Evaluation of ethanolic extract of root of Bergenia ligulata for hepatoprotective, diuretic and antipyretic activities

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ABSTRACT

The Ethanolic extract of the roots of Bergenia ligulata were assessed for Hepatoprotective, Diuretic and Antipyretic activities in albino rats that was compared with standard drugs. Evaluation of the Hepatoprotective activity was done by measuring the levels of Serum Glutamate Pyruvate Transaminase (SGPT), Serum Glutamate Oxaloacetate Transaminase (SGOT), Serum Alkaline Phosphatase (ALP) and Total Bilirubin levels. Evaluation of the Diuretic activity was done by measuring the volume of urine collected at the end of 5 hrs and Na+, K+ and Cl- concentrations in the urine. Rectal temperature was recorded at a time interval of 0, 30 min, 1h, 2h, 3h after drug administration for evaluation of Antipyretic activity. The Ethanolic extract of the roots of Bergenia ligulata was found to produce significant activities.

Keywords: Bergenia ligulata root, Hepatoprotective, Diuretic and Antipyretic.

INTRODUCTION

Bergenia ligulata a perennial herb with thick rootstock. Stem short, fleshy, flowers white, pink or purple occurs in temperate regions from Kashmir region to Bhutan. It is found in the Himalayas between the altitudes of 2,000 and 2,500 meters. The roots of Bergenia ligulata contain tannic acid, gallic acid, starch, mineral salt, albumin, glucose, mucilaginous matter, wax and aromatic substances. The roots of Bergenia ligulata are used as an antidiabetic drug, diuretic, astringent, cardiotonic, wound healer, expectorant, antipyretic and anti-haemorrhoidal.1-3 The root is used as a tonic in fever, diarrhoea and also in an antiscorbutic. This plant explore very little for Pharmacological evaluation, hence an effort has been made to establish the Hepatoprotective, Diuretic and Antipyretic Activities.

MATERIALS AND METHODS

Plant material

The plant of Bergenia ligulata was collected from hilly areas of Dehradun, Uttarakhand, authenticated by Dr. Santosh Kumar Agarwal, Reader and Head, P.G Department of Botany, D.B.S (PG) College, Dehradun. The roots of Bergenia ligulata were dried in shade and subjected to reduction to a coarse powder using grinding mill. The coarse powder was extracted with ethanol (95%) in Soxhlet extractor. The ethanolic extract of the root was concentrated in rotary flash evaporator. The residue was dried in a desicator over sodium sulphate and used to assess the Hepatoprotective, Diuretic and Antipyretic Activities.

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Animals

Wistar albino rats, weighing 120-150 g, were used for evaluation of Hepatoprotective, Diuretic and Antipyretic Activities. All the animals were housed in polypropylene cages at room temperature fed on standard pellet diet and water ad libitum. The Institutional Ethics Committee approved all the experimental protocols.

Acute toxicity study

Acute toxicity studies were carried out for ethanolic extract of Bergenia ligulata on healthy Swiss albino mice of body weight 25-35g by using Up and Down or Stair case method.4 All the animals were housed in polypropylene cages at room temperature fed on standard pellet diet and water ad libitum. The maximum non-lethal dose was found to be 5g/ kg- body weight. Hence 1/10th of the dose was taken as test dose (500mg/kg- body weight).

Hepatoprotective activity

The assessment of hepatoprotective activity was carried out on male albino rats of wistar strain weighing between 150- 180 gm.5 The Liv 52 syrup was used as standard manufactured by Himalaya Drug Company, Bangalore and carbon tetra chloride was used to induce hepatotoxicity.

The animals were divided in three groups of six each. Group I- Normal control (administered with 1% Gum acacia in distilled water), Group II- Negative control (CCl4 intoxicated, 0.7 ml/kg b.w, ip), Group III- administered with ethanolic extract of root (500.0 mg/kg b.w, p.o/ day). The doses were given for various groups as mentioned above for ten successive days. CCl4 was given on 3rd, 6th and 10th day for all groups except Group I. On the 10th day one hour after the last dose of
sured at the end of 5 h and during this period, no food and water was given to separate urine and faeces. The volume of urine collected was measured, the animals were placed in metabolic cages, specially designed given 25 ml / kg of body weight normal saline orally. Immediately after dose, the animals were treated with standard drug furosemide at a dose of dose 20 mg / kg b.w, p.o. Group III- Standard group animals, treated with standard drug Paracetamol at a dose of dose 500 mg / kg b.w, p.o.

The normal body temperature of each animal was measured by flexible thermister probe coated with the lubricant was inserted 3-4 cm deep into rectum and temperature was recorded. Pyrexia was induced by injecting (subcutaneously) 2.0 ml / kg, b.w of 20% aqueous suspension of Brewer’s yeast (Saccharomyces cerevisiae) in normal saline. After 18 h of yeast injection the rectal temperature was recorded at a time interval of 0, 30 min, 1h, 2h and 3h after drug administration.

Table No.1 Hepatoprotective activity of Ethanolic extract of root of Bergenia ligulata in albino rats

<table>
<thead>
<tr>
<th>Groups</th>
<th>SGOT</th>
<th>SGPT</th>
<th>ALP</th>
<th>Total Bilirubin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal Control</td>
<td>174±9.406</td>
<td>64.62±4.517</td>
<td>182.02±11.059</td>
<td>0.73±0.050</td>
</tr>
<tr>
<td>Negative Control</td>
<td>304.45±12.675</td>
<td>163.52±9.058</td>
<td>305.17±11.451</td>
<td>1.47±0.149</td>
</tr>
<tr>
<td>Positive Control</td>
<td>173.32±5.547</td>
<td>72.15±10.269</td>
<td>191.07±13.301</td>
<td>0.72±0.047</td>
</tr>
<tr>
<td>Ethanolic Extract</td>
<td>203.45±6.942</td>
<td>87.15±3.750</td>
<td>212.87±5.177</td>
<td>0.72±0.0645</td>
</tr>
</tbody>
</table>

The Data are expressed as Mean ± SEM Student’s-t test method

Table No.2 Diuretic activity of Ethanolic extract of root of Bergenia ligulata in albino rats

<table>
<thead>
<tr>
<th>Groups</th>
<th>Urine Volume (ml)</th>
<th>Electrolyte Excretion (m Mole/lit)</th>
<th>Na⁺ / K⁺ Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal Control</td>
<td>1.14±0.004</td>
<td>98.45±0.042</td>
<td>101.46±0.42</td>
</tr>
<tr>
<td>Standard</td>
<td>3.1±0.051</td>
<td>138.15±0.042</td>
<td>152.18±0.060</td>
</tr>
<tr>
<td>Ethanolic Extract</td>
<td>2.72±0.006</td>
<td>121.2±0.060</td>
<td>139.06±0.049</td>
</tr>
</tbody>
</table>

The Data are expressed as Mean ± SEM Student’s-t test method

Table No.3 Antipyretic activity of Ethanolic extract of root of Bergenia ligulata in albino rats

<table>
<thead>
<tr>
<th>Groups</th>
<th>Normal Rectal Tem (°c)</th>
<th>Rectal Tem(°c) After Yeast Administration</th>
<th>Rectal Temperature After Treatment (°c) Mean±SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean ±SEM</td>
<td>Mean ± SEM</td>
<td>Mean±SEM</td>
</tr>
<tr>
<td>Normal Control</td>
<td>36.90±0.046</td>
<td>38.01±0.041</td>
<td>37.91±0.023</td>
</tr>
<tr>
<td>Standard</td>
<td>37.00±0.046</td>
<td>38.12±0.009</td>
<td>37.35±0.008</td>
</tr>
<tr>
<td>Ethanolic Extract</td>
<td>36.98±0.007</td>
<td>37.98±0.010</td>
<td>37.11±0.006</td>
</tr>
</tbody>
</table>

The normal body temperature of each animal was measured by flexible thermister probe coated with the lubricant was inserted 3-4 cm deep into rectum and temperature was recorded. Pyrexia was induced by injecting (subcutaneously) 2.0 ml / kg, b.w of 20% aqueous suspension of Brewer’s yeast (Saccharomyces cerevisiae) in normal saline. After 18 h of yeast injection the rectal temperature was recorded at a time interval of 0, 30 min, 1h, 2h and 3h after drug administration.

CCL₄ injection the animals were scarified by cervical dislocation and blood was collected from carotid artery. The serum was separated by centrifugation for the estimation of the levels of Serum Glutamate Oxaloacetate Transaminase (SGOT), Serum Glutamate Pyruvate Transaminase (SGPT), Serum Alkaline Phosphatase (ALP) and Total Bilirubin levels. The values are expressed as mean ± SEM.

Antipyretic activity

The assessment of Antipyretic activity was carried out using Brewer’s Yeast induced pyrexia method in wistar rats. Paracetamol tablet was purchased from local market manufactured by Ind-Swift Limited, Parwanoo (Himachal Pradesh), made into powder in a mortar pestle and add to it 2% gum acacia. This solution was attributed to make a fine suspension. The dose was (20 mg / kg b.w, p.o.).

The animals were deprived of food and water for 18 hours prior to the experiment and then divided in three groups of six each. Group I- Normal control group animals, treated with 2% gum acacia suspension only at a dose of 10 ml / kg b.w. Group II- Standard group animals, treated with standard drug furosemide at a dose of dose 20 mg / kg b.w, p.o. Group III- Test group animals, treated with ethanolic extract of Bergenia ligulata in a 2% gum acacia at a dose of dose 500 mg / kg b.w, p.o.

The assessment of diuretic activity. Furosemide tablet was purchased from local market manufactured by Aventis Pharma Limited, GIDC estate Ankleshwar, made into powder in a mortar pestle and add to it 2% gum acacia. This solution was attributed to make a fine suspension. The animals were divided in three groups of six each. Group I- Normal control group animals, treated with 2% gum acacia suspension only at a dose of 10 ml / kg b.w. Group II- Standard group animals, treated with standard drug furosemide at a dose of 20 ml / kg b.w, p.o. Group III- Test group animals, treated with ethanolic extract of Bergenia ligulata in a 2% gum acacia at a dose of 500 mg / kg b.w, p.o.
RESULTS AND DISCUSSION

The degree of hepatotoxicity developed by CCl\textsubscript{4} toxicant can be well known by elevated levels of SGOT, SGPT, ALP and Total Bilirubin, which is attributed to generation of CCl\textsubscript{3} free radical during metabolism by hepatic microsomes which in turn causes oxidation of lipids of cellular membrane. The Group III- animals treated with ethanolic extract of roots of \textit{Bergenia ligulata} has shown significant decrease in the levels of SGOT, SGPT, ALP and Total Bilirubin as compared to Group II- animals (negative control group) Table no.-1. Hence the ethanolic extract of roots of \textit{Bergenia ligulata} can be used as hepatoprotective.

Result of the evaluation of Diuretic activity showed that ethanolic extract of roots of \textit{Bergenia ligulata} is effective in increasing urinary electrolyte concentration of all ions Na\textsuperscript{+}, K\textsuperscript{+}, Cl\textsuperscript{-} Table no.-2. It means it possesses a significant diuretic activity. The concentration of aldosterone was found to be dependent on Na\textsuperscript{+} / K\textsuperscript{+} ratio. If the Na\textsuperscript{+} / K\textsuperscript{+} ratio falls below the normal in plasma the aldosterone secretion will be decreased and if the ratio rises the aldosterone secretion will be increased. Active phytochemicals such as flavoinds and saponins are known to responsible for diuretic activity. These active principles are present in ethanolic extract of root of \textit{Bergenia ligulata} may be responsible for diuretic activity.

The present study for evaluation of Antipyretic activity the findings revealed that the ethanolic extract of roots of \textit{Bergenia ligulata} has shown the significant antipyretic activity, it has shown significant fall in body temperature up to the 4 h following its administration Table no.-3. The response was comparable to that of antipyretic activity of Paracetamol a standard antipyretic drug.

CONCLUSION

The present study was aimed at finding out whether root of \textit{Bergenia ligulata} possesses Hepatoprotective, Diuretic and Antipyretic activities or not. From the present study it is evident that \textit{Bergenia ligulata} could play an important role in the management of Hepatotoxicity, Diuretic and Antipyretic. As the human being thinks of such drug which are safe, economic having low cost of production, wide distribution and easily available. We may conclude that the root of \textit{Bergenia ligulata} could be useful and safe if we used as Hepatoprotective, Diuretic and Antipyretic. Further study is in progress to isolate and characterized the active principle responsible for these activities.

REFERENCES