Effect of methanolic leaf extract of *Parinari curatellifolia* on rat liver and kidney

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*Parinari curatellifolia* is a valuable and cherished medicinal plant in which different parts of the plant are widely used by the traditional herbalist in the treatment of many diseases. Effect of methanolic leaf extract of *P. curatellifolia* on the liver and kidney of albino rats was investigated. Different doses of 100, 200, 300 and 400 mg/kg/bw of the crude extract were administered to rats daily for a period of 21 days. Serum Alanine Transaminase (ALT), Aspartate Transaminase (AST) and Alkaline Phosphatase (ALP) of the treated animals increased significantly (p < 0.05). Similarly, serum levels of creatinine and urea also increased significantly (p < 0.05) when compared to the control group. There was insignificant difference in the level of bilirubin and protein content. Increase in the serum levels of these biochemical parameters appear to be dose dependent. This is suggestive of liver or kidney impairment caused by the methanolic extract of the plant.

**Key words:** Alanine transaminase (ALT), aspartate transaminase (AST) and alkaline phosphatase (ALP), urea and creatinine.

INTRODUCTION

A medicinal plant is any plant used for therapeutic purpose or as precursor for the synthesis of useful drugs (Sofowora, 1993). The use of medicinal plants for treating diseases is as old as human species. Popular observations on the use and efficacy of medicinal plants significantly contribute to the disclosure of their therapeutic properties, so that they are frequently prescribed, even if their chemical constituents are not completely known. Herbal or phytomedicine are medicine derived from plants. They remain the most common form of alternative medicine and are used by about 60% of the world population both in developing and developed countries where modern medicine are predominantly used (Rickert et al., 1999).

*Parinari curatellifolia* is a valuable and cherished medicinal plant in which different parts of the plant are widely used by the traditional herbalist in the treatment of diabetes and other disease conditions and has been evaluated for its ant-diabetic activities (Ogbonnia et al., 2009). *P. curatellifolia* has various uses in traditional medicine. It is utilized in the treatment of epiglottitis by the people of Eha-Amufu, in Enugu State, Nigeria. The efficacy of this plant on epiglottitis has been evaluated (Eze and Wurochekke, 2013). Due to the indiscriminate and increasing use of *P. curatellifolia* for herbal remedy in the African sub region, it becomes important to ascertain the safety and possible toxic effect of the various parts of these plants on sensitive organs of the body. This research was therefore designed to investigate the toxic effect of the methanolic extract of *P. curatellifolia* leaf on the kidney and liver.

MATERIALS AND METHODS

Collection and identification of the plant material

The plant was collected from Isu village in Eha-Amufu of Enugu State, Nigeria. It was identified and authenticated by a staff of Botany Department, University of Nigeria.
Table 1. Effect of *P. curatellifolia* methanolic leaf extract on some biochemical parameters of liver.

<table>
<thead>
<tr>
<th>Groups</th>
<th>ALT (U/L)</th>
<th>AST (U/L)</th>
<th>ALP (U/L)</th>
<th>BIL (μmol/l)</th>
<th>TP (μmol/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>10.00 ± 0.94</td>
<td>7.00 ± 0.47</td>
<td>22.33 ± 0.72</td>
<td>1.02 ± 0.02</td>
<td>2.00 ± 0.24</td>
</tr>
<tr>
<td>Group 1 (100mg/kg)</td>
<td>14.33 ± 1.18*</td>
<td>14.00 ± 0.47*</td>
<td>28.00 ± 0.94*</td>
<td>1.30 ± 0.27</td>
<td>2.40 ± 0.09</td>
</tr>
<tr>
<td>Group 2 (200mg/kg)</td>
<td>16.00 ± 3.69*</td>
<td>16.67 ± 1.09*</td>
<td>31.00 ± 0.82*</td>
<td>1.31 ± 0.03*</td>
<td>2.50 ± 0.24</td>
</tr>
<tr>
<td>Group 3 (300mg/kg)</td>
<td>19.00 ± 0.94*</td>
<td>23.00 ± 0.94*</td>
<td>36.00 ± 0.94*</td>
<td>1.35 ± 0.15</td>
<td>2.93 ± 0.38</td>
</tr>
<tr>
<td>Group 4 (400mg/kg)</td>
<td>29.33 ± 2.13*</td>
<td>33.00 ± 0.47*</td>
<td>42.00 ± 3.56*</td>
<td>1.58 ± 0.23*</td>
<td>3.19 ± 0.14*</td>
</tr>
</tbody>
</table>

Values are expressed as mean ± standard error of mean (SEM). * Significantly different from control group (P < 0.05). ALT = Alanine transaminase, AST = Aspartate transaminase, ALP = Alkaline phosphatase, BIL = Bilirubin, TP = Total protein.

Nsukka. The voucher specimen was deposited at the herbarium of Modibbo Adama University of Technology, Yola, for references.

Preparation of the plant extract

The leaf of the plant was collected, air dried and ground using a milling machine. The powdered material was transferred into a Soxhlet apparatus and extracted in the Soxhlet extractor using methanol for 24 h. The extract was concentrated by evaporating to dryness and the residue obtained. The residue was transferred into a pre-weighed sample container, and stored at -4°C until when required for use.

Experimental design

Forty-five (45) male wistar albino rats were purchased from the animal house unit of the National Veterinary Research Institute (NVRI), Vom, Jos, Plateau state, Nigeria. They were housed in a steel cage at room temperature, and fed with pelleted standard laboratory feed (Grand cereal). The rats were allowed to acclimatize to the laboratory condition for a period of one week. The animals were grouped into five, each group consisting of (9) rats

- Group 1: Normal control
- Group 2: Treated with 100mg/kg/bw
- Group 3: Treated with 200mg/kg/bw
- Group 4: Treated with 300mg/kg/bw
- Group 5: Treated with 400mg/kg/bw

Administration of the extract

The extract was administered to the rats using a force feeding tube for a period of 21 days. Animals were maintained under environmentally controlled conditions of about 25°C and 13 h light: 11 h dark cycle. The animals had access to water and standard diet *ad libitum* and were kept in their cages for at least 7 days prior for acclimatization in the laboratory conditions.

Collection and handling of sample

At the end of the experiment, the animals were subjected to 24 h fasting and sacrificed after being anaesthetized with diethyl ether. The blood collected by cardiac puncture was centrifuged for 5 min at 3000 rpm using a bench centrifuge. The serum obtained was used to determine the serum levels of the Alanine Transaminase (ALT), Aspartate Transaminase (AST), Serum Creatinine, Serum Urea, Alkaline Phosphatase (ALP), Bilirubin and Total Proteins. The parameters were analyzed using the Randox-Kit.

Statistical analysis

Results were subjected to statistical analysis software SPSS (version 15.0) for analysis. Differences were considered significant if p < 0.05. All data were expressed as mean ± standard error of the mean.

RESULTS AND DISCUSSION

The liver and the kidney are important organs of the body which play important roles in metabolic processes. While the liver primarily detoxifies harmful substances, secretes bile, synthesizes and store important molecules, the kidney helps in maintaining homeostasis of the body by reabsorbing important materials and excreting waste products. In addition, the kidney maintains fluid electrolyte, acid-base balance (Levinthal and Tavil, 1999; Harris, 2005).

Serum levels of Alanine Transaminase and Aspartate Transaminase significantly increased in all the extract treated groups compared to the control group (Table 1).

The increased concentration of aminotransferases, such as alanine aminotransferase (ALT) and aspartate aminotransferase (AST) observed in this study may be as
Table 2. Results of the effect of Parinari curatellifolia methanolic leaf extract on some biochemical parameters of Kidney.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Urea (mg/dL)</th>
<th>Creatinine (mg/dL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>25.34 ± 0.37</td>
<td>0.27 ± 0.05</td>
</tr>
<tr>
<td>Group 1 (100mg/kg)</td>
<td>29.96 ± 3.15</td>
<td>0.40 ± 0.09</td>
</tr>
<tr>
<td>Group 2 (200mg/kg)</td>
<td>35.09 ± 2.39*</td>
<td>0.47 ± 0.14</td>
</tr>
<tr>
<td>Group 3 (300mg/kg)</td>
<td>46.82 ± 2.14*</td>
<td>0.53 ± 0.11</td>
</tr>
<tr>
<td>Group 4 (400mg/kg)</td>
<td>51.47 ± 4.91*</td>
<td>1.33 ± 0.14*</td>
</tr>
</tbody>
</table>

Values are expressed as mean ± standard error of mean (SEM)

* Significantly different from control group (P< 0.05)

A result of damage done to the liver by the extract. This is because, ALT and AST are excellent biomarkers of liver injury caused by exposure of the liver to toxic substances (Ranjina, 1999). When the integrity of the hepatocellular membrane is compromised, it leads to extrusion of the enzymes from the liver into the plasma (Moss and Henderson, 1996).

Creatinine and urea are markers of glomerular filtration rate. The increase in creatinine and urea observed in this study (Table 2) may be as result of malfunctioning of the kidney or damage done on the kidney by the extract. This is because increase in creatinine and urea is seen when the kidney is damaged or when the kidney is not functioning properly (Deepak et al., 2011). These increases appeared to be dose dependent

Bilirubin and total protein showed no significant difference compared to the control group (p < 0.05). Bilirubin acts as one of the markers of biliary function and cholestasis (Haris, 2005). Bilirubin is measured to diagnose and/or monitor liver diseases such as cirrhosis, hepatitis, or gall stones (AACN, 2012). Low serum bilirubin concentration could be one of the important factors for the high incidence of cardiovascular diseases (Fukui et al., 2011).

**Conclusion**

It could be seen from this study that the hepatocellular membrane was compromised by the leaf extract of this plant which led to the extrusion of the assayed enzymes from the liver, thereby increasing their serum concentration. The increase in renal parameters used in this study also showed that there was renal impairment. The increase in the concentration of the assayed biochemical parameters appeared to be dose dependent.

The results obtained for the methanolic extract of *P. curatellifolia* leaf is suggestive of hepatotoxicity and renal impairment.

**Acknowledgement**

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**REFERENCES**


