Research Paper

Biochemical Effects on the Liver and Kidney of Rats Administered Aqueous Leaf Extract of *Guira Senegalensis*

A.U. Wurochekke1,* and S. Usman1

1 Biochemistry Department, Modibbo Adama University of Technology, Yola

* Corresponding author, e-mail: (wchekke@yahoo.co.uk)

(Received: 20-10-13; Accepted: 29-11-13)

**Abstract:** Effect of crude aqueous extract of *guira senegalensis* on liver and kidney of albino rats have been investigated. The levels of serum alanine aminotransferase (ALT) and aspartate aminotransferase (AST) of treated animals have significantly increased compared to the control group. Increased levels of these enzymes appeared dose dependent. Both ALT and AST have significantly (p>0.005) increased in animals treated with the highest dose (900mg/kg) compared to the control and other treated groups. Similarly, serum levels of urea and creatinine of treated animals have significant (p<0.005) increase compared to the control group. The result is suggestive of liver and kidney impairment by the crude extract.

**Keywords:** Guira senegalensis, ALT, AST, Urea, Creatinine.

**Introduction**

*Guira senegalensis* is a tropical medicinal plant of the family *combratacea* [1]. The plant is widely distributed in the west African savannah and it grows as a shrub in dry localities where rain fall is small [2][3].

Medically the plant is used to treat hemorrhoids, dysentery, malaria, gastroenteritis, wound and skin infections [4]. Other uses include improvement of lactation after child bath, prevention of leprosy, chest complain and treatment of rheumatic conditions [5]. Herds men in northern Nigeria traditionally use the crude leaf extract in the treatment of trypanosomiasis [6]. Wurochekke [7]. also reported the *in vitro* and *in vivo* trypanocidal activity of the leaf extract of the plant against *Trypanosoma brucei brucei*. 
The crude leaf extract of the plant also has *in vitro* detoxifying action against snake venom [8]. The exact target of action of the leaf extract on venom and the biochemistry that is involved in the process have been reported [9].

Recently, the number of people using medicinal plants have been rapidly increased and therefore national health authorities are beginning to express concern over the safety and efficacy of these products since almost all of them are sold over the counter and are not registered [10].

No doubt, *guira senegalensis* has a great potential in combating various diseases and traditional healers encourage the use of this plant for treatment. However, its safety on some important organs have not been reported. The present work was therefore undertaken to evaluate the effect of the crude aqueous leaf extract, which is mostly used, on the liver and kidney of rats.

**Materials and Methods**

**Plant**

Leaf of *guira senegalensis* was collected around Girei, a village near federal university of technology, Yola. The plant was authenticated and a voucher specimen deposited at the forestry department of the same university. The leaf was shade dried and made into fine powder.

**Animal Grouping**

Twenty Wister rats weighing between 100-120g were purchased from veterinary research institute, Vom, Jos. They were housed in a well ventilated room and were given commercial diet and water *ad libitum*. The animals were grouped into four of five rats each.

- Group 1: Normal control.
- Group 2: Treated with 300mg/kg/day.
- Group 3: Treated with 600mg/kg/day.
- Group 4: Treated with 900mg/kg/day.

**Preparation of Aqueous Extract**

Fifty (50g) grams of the fine powder of the leaf was suspended in 500ml of water and stirred magnetically for six hours. The extract was filtered and the filtrate concentrated under reduced pressure using rotary evaporator.

**Sample Handling**

At the end of the experiment, blood was collected from the rats by direct heart puncture and serum was obtained. The levels of alkaline phosphatase was determined [11]. Alanine aminotransferase (ALT) and aspartate aminotransferase (AST) were determined [12]. Similarly, liver and kidney tissues of the rats were homogenized and the supernatant used for the analysis.

**Statistical Analysis**

Results were presented as mean± standard error of mean for all groups. Student t-test was used for test of significance between two groups.
Results

Table 1 shows the result of serum levels of alanine aminotransferase (ALT), aspartate aminotransferase (AST) and alkaline phosphatase (ALP). All the enzymes in the treated groups have significantly (p<0.005) increased compared to the control group. Increased in the enzymes levels appeared dose dependent. Group treated with the highest dose (900mg/kg) had the highest level of the serum enzymes.

**Table 1: Serum levels of ALT, AST and ALP**

<table>
<thead>
<tr>
<th>GROUP</th>
<th>ALT (U/L)</th>
<th>AST (U/L)</th>
<th>ALP (U/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NORMAL</td>
<td>8.0±0.002</td>
<td>7.0±0.008</td>
<td>9.0±0.012</td>
</tr>
<tr>
<td>300mg/kg/day</td>
<td>21.0±0.002*</td>
<td>16.0±0.046*</td>
<td>18.0±0.002*</td>
</tr>
<tr>
<td>600mg/kg/day</td>
<td>48.0±0.003**</td>
<td>23.0±0.015**</td>
<td>33.0±0.002**</td>
</tr>
<tr>
<td>900mg/kg/day</td>
<td>77.0±0.009***</td>
<td>59.0±0.016***</td>
<td>43.0±0.003***</td>
</tr>
</tbody>
</table>

Values are mean of three observations ± SD;
*Values are significant (p<0.005) compared to the control.

Similarly, serum urea and creatinine have significantly (p<0.005) increased in the treated animals compared to the control group. Here also the effect observed is dose dependent (Table 2).

**Table 2: Serum levels of creatinine and urea**

<table>
<thead>
<tr>
<th>GROUP</th>
<th>UREA(mg/dL)</th>
<th>CREATININE(mg/dL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>1.5±0.040</td>
<td>2.1±0.006</td>
</tr>
<tr>
<td>300mg/kg</td>
<td>3.0±0.058*</td>
<td>6.4±0.058*</td>
</tr>
<tr>
<td>600mg/kg</td>
<td>6.2±0.086**</td>
<td>8.2±0.057**</td>
</tr>
<tr>
<td>900mg/kg</td>
<td>8.9±0.115***</td>
<td>9.5±0.404***</td>
</tr>
</tbody>
</table>

Values are mean of three observations ± S.E.M;
*Values are significant (p<0.005) compared to the control.

Table 3 shows the percentage weight gain of the experimental animals. There was slight percentage weight gain after the administration of the crude extract to the animals.
Table 3: Percentage weight gain of the experimental animals

<table>
<thead>
<tr>
<th>GROUP</th>
<th>MEAN INITIAL WEIGHT (g)</th>
<th>MEAN FINAL WEIGHT (g)</th>
<th>PERCENTAGE WEIGHT GAIN (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal control</td>
<td>108.6</td>
<td>128.0</td>
<td>15</td>
</tr>
<tr>
<td>300mg/kg</td>
<td>105.4</td>
<td>123.0</td>
<td>14.3</td>
</tr>
<tr>
<td>600mg/kg</td>
<td>97.8</td>
<td>117.0</td>
<td>16.4</td>
</tr>
<tr>
<td>900mg/kg</td>
<td>108.4</td>
<td>128.2</td>
<td>15.4</td>
</tr>
</tbody>
</table>

Discussion

Liver and kidney are two important organs that perform many functions for the healthy survival of the body. The liver primarily detoxifies harmful substances, secretes bile into intestine, synthesizes and stores important molecules among other things. The kidney helps in maintaining homeostasis of the body by reabsorbing important materials and excreting waste products.

Liver injury disrupts its normal function, symptoms, signs and abnormal blood tests of liver disease develop. Drug-induced liver diseases are similar to those of liver diseases caused by other agents such as viruses and immunologic diseases. They both cause elevations in blood levels of alanine aminotransferase and aspartate aminotransferase.

In the present work, the serum levels of both ALT and AST in the group administered 900mg/kg have significantly (p<0.005) increased compared to the control group. Increased serum levels of ALT, AST and ALP was due to hepatic release of these enzymes from the cytosol [13]. The extract has affected the integrity of the liver resulting to the release of these cytosolic enzymes into the blood. Liver injury from herbal remedies has ranged from mild elevation of liver enzymes to fulminated liver failure [14]. Toxicity of herbal preparation could be as a result of several factors including contaminations with pesticides, microbes, heavy metals, toxins or adulteration with orthodox drugs [14]. High content of alkaloids present in guira senegalensis could be responsible for the liver injury observed.

From the result, the effect of the extract on the liver is dose dependent, as higher doses resulted into high levels of enzymes released. This suggests that at higher dose extract-organ interaction is increased, and increased active principle in the extract exerts higher level of toxicity on the liver. Even though, there are increasing clinical reports on the organ toxicity associated with consumption of herbal medicine, there are some herbs found to be promising in the treatment of some liver diseases [15]. These herbs include Sylimarin for antifibrotic, phyllantus amarus in chronic hepatitis B, glycyrrhizin treat chronic viral hepatitis. Apart from therapeutic properties, reports have also indicated liver injury after the intake of herals, including those advertised for liver disease [15]. This could be due to metabolic activation of herbal components [16].

Similarly, the extract has also affected the kidneys. The level of serum urea of treated groups has significantly (p<0.005) increased compared to the control group. The level of blood creatinine in the group treated with the highest dose is significantly higher compared to the control group. Healthy kidney filtrate urea, which is waste product of protein metabolism, out of the blood. High levels of urea in the blood, as observed in the present work, is an indicative of impaired kidney. Increased creatinine level is also suggestive of kidney malfunction but because creatinine values are so variable
and can be affected by diet it is more accurate for determining reduced kidney function. The present work suggest that crude aqueous extract of guira senegalensis affect both the liver and kidney.

References