EFFECT OF *AILANTHUS EXCELSA* EXTRACT IN HEPATIC DISORDERS

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**ABSTRACT**

Objectives of the present Investigations is to study hepatoprotective activity of methanol and aqueous extract of leaves of *Ailanthus excelsa*. Desired plant part was collected, air dried at room temperature in shadow and coarsely ground. The powdered material of leaves was extracted with methanol and distilled water in Soxhlet apparatus. Duration of the study was 10 days. All the animals were sacrificed on the 11th day for the estimation of various bio-chemical parameters like SGOT, SGPT, ALP, and TB. Control group animal showed decreased level of TP compared to normal significantly. Treatment with Silymarin, Methanolic extract, Aqueous extract of *A.excelsa* significantly increased serum albumin level. Silymarin and Methanolic extract (400mg) more effective than Methanolic extract (200mg) Aqueous extract (400mg) and Aqueous extract (200mg) of *A.excelsa*. Carbon tetrachloride induced hepatotoxicity was significantly prevented by pretreatment with methanolic and aqueous extracts of *A.excelsa* leaves the preventive effect causing reduction in elevated biochemical parameter levels like serum ALT, AST, ALP and total bilirubin and increase in serum total protein and serum albumin levels after methanolic and aqueous extract treatment has confirmed the hepatoprotective effect of *A.excelsa* leaves in liver damage models in rats and near restoration of hepatic cells with minor fatty change and absence of necrosis was also identified with the histological slides.

**KEYWORDS:** *Ailanthus excelsa*, Hepatoprotective, Methanolic extract, Aqueous extract.

**INTRODUCTION**

The effects of oral administration of ethyl acetate, ethanol and aqueous extracts of some medicinal plant to study hepatoprotective effect on carbon tetrachloride induced liver
disorders were investigated. The rats are individually treated daily with ethanolic and ethyl acetate extract of plant drug. The hepatoprotective activity of the extracts was assessed by estimating the levels of serum aspartate aminotransferase, alanine aminotransferase, alkaline phosphatase and total bilirubin in the rats (Rajasekaran et al., 2010). Silymarin, a flavonoid ligand mixture extracted from the Silybum marianum (milk thistle) is a popular remedy for hepatic diseases. However there are several herbs/herbal formulations claimed to possess beneficial activity in treating hepatic disorders (Ramachandra et al., 2007). Ailanthus is a genus of tall, leafy trees, widely distributed in Indo-Malay, Japan, China and Australia (Dinesh Kumar et al., 2010). Different species of the genus are Ailanthus glandulosa in China, Ailanthus malbarica in Indo-China and Ailanthus excelsa in India (Lavhale et al., 2007). Ailanthus excelsa Roxb.(Simaroubaceae) is commonly known as “Mahanimba” due to its resemblance with the neem tree (Azadirachta indica) and Maharukha due to its large size.

The aim of current study is to see the hepatoprotective effect of methanolic extract of stem bark of Ailanthus excels in Wister albino rats by inducing liver damage by carbon tetra chloride (CCl4). The methanolic extract at an oral dose of 200mg/kg exhibited significant (p<0.001) hepatoprotective effect by lowering serum enzyme levels of glutamic oxaloacetic transaminase (SGOT), glutamic pyruvic transaminase (SGPT), alkaline phosphatase (ALP) and total bilirubin (TB). These observations were supplemented by histopathological examination of liver section. Silymarin was used as positive control.

MATERIALS AND METHODS

Extraction of Plant extract

The plant was identified and desired plant part was collected from road side area in Amravati city, air dried at room temperature in shadow and coarsely ground. Before starting extraction the coarsely ground powder is rendered moisture free. Extraction carried out by Soxhlet extraction assembly. The shade dried leaves was powdered coarse (sieve 60) and powdered material of leaves of Ailanthus excelsa was extracted with methanol and distilled water in Soxhlet apparatus. The extract was concentrated under vacuum to get residue. The residue was dried in vacuum desiccators (Prakash Yoganandam et al., 2010).

Study groups

Healthy male Wistar albino rats were divided into 7 groups each containing 6 animals and they were grouped as follows,
Group-1: Normal control received 1ml/kg normal saline.
Group-2: Served as carbon tetrachloride control.
Group-3: Received 25mg/kg/day/p.o. of standard drug Silymarin.
Group-4: Received 200mg/kg/day/p.o. methanolic extract of A.excelsa
Group-5: Received 400mg/kg/day/p.o. methanolic extract of A.excelsa
Group-6: Received 200mg/kg/day/p.o. aqueous extract of A.excelsa
Group-7: Received 400mg/kg/day/p.o. aqueous extract of A.excelsa

Ethical consideration
The research protocol for this animal studies were approved by the scientific review board of Institutional Animal Ethics Committee (IAEC). 0.7ml/kg of carbon tetrachloride was injected intraperitoneally (i.p.) to all groups except normal control to induce hepatotoxicity on 3, 6 and 10th days of experiment. Duration of the study was 10 days. All the animals were sacrificed on the 11th day. For the estimation of various bio-chemical parameters blood samples were collected by cardiac puncture. Serum was separated and used for estimation of SGOT, SGPT, ALP, and TB. As previously described by (Galighor et al., 2010), total protein and serum albumin also determined. These parameters also get affected by liver injury (Rekha Rajendran et al., 2009). Liver were isolated for the histopathological studies.

Histological studies
Preparation of permanent slides for Histological investigations using fixative Bouin’s fluid (aqueous) (Krishna Mohan et al., 2010).

Statistical analysis of data
Results were expressed as Mean ± S.E.M. and the data obtained were analyzed by ‘One-way ANOVAs followed by ‘Dunnett’s Multiple Comparision Test’.

RESULTS
After scarification of rats various biochemical analysis can be done such as SGOT, SGPT, ALP, TB, total protein and serum albumin etc. table1 shows the effect of Ailanthus excelsa on Carbon tetrachloride induced liver damage in rats. Table no. 1 shows the effect of A.excelsa on SGOT, SGPT, ALP and TB.
Table 1: Effect of *Ailanthus excelsa* on Carbon tetrachloride induced liver damage in rats.

<table>
<thead>
<tr>
<th>Treatment groups</th>
<th>SGOT (IU/L)</th>
<th>SGPT (IU/L)</th>
<th>ALP (IU/L)</th>
<th>TB (IU/L)</th>
<th>SA (gm/dl)</th>
<th>TP (gm/dl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal Control</td>
<td>61.97± 2.73</td>
<td>67.41± 4.37</td>
<td>75.37± 2.89</td>
<td>0.93± 0.13</td>
<td>4.06± 0.24</td>
<td>8.21± 0.32</td>
</tr>
<tr>
<td>CCl4 Control</td>
<td>108.1± 2.69#</td>
<td>104.5± 4.01#</td>
<td>142.8± 5.71#</td>
<td>3.88± 0.32#</td>
<td>1.47± 0.13</td>
<td>3.99± 0.33#</td>
</tr>
<tr>
<td>Silymarin</td>
<td>69.37± 2.5***</td>
<td>0.66± 3.60***</td>
<td>79.47± 3.41***</td>
<td>1.73± 0.23***</td>
<td>3.74± 0.17***</td>
<td>7.71± 0.38***</td>
</tr>
<tr>
<td>Methanolic extract 200 mg/kg</td>
<td>85.92± 5.05**</td>
<td>79.34± 6.33**</td>
<td>121.3± 1.44**</td>
<td>2.86± 0.23 *</td>
<td>3.05± 0.26*</td>
<td>6.51± 0.37**</td>
</tr>
<tr>
<td>Methanolic extract 400 mg/kg</td>
<td>73.12± 5.38***</td>
<td>6.77± 3.48***</td>
<td>85.59± 4.68***</td>
<td>2.50± 0.18**</td>
<td>3.48± 0.51**</td>
<td>6.97± 0.78***</td>
</tr>
<tr>
<td>Aqueous extract 200 mg/kg</td>
<td>95.65± 5.50</td>
<td>87.82± 3.61*</td>
<td>132.8± 5.71</td>
<td>3.16± 0.27</td>
<td>2.63± 0.32</td>
<td>5.81± 0.43*</td>
</tr>
<tr>
<td>Aqueous extract 400mg/kg</td>
<td>91.20± 3.39*</td>
<td>81.14± 4.25**</td>
<td>118.8± 3.96**</td>
<td>2.89± 0.24*</td>
<td>3.10± 0.51*</td>
<td>6.68± 0.32**</td>
</tr>
</tbody>
</table>

Results were expressed as Mean ± SEM, N=6. Data analysed by One way ANOVA followed by Dunnett’s multiple comparison test, # (P<0.05) compared to normal and ***(P<0.001), **(P<0.01), *(P<0.05) compared to CCl4 Control.

Control group animal showed increased level of SGOT, SGPT, ALP and TB as compared to normal significantly. Treatment with Silymarin, Methanolic extract, Aqueous extract of *A.excelsa* significantly decreased SGOT, SGPT, ALP and TB level. Silymarin, Methanolic extract (400mg), were more effective than Methanolic extract (200mg), Aqueous extract (400mg) and Aqueous extract (200mg) of *A.excelsa*. Table no. 1 also shows the effect of *A.excelsa* on SA and TP in which Control group animal showed decreased level of SA and TP as compared to normal significantly. Treatment with Silymarin, Methanolic extract, Aqueous extract of *A.excelsa* significantly increased SA level. Silymarin and Methanolic extract (400mg) were more effective than Methanolic extract (200mg) Aqueous extract (400mg) and Aqueous extract (200mg) of *A.excelsa*.

**Histological Analysis**

Histopathological examination of liver sections of normal control group showed normal cellular architecture with distinct hepatic cells, sinusoidal spaces and central vein as shown in Fig.1.
In the liver section of rats intoxicated with carbon tetrachloride there was disarrangement and degeneration of normal hepatic cells with intense centrilobular necrosis extending to mid zone and sinusoidal haemorrhages and dilation as shown in Fig.2.

The liver section of rats treated with Silymarin showed less vacuole formation, reduced sinusoidal dilation and less disarrangement and degeneration of hepatocytes, indicating marked regenerative activity as shown in Fig.3.
The liver section of rats treated with (200mg/kg) and (400mg/kg) of Methanolic and Aqueous extract of *A.excelsa* showed less vacuole formation, reduced sinusoidal dilation, less disarrangement, less degeneration of hepatocytes and less centrilobular necrosis. Also Methanolic extract of *A.excelsa* (400mg/kg) showed better results as compared to *A.excelsa* (200mg/kg) extract as depicted in Fig. 4-7.

**DISCUSSION**

The hepatoprotective index of a drug evaluated by its capability to reduce the injurious effects or to preserve the normal hepatic physiological mechanism, which have been induced by hepatotoxin. The measurement of serum SGOT, SGPT and ALP levels serves as a means for the indirect assessment of condition of liver. The treatment of the animals with methanolic and aqueous extract of *A.excelsa* (200mg/kg and 400mg/kg) with respect to
intoxication with carbon tetrachloride decreased significantly (P<0.001) levels of SGOT, SGPT and ALP.

A high concentration of bilirubin in serum is an indication for increased erythrocyte degeneration rate. It also reflect the necrotic conditions of hepatocytes.[8] The oral administration of methanolic and aqueous extract of A.excelsa (200mg/kg and 400mg/kg) decreased levels of serum TB suggest the stability of the biliary function during injury with carbon tetrachloride.

The levels of Total protein and Serum albumin were reduced due to the carbon tetrachloride induced hepatotoxicity. The Total protein and Serum albumin levels were also raised significantly suggesting the stabilization of endoplasmic reticulum leading to protein synthesis. This hepatoprotective effect exhibited by the methanolic and aqueous extract of A.excelsa at dose level of (200mg/kg and 400mg/kg). Histopathological liver sections also revealed that normal liver architecture was disturbed by carbon tetrachloride group and methanolic and aqueous extract of A.excelsa showed protective action against carbon tetrachloride induced liver damage. Thus from the result of the current investigation it may inferred that both the extracts (methanolic and aqueous) of A.excelsa leaves possesses potent hepatoprotective activity.

**CONCLUSION**

Carbon tetrachloride causes increased levels of SGOT, SGPT, ALP and TB and decreased levels of total protein and serum albumin. Methanolic and aqueous extract of A. excelsa could effectively controlled the SGOT,SGPT,ALP and TB levels and increased the total protein and serum albumin levels in the protective studies. The methanolic extract (400mg/kg) more effective as compared to methanolic (200mg/kg) and aqueous extract (200mg/kg and 400mg/kg) of A.excelsa. The histopathological studies also substantiate the activity of the drug Therefore, the study scientifically supports the traditional use of this drug for the treatment of liver disorders.

**CONFLICTS OF INTERESTS**

The authors have no conflict of Interest.
AUTHORS CONTRIBUTION
Deepti Bonde carried out conception, design of study the experiment and Interpretation of data. Nilesh Choudhary wrote the manuscript with support from Mukund Tawar. Vivek Kahale helped to supervise the project.

REFERENCES
