Modulation of renal functions by *Momordica charantia* L. in acetaminophen-intoxicated rabbits

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ABSTRACT

Renal function tests (serum creatinine, urea and uric acid), were performed in acetaminophen-intoxicated rabbits during hepatoprotective and hepatocurative treatment with *Momordica charantia* fruit extract. In hepatocurative group, the *M. charantia* treatment was preceded by acetaminophen intoxication, whereas, in hepatoprotective group, the acetaminophen intoxication was preceded by *M. charantia* treatment. The results showed that *M. charantia* played both hepatoprotective and hepatocurative roles.

Key words: Renal Function Tests, Creatinine, Urea, Uric acid, Acetaminophen, *Momordica charantia*.

INTRODUCTION

Various medicinal properties have been claimed for *Momordica charantia* L. that include anti-diabetic and anti-malarial; also it has been found effective against jaundice, kidney stones, leprosy, piles, pneumonia, rheumatism and scabies. There are different reports available on clinical use of *M. charantia* in cancer patients that have shown promising results. Semiz & Sen (2007) have studied the effect of *M. charantia* fruit extracts on anti-oxidant enzymes in rats. The results indicated that there was a significant increase especially in hepatic antioxidant enzymes such as superoxide dismutase, catalase and glutathione peroxidase. Dandagi et al. (2008) explored the hepatoprotective activity of extract of *M. charantia* against experimental hepatotoxicity, and observed significant results. The hepatoprotective activity of hydro-alcoholic extract of *M. charantia* leaves was evaluated, by estimation of SGOT, SGPT, ALP and total Bilirubin. In *M. charantia* treated animals, the toxic effects of CCl₄ were controlled significantly by restoration of increased levels of SGOT, SGPT, ALP and total Bilirubin (Chaudhri et al., 2009). The present study was designed to explore the hepatoprotective and hepatocurative properties of *Momordica charantia* in the chemically-induced liver damage in rabbits by changes in renal function tests (RFTs).

MATERIALS & METHODS

The fruits of *M. charantia* were procured from the local market. The collected fruits were washed with water, shade dried and ground to coarse sized powder. 500 grams *Momordica* powder was soaked in 4 liters of absolute methanol for two weeks with occasional shaking and then filtration was done. This filtrate was subjected to rotary evaporator at 42-45° C to
evaporate the solvent (Methanol). Thus the crude extract of *Momordica charantia* fruit was obtained.

Male rabbits (*Oryctolagus cuniculus*), weighing 1-2 kg were used. The animals were housed in the GC University Animal House under standard conditions and fed with standard diet. Acetaminophen was used as a hepatotoxic drug. Chemical kits by Audit Diagnostics, Ireland and Biocon Diagnostik, Germany, were used for RFT assays.

Rabbits were randomly divided into the two groups, namely, Hepatocurative and Hepatoprotective groups. The hepatocurative group, consisting of 5 rabbits, was acclimatized for one week. These rabbits were given the acetaminophen (1500 mg /Kg body wt./day) orally for 3 days. The rabbits were given the *Momordica* extract's oral dose (200mg/kg body wt./day). This treatment started on 4th day of the study and ended on 20th day. Blood was assayed at different intervals during the treatment i.e. on 6th day, 11th day, 16th day, and 20th day, for different renal function tests. In hepatoprotective studies, animals were given the same *Momordica* extract dose orally (200mg/kg body wt./day) for 15 days. After the treatment with *Momordica* extract, i.e on 16th day, the rabbits were given acetaminophen (1500 mg /Kg body wt./day) suspended in 20 ml of distilled water, for 6 days. Blood sampling was done on 18th day and on 21st day, and different renal function tests were performed.

The results were analyzed by using ANOVA (One-way Analysis of Variance). Probability less than 0.05 (P< 0.05) was considered significant.

**RESULTS**

**Hepatocurative Treatment**

**Creatinine:**

In the hepatocurative group the acetaminophen administration to the rabbits, at 1500 mg/kg body weight, led to a considerable and significant increase in creatinine concentration (72.99±1.5 mg/dl) as compared to the control values (10.06±0.98 mg/dl). The treatment with *Momordica* extract of acetaminophen poisoned rabbits led to a significant decrease in creatinine values (57.3±0.05, 49.6±1.18, 35.1±0.44, 34.7±0.78 mg/dl after 11th, 16th, and 20th days of treatment with *Momordica* extract, respectively) (Table 1).

**Urea:**

The urea level of blood was elevated significantly (34.9±0.004 mmol/l) after intoxication of rabbits with acetaminophen at 1500 mg/kg body weight as compared to the control concentration of blood urea (16.2±0.68 mmol/l.). Then treatment of these rabbits with fruit extract of bitter melon resulted in the gradual and significant decrease in urea concentration (31.8±1.0*, 31.2±1.12, 27.7±0.98, 26.5±0.56 mmol/l after 6th, 11th, 16th, and 20th days of treatment with *Momordica* extract, respectively) (Table 1).

**Uric Acid:**

The concentration of uric acid was decreased (0.22±0.62 mg/dl) by administration of acetaminophen (1500 mg/kg body weight for three days) as compared to control group (1.3±0.08 mg/dl). The subsequent treatment with extract of *Momordica* (200mg/ kg body weight/ day) increased the uric acid concentration progressively (0.26±1.5, 0.41±1.12, 0.44±0.32, 0.57±0.55
mg/dl after 6th, 11th, 16th, and 20th day of the treatment, respectively) towards the normal level of uric acid indicating the hepatocurative role of *M. charantia* (Table 1).

**Hepatoprotective Treatment**

**Creatinine:**

In hepatoprotective group, the treatment with the extract of *Momordica* (200mg/ kg body weight/ day) for fifteen days produced a decrease of creatinine concentration (9.06±0.22 mg/dl) as compared to normal values (10.15±0.08 mg/dl). Then the liver of these rabbits was challenged with acetaminophen (1500 mg/kg body weight/ day) and a rise in the creatinine value was observed i.e. 25.8±0.65 and 36.74±1.2 mg/dl on 18th day and 21st days, respectively (Table 2).

**Urea:**

The urea level was decreased slightly (17.3±0.87 mmol/l) after the administration of *Momordica* extract (200mg/ kg body weight/ day) for fifteen days as compared to control values of urea (19.2±0.12 mmol/l). After the administration of acetaminophen, the urea levels of these rabbits were increased significantly (24.3±0.96 and 30.7±1.2 mmol/l on 18th day and 21st days, respectively) (Table 2).

**Uric Acid:**

Administration of *Momordica* extract to the rabbits resulted in slight increase in uric acid (1.8±1.30 mg/dl) as compared to normal value of uric acid (1.5±0.006 mg/dl). These rabbits were intoxicated with acetaminophen and a decrease in uric acid was observed (0.81±1.2 and 0.67±1.23 mg/dl on 18th day and 21st day, respectively) (Table 2).

**Table 1: Concentrations of creatinine, urea and uric acid in blood sera of acetaminophen intoxicated rabbits, subsequently treated with extract of *M. charantia* (Hepatocurative treatment).**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Creatinine (mg/dl)</th>
<th>Urea (mmol/l)</th>
<th>Uric Acid (mg/dl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (Day 0)</td>
<td>10.06±0.98</td>
<td>16.2±0.68</td>
<td>1.3±0.08</td>
</tr>
<tr>
<td>Acetaminophen (Day 3)</td>
<td>72.99±1.5</td>
<td>34.9±0.004</td>
<td>0.22±0.62</td>
</tr>
<tr>
<td><em>Momordica</em> Extract (Day 6)</td>
<td>57.3±0.05</td>
<td>31.8±1.0</td>
<td>0.26±1.5</td>
</tr>
<tr>
<td><em>Momordica</em> Extract (Day 11)</td>
<td>49.8±1.18</td>
<td>31.2±1.12</td>
<td>0.41±1.12</td>
</tr>
<tr>
<td><em>Momordica</em> Extract (Day 16)</td>
<td>35.1±0.44</td>
<td>27.7±0.98</td>
<td>0.44±0.32</td>
</tr>
<tr>
<td><em>Momordica</em> Extract (Day 21)</td>
<td>34.7±0.78</td>
<td>28.5±0.56</td>
<td>0.57±0.55</td>
</tr>
</tbody>
</table>

Numbers in parentheses indicate the number of animals.
Table 2: Concentrations of creatinine, urea and uric acid in blood sera of *M. charantia* treated rabbits, subsequently having acetaminophen intoxication (Hepatoprotective treatment).

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Creatinine (mg/dl)</th>
<th>Urea (mmol/l)</th>
<th>Uric Acid (mg/dl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (Day 0)</td>
<td>10.15±0.08</td>
<td>19.2±0.12</td>
<td>1.5±0.006</td>
</tr>
<tr>
<td><em>Momordica</em> Extract (Day 15)</td>
<td>9.06±0.22</td>
<td>17.3±0.87</td>
<td>1.8±1.30</td>
</tr>
<tr>
<td>Acetaminophen (Day 18)</td>
<td>25.8±0.65</td>
<td>24.6±0.56</td>
<td>0.81±1.2</td>
</tr>
<tr>
<td>Acetaminophen (Day 21)</td>
<td>36.74±1.2</td>
<td>30.7±1.2</td>
<td>0.67±1.23</td>
</tr>
</tbody>
</table>

Numbers in parentheses indicate the number of animals.

**DISCUSSION**

Present study showed that *M. charantia* played both roles, i.e., hepatoprotective and hepatocurative. The curative role of *M. charantia* was evident from the significant decrease in creatinine and urea values which were elevated considerably and significantly on acetaminophen intoxication. The protective role of *M. charantia* was shown by less increase in creatinine and urea values on acetaminophen intoxication in rabbits treated with *M. charantia* before acetaminophen intoxication than the increase in these values on acetaminophen intoxication in rabbits not treated with *M. charantia*. In a related study by Grover *et al.* (2002), streptozoin- induced diabetic mice showed several times higher mean values of serum creatinine, urinary albumin, urine volume and renal weight compared to normal mice, but these values were significantly less in *M. charantia* treated animals. Koriem *et al.* (2009), evaluated the protective effect of some medicinal plants against liver and kidney toxicity induced by cadmium chloride.

The results in our study suggested beneficial properties of *Momordica* extract against experimentally-induced hepatotoxicity of acetaminophen. The possible mechanism of the protection may be due to the potential antioxidant activity of this plant proven experimentally.

**REFERENCES**


