HYPOLIPIDEMIC ACTIVITY OF STEM BARK OF AILANTHUS EXCELSA ROXB

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ABSTRACT

*Ailanthus excelsa, Roxb (Family-Simaroubaceae) commonly known as “Mahaneeem” is a large deciduous tree with rough and light grey stem bark. It has a large panel of indications to evaluate its stem bark as it contains variety of important phytoconstituents which are used in treating diarrhoea, dysentery, cholera, astringent, febrifuge, anthelmintic and liver tonic. Background: The stem bark of the Ailanthus excelsa, Roxb was investigated for hyperlipidemia related disorders which is one of the major risk factor of coronary heart disease and atherosclerosis. Purpose: The purpose of present investigation is the reduction of elevated lipid profiles through various prepared plant extracts in triton WR 1339 induced hyperlipidemic model. Study Design: In the present investigations, stem bark was collected, authenticated, extracted with solvent and in vivo studies in correlation with triton injected experimental animals were carried out in decreasing the elevated lipid profiles. Methods: The study pertains the hypolipidemic activity of ethanolic extract and its fractions of stem bark of Ailanthus excelsa, Roxb on triton WR 1339 induced hyperlipidemic model. Results: The results obtained are significant with fractionated part of ethonolic extract of Ailanthus excelsa Roxb (200 + 200 mg/kg) in lowering total cholesterol, triglycerides, High density lipoprotein, low density lipoprotein and Very low density lipoprotein. Conclusion: The observation enables to evaluate the biological and molecular approaches to restrain the adverse effects of cardiovascular disorder particularly complications related to lipidemia.
KEYWORDS: Ailanthus excelsa, Roxb, stem bark, atherosclerosis, phytoconstituents, hypolipidemic, triton.

INTRODUCTION

The scourge of cardiovascular diseases (CVDs) is the most prevalent cause of death. In this context, hyperlipidemia is one of the major risk factors of coronary heart disease and atherosclerosis. It also causes atherosclerosis, which is a major cause of death in the world. In India atherosclerosis is also becoming a major disease with changing life styles and increasing stress. Arteriosclerosis, coronary heart disease and some other diseases are strongly associated with disorder of lipid metabolism and plasma hyper lipoprotein (Brown et al., 1986).

The present study evaluates the efficiency of herbal medicines in lowering elevated lipid levels. The therapeutic use of herbal medicines is gaining considerable momentum in the world during the past decade. Plants or plant derived compounds have been used as a major source of drug for treatment of hyperlipidemia in worldwide. Ailanthus excelsa Roxb (Family-Simaroubaceae) is large and deciduous tree up to a height of 18-24 m and found throughout India. The aerial parts of the plant is widely used in curing variety of disorder such as antitumor, antiviral, anti malarial, antileukemic, antifeedent, hepatoprotective, antiasthmatic, antifertility and antibacterial activity. The objective of the present study was to evaluate the hypolipidemic activity of stem bark of Ailanthus excelsa Roxb on triton WR 1339 induced hyperlipidemic model in rats.

MATERIAL AND METHODS

Plant Material

The stem bark of Ailanthus excelsa Roxb was collected (in the month of July and august) from surrounding fields of Sriganganagar. The stem bark of Ailanthus excelsa Roxb were dried in shade, and used for investigations. The plants was identified and authenticated by Mr. N. K Pandey Research officer (Botany), NRIASHRD Dept. of AYUSH.

Defatting and Extraction

The Plant was dried in shade at room temperature and after 7 – 8 days, it was converted into powder form with the help of grinder. 80 gm of powdered drug was weighed and packed in soxhlet apparatus. The drug was then continuously extracted with petroleum ether for about 72 hours. After some time a drop from the thimble was placed on a filter paper absence of
any oily spot ensured complete defeating. The marc was then dried in air to remove traces of petroleum ether. The marc was again extracted with ethanol in soxhelet apparatus the extraction was completed in 25 cycles. The ethanolic extract was dried and stored in closed container (Kumar, D.et al., 2010).

**Determination of In vivo Hypolipidemic activity of stem bark of Ailanthus excelsa Roxb.**

**Selection of Model**

The model described in Journal of Ethanopharmacology as Triton induced WR 1339 hyperlipidemia in 2004 Feb; 90(2-3):249-52 was taken for analysis. (Patil et al., 2004).

**Animals**

Healthy adult Male Wistar rats weighing about 100-200g were used for the study. They were housed in groups in polypropylene cages, maintained under standard conditions (12:12h light: dark cycle; 27±3°C; 40–60% humidity) and maintained with free access to standard rat pellet diet (Amrut laboratory animal feed, manufactured by Navmahrashtra Chakan Oil Mills Ltd, Pune) and filtered water (Vogel et al., 1998).

The weighed quantity of fractionated Ethanolic extract (1.5 gm) of Ailanthus excelsa were taken and triturated with polyvinyl pyrrolidine (2% w/v) and distilled water added to get the final concentration of suspension to 20 ml. Suspensions were stored in air tight bottle in refrigerator. Triton WR 1339 (Isooctyl-polyoxy-ethylene phenol) was obtained from Sigma Eldrich Chemicals Co. (St. Louis, Missouri, U.S.A.) (Verma et al., 1988).

**Preparation of Extract Doses**

1.5 gram of dried fractionated Ethanolic extract of Ailanthus excelsa Roxb (Dark green) was triturated with polyvinyl pyrrolidine (2% w/v) and make upto a volume of 20ml with distilled water.

**Preparation of Triton WR 1339 Dose**

Triton WR 1339 was prepared in (7 % Solution in normal saline) at a dose of 200 mg/kg body weight i.p. The group served as triton control was treated with triton at a dose of 200 mg/kg body weight i.p. respectively (Kumar V., et al 2008).

**Acute toxicity studies**

The study was designed in a manner to establish dose dependent Hypolipidemic activity of different doses of the same extract under same sets of conditions and different serum lipid
parameters were determined and compared with standard & other groups. Therefore doses of 100mg/kg body weight (oral) and 200 mg/kg body weight (oral) of fractionated ethanolic extract was administered to the control and triton induced hyperlipidemic model in albino rats (Nitayanand, S., et al., 1971).

**Grouping of Animals**
Animal study was performed in IPS college of Pharmacy, Gwalior (M.P.) Adult albino rats of either sex (100-200 g) were selected for the study and were divided into following groups of six animals each

Group I: Control (Without any drug treatment, given food and water intermittently).
Group II: Triton Control treated (200 mg/kg body wt. i.p.)
Group III: Triton + Standard Drug – (Atorvastatin) (10 mg/kg body wt oral).
Group IV: Triton + Fractionated ethanolic extract of *Ailanthus excelsa* (200 mg/kg b.w. i.p.+100 mg/kg body wt. oral)
Group V: Triton + Fractionated ethanolic extract of *Ailanthus excelsa* (200mg/kg b.w. i.p +200 mg/kg body wt. oral).

**Effect of Triton WR 1339 on serum lipid parameters**
The systemic administration of the surfactant Triton WR 1339 (isooctyl-polyoxy-ethylene phenol) to albino rats results in a biphasic elevation of plasma cholesterol and triglycerides. In this Hyperlipidemic model, Adult albino rat of either sex weighing about 100-200 gm are starved for 18 hr and then injected with Triton WR 1339 (200 mg/kg) i.v. After administration Serum cholesterol level increases sharply 2-3 times after 24 hrs in the first phase. In the second phase hypercholesterolemia decreases nearly to the control levels within the next 24 hrs. The test drug or plant extract employed for the controls are administered simultaneously with the Triton injection. Then Serum lipid levels analysis are made 6, 24, and 48 hr after triton injection (Schurr et al., 1972).

**Table 1: Effect of ethanolic extracts of *Ailanthus excelsa* Roxb on total cholesterol level in triton induced hyperlipidemic albino rats.**

<table>
<thead>
<tr>
<th>GROUP/ TIME IN HRS</th>
<th>0 Hrs</th>
<th>6 Hrs</th>
<th>24 Hrs</th>
<th>48 Hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (I)</td>
<td>114.50 ± 3.81</td>
<td>106.70 ± 4.14</td>
<td>133.66 ± 3.63</td>
<td>115.00 ± 3.80</td>
</tr>
<tr>
<td>TritonWR1339 Control(200mg/kg) (II)</td>
<td>137.60 ± 4.18</td>
<td>130.00 ± 2.12</td>
<td>157.32 ± 3.24</td>
<td>179.25 ± 3.12</td>
</tr>
<tr>
<td>Standard rug Atorvastatin (10mg/kg)(III)</td>
<td>93.70 ± 2.25*</td>
<td>113.20 ± 4.25*</td>
<td>123.05 ± 3.78*</td>
<td>95.09 ± 2.07*</td>
</tr>
<tr>
<td>Triton WR 1339+ Fractionated EtoH Extract AE (200+100mg/kg) (IV)</td>
<td>127.33 ± 4.23*</td>
<td>162.50 ± 5.30</td>
<td>132.16 ± 3.72*</td>
<td>121.50 ± 3.56*</td>
</tr>
</tbody>
</table>
Table 2: Effect of ethanolic extracts of *Ailanthus excelsa* Roxb on total triglyceride level in triton induced hyperlipidemic albino rats.

<table>
<thead>
<tr>
<th>GROUP/ TIME IN HRS</th>
<th>0 Hrs</th>
<th>6 Hrs</th>
<th>24 Hrs</th>
<th>48 Hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (I)</td>
<td>73.50 ± 1.17</td>
<td>79.66 ± 0.71</td>
<td>81.08 ± 0.45</td>
<td>77.50 ± 1.02</td>
</tr>
<tr>
<td>Triton WR 1339 Control (200 mg/kg) (II)</td>
<td>63.30 ± 1.08</td>
<td>73.06 ± 1.07</td>
<td>89.04 ± 2.19</td>
<td>93.05 ± 3.02</td>
</tr>
<tr>
<td>Standard Drug atorvastatin (10 mg/kg) (III)</td>
<td>73.02 ± 3.13</td>
<td>80.11 ± 3.14</td>
<td>75.31 ± 2.90</td>
<td>71.33 ± 4.03*</td>
</tr>
<tr>
<td>Triton WR 1339+ Fractionated EtoH Extract AE(200+100mg/kg) (IV)</td>
<td>65.09 ± 2.86*</td>
<td>89.06 ± 3.41</td>
<td>48.51 ± 2.39*</td>
<td>56.16 ± 2.70*</td>
</tr>
</tbody>
</table>

All values are expressed as mean ± SEM, n=6. All data are subjected to One Way ANOVA followed by Dennett’s test. *P<0.05 compared to vehicle treated group; *AE* - *Ailanthus excelsa* Roxb; *F. EtoH extract* – Fractionated ethanolic extract

Table 3: Effect of ethanolic extracts of *Ailanthus excelsa* Roxb on total HDL-cholesterol level in triton induced hyperlipidemic albino rats.

<table>
<thead>
<tr>
<th>GROUP/ TIME IN HRS</th>
<th>0 Hrs</th>
<th>6 Hrs</th>
<th>24 Hrs</th>
<th>48 Hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (I)</td>
<td>18.70 ± 0.63</td>
<td>25.33 ± 0.88</td>
<td>31.00 ± 1.06</td>
<td>22.83 ± 1.07</td>
</tr>
<tr>
<td>Triton WR 1339 Control (200mg/kg) (II)</td>
<td>56.20 ± 1.23</td>
<td>77.10 ± 2.08</td>
<td>87.12 ± 3.36</td>
<td>108.06 ± 3.79</td>
</tr>
<tr>
<td>Standard Drug –atorvastatin (10mg/kg) (III)</td>
<td>49.50 ± 1.86</td>
<td>37.30 ± 1.19*</td>
<td>49.05 ± 1.29</td>
<td>55.20 ± 1.92</td>
</tr>
<tr>
<td>Triton WR 1339+ F. EtoH Ext AE(200+100 mg/kg) (IV)</td>
<td>19.76 ± 2.12*</td>
<td>30.91 ± 1.01*</td>
<td>25.58 ± 2.11*</td>
<td>21.55 ± 1.81*</td>
</tr>
<tr>
<td>Triton WR 1339+ F.EtoH Ext AE (200+200 mg/kg) (V)</td>
<td>34.21 ± 3.71</td>
<td>52.09 ± 0.17</td>
<td>59.06 ± 2.02</td>
<td>46.53 ± 1.66</td>
</tr>
</tbody>
</table>

All values are expressed as mean ± SEM, n=6. All data are subjected to One Way ANOVA followed by Dennett’s test. *P<0.05 compared to vehicle treated group; *AE* - *Ailanthus excelsa* Roxb; *F. EtoH extract* – Fractionated ethanolic extract.
Table 4: Effect of ethanolic extracts of *Ailanthus excelsa* Roxb on LDL level in triton induced hyperlipidemic albino rats.

<table>
<thead>
<tr>
<th>GROUP/ TIME IN HRS</th>
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<th>6 Hrs</th>
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<th>48 Hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (I)</td>
<td>82.70 ± 4.15</td>
<td>115.53 ± 4.23</td>
<td>87.98 ± 2.68</td>
<td>79.86 ± 4.61</td>
</tr>
<tr>
<td>Triton WR 1339 Control (200mg/kg) (II)</td>
<td>58.00 ± 2.36</td>
<td>91.06 ± 3.76</td>
<td>110.04 ± 3.21</td>
<td>108.00 ± 3.02</td>
</tr>
<tr>
<td>Standard Drug –Atorvastatin (10mg/kg) (III)</td>
<td>28.90 ± 2.72*</td>
<td>59.01 ± 1.26*</td>
<td>38.08 ± 0.29*</td>
<td>36.03 ± 2.27*</td>
</tr>
<tr>
<td>Triton WR 1339+ F.EtoH ExtAE (200+100 mg/kg) (IV)</td>
<td>89.80 ± 3.30</td>
<td>120.33 ± 4.18</td>
<td>93.15 ± 4.47*</td>
<td>86.48 ± 2.67*</td>
</tr>
<tr>
<td>Triton WR 1339+ F.EtoH ExtAE (200+200 mg/kg) (V)</td>
<td>77.10 ± 2.81</td>
<td>96.50 ± 3.88</td>
<td>84.31 ± 3.47*</td>
<td>80.19 ± 2.96*</td>
</tr>
</tbody>
</table>

All values are expressed as mean ± SEM, n=6. All data are subjected to One Way ANOVA followed by Dennett’s test. *P<0.05 compared to vehicle treated group; *AE* - *Ailanthus excelsa* Roxb; *F. EtoH* extract – Fractionated ethanolic extract

Table 5: Effect of ethanolic extracts of *Ailanthus excelsa* Roxb on VLDL level in triton induced hyperlipidemic albino rats.

<table>
<thead>
<tr>
<th>GROUP/ TIME IN HRS</th>
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<th>6 Hrs</th>
<th>24 Hrs</th>
<th>48 Hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (I)</td>
<td>15.10 ± 0.23</td>
<td>16.13 ± 0.14</td>
<td>16.68 ± 0.62</td>
<td>15.30 ± 0.20</td>
</tr>
<tr>
<td>Triton WR 1339 Control (200mg/kg) (II)</td>
<td>32.09 ± 1.02</td>
<td>46.00 ± 1.15</td>
<td>87.06 ± 2.01</td>
<td>89.02 ± 2.21</td>
</tr>
<tr>
<td>Standard Drug –Atorvastatin (10mg/kg) (III)</td>
<td>40.00 ± 1.66</td>
<td>36.22 ± 1.19*</td>
<td>66.75 ± 1.98*</td>
<td>51.85 ± 1.75*</td>
</tr>
<tr>
<td>Triton WR 1339+ F.EtoH ExtAE (200+100 mg/kg) (IV)</td>
<td>14.90 ± 0.58*</td>
<td>16.25 ± 0.62*</td>
<td>14.62 ± 0.56*</td>
<td>14.46 ± 0.80*</td>
</tr>
<tr>
<td>Triton WR 1339+ F.EtoH ExtAE (200+200 mg/kg) (V)</td>
<td>18.50 ± 1.27*</td>
<td>28.05 ± 2.11*</td>
<td>23.62 ± 1.73*</td>
<td>24.06 ± 1.39*</td>
</tr>
</tbody>
</table>

All values are expressed as mean ± SEM, n=6. All data are subjected to One Way ANOVA followed by Dennett’s test. *P<0.05 compared to vehicle treated group; *AE* - *Ailanthus excelsa* Roxb; *F. EtoH* extract – Fractionated ethanolic extract

**Studies on Hypolipidemic Activity**

Hypolipidemic activity is evaluated by changes in serum lipid level on the experimental animals after administration of the test drugs. The parameters are determined before and after drug administration at regular intervals. Screening of activity with fractionated ethanolic extract of *Ailanthus excelsa* Roxb and triton induced hyperlipidemic animal models was employed. (Rall TW., et al 1990)
RESULTS AND DISCUSSION

Evaluation of Serum Lipid parameters

The lipid parameters were examined through various prepared plant extract of *Ailanthus excelsa* Roxb on Triton WR 1339 induced hyperlipidemic model. The significant effect was observed with Fractionated part of ethanolic extract of *Ailanthus excelsa* Roxb (200 + 200 mg/kg) in lowering lipid profiles.

Effect of Triton WR 1339 on lipid parameters in albino rats

Triton WR 1339 is a non-ionic poly oxy ethylene phenol which is mainly used as surfactant and its effectively elevates the lipid profile in various experimental models. It generally results in a biphasic elevation of plasma cholesterol and triglycerides level respectively. In control group I shown normal values of lipid parameters such as total cholesterol, triglycerides, HDL-cholesterol LDL and VLDL etc at a time interval of 0,6,24.48 hrs.

Fig -1 Total cholesterol level in triton induced hyperlipidemic albino Rats

Abbreviations -Gr A –Group A, Gr B- Group B, Gr C- Group C, Gr D, Group D, Gr E – Group E. Series 1 - Triton WR 1339 Control (200mg/kg) Series 2 - Standard Drug – Atorvastatin (10mg/kg) Series 3 - Triton WR 1339 + Fractionated ethanolic Extract *Ailanthus Excelsa* (200+100 mg/kg) Series 4- Triton WR 1339+ Fractionated ethanolic Extract *Ailanthus Excelsa* (200+200 mg/kg).

Fig -2 Total Triglycerides level in triton induced hyperlipidemic albino Rats.

Abbreviations -Gr A –Group A, Gr B- Group B, Gr C- Group C, Gr D, Group D, Gr E – Group E. Series 1 - Triton WR 1339 Control (200mg/kg) Series 2 - Standard Drug – Atorvastatin (10mg/kg) Series 3 - Triton WR 1339 + Fractionated ethanolic Extract *Ailanthus Excelsa* (200+100 mg/kg) Series 4- Triton WR 1339+ Fractionated ethanolic Extract *Ailanthus Excelsa* (200+200 mg/kg).

Effect of Fractionated part of Ethanolic Extract of *Ailanthus excelsa* Roxb on lipid parameters in albino rats.

In group III treated with standard drug (Atorvastatin 10 mg/kg) shows significant decrease in lipid parameters after 6,24,48 hrs respectively as compared to triton control group II. In group IV treated with triton WR 1339 and fractionated ethanolic extract of *Ailanthus excelsa* (200+100 mg/kg body wt. i.p.) shows no reduction in total cholesterol, triglycerides and LDL level at their respective time intervals and showed significant decrease in HDL- cholesterol.
and VLDL levels as compared to triton control group after 6 hrs and 24 hrs time interval respectively (Verma S.K., et al., 1988).

In group V treated with (triton,200 mg/kg body weight + Fractionated ethanolic extract of *Ailanthus excelsa* 200mg/kg body weight. i.p.) results in significant decrease in lipid parameters such as total cholesterol level, triglycerides, HDL- cholesterol, LDL and VLDL profile in comparison with triton control group after 6 hrs and 48 hrs time intervals respectively.

**Fig-3 HDL-cholesterol level in triton induced hyperlipidemic albino rats.**

**Abbreviations** -Gr A –Group A, Gr B- Group B, Gr C- Group C, Gr D, Group D, Gr E – Group E. Series 1 - Triton WR 1339 Control (200mg/kg) Series 2 - Standard Drug – Atorvastatin (10mg/kg) Series 3 - Triton WR 1339 + Fractionated ethanolic Extract *Ailanthus Excelsa* (200+100 mg/kg) Series 4- Triton WR 1339+ Fractionated ethanolic Extract *Ailanthus Excelsa* (200+200 mg/kg).

**Fig -4 LDL level in triton induced hyperlipidemic albino rats.**

**Abbreviations** -Gr A –Group A, Gr B- Group B, Gr C- Group C, Gr D, Group D, Gr E – Group E. Series 1 - Triton WR 1339 Control (200mg/kg) Series 2 - Standard Drug – Atorvastatin (10mg/kg) Series 3 - Triton WR 1339 + Fractionated ethanolic Extract *Ailanthus Excelsa* (200+100 mg/kg) Series 4- Triton WR 1339+ Fractionated ethanolic Extract *Ailanthus Excelsa* (200+200 mg/kg).

**Fig -5 VLDL level in triton induced hyperlipidemic albino rats.**

**Abbreviations** -Gr A –Group A, Gr B- Group B, Gr C- Group C, Gr D, Group D, Gr E – Group E. Series 1 - Triton WR 1339 Control (200mg/kg) Series 2 - Standard Drug – Atorvastatin (10mg/kg) Series 3 - Triton WR 1339 + Fractionated ethanolic Extract *Ailanthus Excelsa* (200+100 mg/kg) Series 4- Triton WR 1339+ Fractionated ethanolic Extract *Ailanthus Excelsa* (200+200 mg/kg).

**Statistical analysis**

All values are expressed as mean ± SEM, n=6. All data are subjected to One Way ANOVA followed by Dennett’s test. *P<0.05 compared to vehicle treated group (Woodson et al., 1957).
CONCLUSION

The pharmacological evaluation of lipid parameters were examined through various prepared plant extract of *Ailanthus excelsa* Roxb on trition WR 1339 induced hyperlipidemic model. The significant effect was observed with fractionated part of ethonolic extract of *Ailanthus excelsa* Roxb (200 + 200 mg/kg) in lowering lipid profiles. The levels of lipid parameters reduces significantly after administration of drug extracts in different doses which may be due to active constituents present in the form of steroidal compounds, triterpenes, alkaloids, flavonoids in the form of kaempferol, luteolin and apigenin (Brown et al., 1986). The research investigations pertains for analyzing the biological and molecular behavior of traditionally recognized natural drug *Ailanthis excelsa* Roxb on lipid profiles and the results were encouraging for further assessment to elucidate both mechanisms on chronic hyperlipidemia models. (Vogel’s I.J., 1998).

REFERENCES


