herbal**
500 mg of *Eclipta alba* / kg body weight of rat

**Animals**
Wister albino rats either sex weighing between 100-200g were used for the hepatoprotective study. The animals were housed in poly propylene cages and maintained at 24±2°C under 12 hr light/dark cycle and were fed and libitum with standard pellet diet and had free access to water. Maintenance and use of animals as per the experimental was approved by the Institutional Animals Ethics Committee.

**Experimental protocol for hepatoprotective study**
The rats were randomly divided into four groups of six animals in each groups.

*Group I*
Served as a control, received distilled water, orally.

*Group II*
Received paracetamol (2g/kg po) single dose for seven days.

*Group III*
Received paracetamol (2g/kg/po) single dose and silymarin (100mg/kg po) simultaneously for seven days.

*Group IV*
Received paracetamol (2g/kg po) single dose and *Eclipta alba* extract (500mg/kg po) simultaneously for seven days.
Administration of herbal plant (*Eclipta alba*)
The above powdery extract of *Eclipta alba* leaves (EA) was suspended in water without adding any suspending agent for oral administration.

Collection of blood
At the end of experimental regimen, the animals in different groups were sacrificed by cervical decapitation. Blood was collected in test tubes without anticoagulant for serum separation. Serum were separated by centrifugation and used for various biochemical estimations of serum aspartate transaminase (AST), alanine transaminase (ALT), alkaline phosphatase (ALP), γ-glutamyl transferase (GGT), lactate dehydrogenase (LDH), serum protein, bilirubin in serum, cholesterol, and triglycerides.

Liver was dissected out, washed in ice-cold saline and kept in ice-cold container for various biochemical estimations.

Changes in the activities of AST, ALT, ALP, γ-GT, LDH, serum protein and serum bilirubin, cholesterol and triglycerides in serum of control and experimental rats

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Parameter</th>
<th>Control</th>
<th>PCM</th>
<th>PCM + Silymarin</th>
<th>PCM + Eclipta alba</th>
<th>Level of significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>AST</td>
<td>93.26±1.14</td>
<td>265.67±13.33</td>
<td>110.28±11.25</td>
<td>97.91±1.65</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>2.</td>
<td>ALT</td>
<td>58.49±1.36</td>
<td>166.61±11.60</td>
<td>70.18±1.40</td>
<td>60.87±1.33</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>3.</td>
<td>ALP</td>
<td>11.62±1.21</td>
<td>45.43±1.57</td>
<td>18.73±1.21</td>
<td>14.12±0.88</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>4.</td>
<td>LDH</td>
<td>110.30±10.60</td>
<td>195.47±13.54</td>
<td>125.83±11.30</td>
<td>115.53±10.39</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>5.</td>
<td>γ-GT</td>
<td>2.01±0.01</td>
<td>4.85±0.02</td>
<td>2.75±0.03</td>
<td>2.11±0.05</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>6.</td>
<td>Serum protein</td>
<td>6.62±1.04</td>
<td>3.82±1.33</td>
<td>6.48±1.28</td>
<td>5.22±0.63</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>7.</td>
<td>Serum bilirubin</td>
<td>0.95±0.05</td>
<td>2.55±0.87</td>
<td>1.32±0.60</td>
<td>1.16±0.03</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>8.</td>
<td>Serum Cholesterol</td>
<td>92.39±12.09</td>
<td>275.65±13.95</td>
<td>100.34±11.27</td>
<td>99.25±11.91</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>9.</td>
<td>Serum Triglycerides</td>
<td>40.27±1.12</td>
<td>121.72±1.20</td>
<td>58.10±1.39</td>
<td>54.20±2.60</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

Statistical analysis
Tests were carried out in triplicates. Differences among the tested antioxidants were analysed by using one-way ANOVA. Values are expressed as the Mean ± SD and differences between groups were considered to be significant if p<0.05.

Histopathological studies in liver
Histopathological studies showed that paracetamol administered rat caused pathological changes in liver including severe congestion, hydropic degeneration and occasional necrosis (Fig. 2). The liver was almost has normal appearance with mild change in severe congestion, hydropic degeneration and occasional necrosis of rats treated with *Eclipta alba* and PCM (Fig. 4), indicating that the administration of *Eclipta alba* decreased the hepatocyte damage induced by paracetamol (PCM) and silymarin also has the same effect (Fig. 3). Control rats showed the normal appearance of liver without any histological alterations (Fig. 1).

The results of functional tests together with histological observations suggest that paracetamol leads to serious change in histology of liver, thus poisoning a risk for health. The increased formation of lipid peroxidation and associated reactive oxygen species leads to collapse in
membrane integrity and other pathological changes in liver. The efficiency of any protective
drug is essentially dependent on its capacity of either reducing the harmful effects (or) in
maintaining the normal physiology of cells and tissues, which have been attributed by toxins.
The membrane protective properties and antioxidant nature of *Eclipta alba* is helpful to alleviate
the pathological changes caused by paracetamol in liver.

**Histopathological changes in rat liver**

![Histopathological changes in rat liver](image1)

**RESULTS AND DISCUSSION**

Liver is a versatile organ of the body that regulates internal chemical environment. Liver injuries
induced by various hepatotoxins have been recognized as a major toxicological problem for
years (Azer Mc Caughan and Stacey, 1997). Paracetamol is one of the most popular analgesic
and antipyretic drugs worldwide, and overdose (or) idiopathic reaction are among the major
causes of morbidity and mortality in its victims (Microchnichenko *et al*., 1999). Historically
plants have been used as folk medicine against various type of disease. Experimental work on
several plants has been carried out to evaluate their efficiency against chemically induced toxicity (Mitra et al., 1992).

In the present study the efficiency of extract of leaf of *Eclipta alba* elucidated against experimental tissue injury, oxidative stress and proliferative response induced by hepatotoxic drug, Paracetamol.

**CONCLUSION**

In the present study the above parameters analyzed, it was concluded that *eclipta alba* has significant hepatoprotective activity against paracetmol induced rat. The antiheptotoxic activity of the leaf extract of *Eclipta alba* were compared with the standard hepatoprotective agent silymarin. However, to know the extract mechanism of action of eclipta alba, further studies with purified fractions/bioactive compounds warranted.

**REFERENCES**


[5] Microchnitchneko, **1999**. paracetamol is one of the most popular analgestic antipyretic drugs worldwide, p.158.


