COMPARATIVE ANALYSIS OF HEPATOPROTECTIVE EFFECT OF ETHANOL EXTRACTS OF GONGRONEMA LATIFOLIUM AND ALTERNANTHERA DENTATE LEAVES IN RATS.

Sylvester Chika Ohadoma*

Department of Pharmacology, College of Medicine, Imo State University, Owerri, Nigeria.

ABSTRACT

Objective: To comparatively investigate the hepatoprotective effect of ethanol extracts of Gongronema latifolium and Alternanthera dentate leaves in experimental rats. Methods: Two sets (A and B) of four groups comprising five rats each were used. Each of A and B sets had a control group while the other 3 groups were administered different concentrations 100, 200 and 300 mg/kg of ethanol extracts of G. latifolium and A. dentate respectively, once daily for 14 days. The alanine transaminase (ALT), aspartate transaminase (AST), alkaline phosphatase (ALP), total protein (TP), albumin (ALB) and bilirubin (BIL) levels were evaluated. Results: All medicaments significantly (p<0.05) showed reduced ALT, AST, ALP, ALB, BIL and increased TP levels, with G. latifolium exhibiting greater efficacy than A. dentate. Conclusion: The leaves extracts of G. latifolium and A. dentate possess hepatoprotective effect.

KEYWORDS: Gongronema latifolium, Alternanthera dentate, hepatoprotective effect, comparative analysis.

INTRODUCTION

The use of medicinal plants especially in the developing countries for the treatment of common illnesses as well as persistent diseases has often maintained popularity for historical and cultural reasons.\cite{1,2} The practice has gained continued grounds making traditional medicine an inevitable global discourse. This age-long practice has encouraged research into pharmacologic activities of plants secondary metabolites and has improved modern pharmacotherapeutics around the world.\cite{3,4} The phytomedicines are now available as food...
supplements in most countries. Despite the essential contribution to healthcare delivery particularly in the developing countries like Nigeria mainly because of low cost and availability, yet there is growing concern about the safety of crude extracts from plants.\textsuperscript{[5]} Indeed, studies have established that some plants species are potentially toxic to vital organs such as liver, kidney, heart, pancrease, spleen, intestine, of animals.\textsuperscript{[6, 7]} The risk of such toxicity may be greater in individual taking other medications or with genetic traits that increase the bioavailability of these compounds.\textsuperscript{[8]} It is only when toxicity study data are compared to the evidence for beneficial health effects can a balanced judgment be made regarding the potential utility of these compounds for disease prevention and treatment.\textsuperscript{[9]} The versatility in the use of \textit{Gongronema latifolium} and \textit{Alternanthera dentate} in the management of several disease conditions and their safety/toxicity considerations, informed the choice for this study. \textit{Gongronema latifolium} referred to as bush buck belongs to the family Asclepiadaceae.\textsuperscript{[10]} It is known as ‘utazi’ in the South-eastern and ‘arokeke’ in the Southwestern parts of Nigeria.\textsuperscript{[11]} \textit{G. latifolium} has been reported to exert anthelminthic effect.\textsuperscript{[12]} The leaves are used to prepare soup for mothers that have recently put to bed, where it is believed to stimulate appetite, reduce post-partum contraction and enhance the resumption of the menstrual cycle.\textsuperscript{[13]} \textit{G. latifolium} is also notable for maintenance of blood glucose level\textsuperscript{[14]}, antioxidative effect\textsuperscript{[15]}, haemoglobin formation\textsuperscript{[16]}, blood pressure lowering\textsuperscript{[17]} and anti-inflammatory\textsuperscript{[10]} effects. The crude extract of \textit{Alternanthera dentate} leaves has reportedly been used for the treatment of night blindness; as antiviral against herpes simplex virus and treatment of snake and scorpion bites.\textsuperscript{[18]} This present study was aimed at comparing the hepatoprotective effects of \textit{G. latifolium} and \textit{A. dentate} in normal rats.

\textbf{MATERIALS AND METHODS}

\textbf{Plant materials}

The fresh leaves of \textit{Gongronema latifolium} and \textit{Alternanthera dentate} were collected from owerrir, Imo State, Nigeria; and authenticated by Osuala, FN of Pharmacognosy Department, Madonna University, Elele, Nigeria. The leaves were air-dried at room temperature for 28 days.

The leaves ground separately to five powder were extracted using soxhlet extractor with ethanol as the solvent. After filtration, the crude ethanol extracts were concentrated using rotary evaporator.
Animals
Forty (40) adult male Wistar rats (150-220 g) kept in the Laboratory Animals Facility of Department of Pharmacology and Toxicology, Madonna University, Elele, Nigeria, were used in the studies. The animals were maintained under standard laboratory situations and had free access to standard pellets (Vital feeds, Plc, Nigeria) and clean water. Prior to experimental uses, the animals were transferred to work area and allowed for two weeks of acclimatization.

Experimental design
The animals were randomly selected into two sets (A and B) of four groups comprising five rats each. Each set had one group which served as control while the other 3 groups in the 2 sets were administered different concentrations of ethanol leaf extracts. The control groups were administered normal saline while the other groups were administered 100, 200, and 300 mg/kg of the ethanol extracts of *G. latifolium* and *A. dentate* respectively, through oral intubation once daily for 14 days. The animals were sacrificed on the 15th day by cervical dislocation and the blood samples collected by cardiac puncture. Blood was allowed to clot and then separated by centrifugation to obtain serum.

Biochemical assays
The alanine transaminase (ALT), aspartate transaminase (AST), alkaline phosphate (ALP), total protein (TP), albumin (ALB) and bilirubin (BIL) levels were evaluated using assay kits (Randox Laboratory Ltd, United Kingdom BT 294 QY). The principle was based on colorimetric measurement.

Statistical analysis
Data were expressed as mean ± standard error of mean (SEM). Statistical comparisons were performed by one-way ANOVA, followed by Tukey-Kramer multiple comparisons test and student-Newman-Keuls multiple comparisons test and the values were considered statistically significant when p-value is less than 0.05 (p<0.05).

RESULTS
The biochemical assays showed reduction in ALT level which increased with increase in concentrations of ethanol extract of *A. dentate* leaves administered. The lowest concentration (100 mg/kg) was most potent with 64.5% reduction. ALP levels showed non dose-dependent, significant reduction (p< 0.05). There was increase in AST, TP, ALB, and BIL levels which
were not significant when compared with the control (Table I). The ethanol extract of *G. latifolium* leaves showed concentration-dependent reductions ($p< 0.05$) in ALT, ALB and BIL levels. The reduction in AST and ALP levels was not dependent on the concentrations of the extract. The result showed an increase in TP that was not dose-dependent but had the highest concentration with the 200 mg/kg, showing 58.5% increase (Table II).

### Table I: The effect of ethanol extract of *Alternanthera dentate* on ALT, AST, ALP, TP, ALB and BIL levels in rats.

<table>
<thead>
<tr>
<th>Group</th>
<th>Medication</th>
<th>ALT</th>
<th>AST</th>
<th>ALP</th>
<th>TP</th>
<th>ALB (g/dL)</th>
<th>BIL (g/dL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>100 mg/kg</td>
<td>10.2±3.21*</td>
<td>15.0±2.08</td>
<td>35.0±13.50*</td>
<td>03.6±0.98</td>
<td>02.50±3.15*</td>
<td>0.15±1.20</td>
</tr>
<tr>
<td>II</td>
<td>200 mg/kg</td>
<td>13.5±6.10</td>
<td>16.5±1.70</td>
<td>63.7±20.0</td>
<td>03.9±3.16</td>
<td>02.60±9.40</td>
<td>0.20±15.21</td>
</tr>
<tr>
<td>III</td>
<td>300 mg/kg</td>
<td>19.0±4.25</td>
<td>13.5±1.32</td>
<td>44.5±4.96</td>
<td>04.2±1.55</td>
<td>02.8±6.15</td>
<td>0.16±7.464</td>
</tr>
<tr>
<td>IV</td>
<td>0.1 mL Normal Saline</td>
<td>28.8±4.30</td>
<td>13.3±9.02</td>
<td>52.5±7.24</td>
<td>03.5±3.25*</td>
<td>02.6±6.10</td>
<td>0.15±3.60</td>
</tr>
</tbody>
</table>

*p<0.05; significant level compared with control.

### Table II: The effect of ethanol extract of *Gongronema latifolium* on ALT, AST, ALP, TP, ALB and BIL levels in rats.

<table>
<thead>
<tr>
<th>Group</th>
<th>Medication</th>
<th>ALT</th>
<th>AST</th>
<th>ALP</th>
<th>TP</th>
<th>ALB (g/dL)</th>
<th>BIL (g/dL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>100 mg/kg</td>
<td>08.5±1.53*</td>
<td>12.2±6.02</td>
<td>17.4±36.54*</td>
<td>04.92±1.54</td>
<td>01.78±0.24</td>
<td>0.08±0.17</td>
</tr>
<tr>
<td>II</td>
<td>200 mg/kg</td>
<td>06.2±0.11*</td>
<td>06.7±6.04*</td>
<td>36.5±18.18</td>
<td>05.20±1.196*</td>
<td>01.58±0.54*</td>
<td>0.03±0.34*</td>
</tr>
<tr>
<td>III</td>
<td>300 mg/kg</td>
<td>05.8±2.99*</td>
<td>08.6±3.77</td>
<td>21.8±6.64*</td>
<td>04.94±1.595</td>
<td>01.14±0.90*</td>
<td>0.03±1.01*</td>
</tr>
<tr>
<td>IV</td>
<td>0.1 mL Normal Saline</td>
<td>25.3±15.20</td>
<td>11.6±3.93</td>
<td>44.6±29.67</td>
<td>03.8±0.49*</td>
<td>03.2±0.16</td>
<td>0.12±0.36</td>
</tr>
</tbody>
</table>

*p<0.05; significant level compared with control.

### DISCUSSION

The results obtained in this study showed that both ethanol extracts of *G. latifolium* and *A. dentate* leaves possess hepatoprotective properties with *G. latifolium* comparatively showing greater activity. This may be attributed to the high levels of ascorbates found in *G. latifolium* leaves, which are antioxidants.[17] The extracts may also act on glutathione peroxidase which subsequently reduces oxidative stress that normally would destroy the hepatocytes.[19] The function of the ALB includes the maintenance of osmotic pressure and binding of key substances such as drugs which makes a reliable marker for diagnosis in liver diseases.[20, 21] In ethanol extract of *A. dentate*, there was increase in ALB, AST, TP and BIL levels which were not significant compared with the control, but noted was a significant reduction of ALB...
serum levels in rats administered with ethanol extract of *G. latifolium*, which were concentrated dependent. This did not concur with the documented report that it is indicative of necrosis.\(^{[22]}\) Both *A. dentate* and *G. latifolium* showed increase in TP levels which may be due to increase in synthesis of globulin, stimulated by the extracts. The reduction of BIL levels noted at all concentrations of *G. latifolium* may not be unconnected with reduction in degradation of red cells and haemoglobin and maintenance of red cell integrity. Biochemical evaluation of medicinal plants is a common tool for the assessment of the usefulness of herbs and it is likely to reveal their potential toxicity or safety. However, toxicity in this case may be a relative term since only pure and active component of the extract should be considered when assessing toxicity. Alanine transaminase (ALT) also called serum glutamate pyruvate transaminase or alanine aminotransferase is an enzyme present in hepatocytes. When a cell is damaged, it leaks into the blood along with other cellular contents where they can be measured. ALT rises dramatically in acute lives damage, such as viral hepatitis, ingestion of xenobiotics or acetaminophen overdose.\(^{[23]}\) Aspartate transaminase (AST) also called serum glutamate oxalate transaminase (SGOT) or aspartate aminotransferase is similar to ALT in that it is another enzyme associated with liver parenchymal cells. It is raised in acute liver damage, but it is also present in red blood cells, cardiac and skeletal muscles; therefore, not specific to the liver. The ratio of AST to ALT is sometimes useful in differentiating between causes of liver damage.\(^{[24]}\) Elevated AST levels are not specific for liver damage; and AST has also been used as a cardiac marker. Alkaline phosphatase (ALP) is an enzyme in the cells lining the biliary ducts of the liver, ALP levels rises with large bile duct obstruction, intrahepatic cholestasis or infiltrative disease of the liver. ALP is also present in the bone and placental tissue, so it is higher in growing children (as their bones are being remodeled) and the elderly patients with Paget’s disease.\(^{[6, 25]}\) The extracts of *G. latifolium* and *A. dentate* exerted reduction in ALT and ALP activities in the treated animals. This is in consonance with documents reported.\(^{[26]}\) Nwinyi.\(^{[27]}\) reported that the leaf extract of *G. latifolium* contains saponins, terpenes, steroids, glycosides, alkaloids, tannins and flavonoids. A. dentate has been reported to contain a plethora of phytochemicals including flavonoids.\(^{[28]}\) Flavonoids are reported to exhibit antioxidant activity and are effective scavengers of superxide anions; a phenomenon that favours hepatoprotectives tendencies.

**CONCLUSION**

The ethanol extracts of *G. latifolium* and *A. dentate* leaves possess hepatoprotective effect with the former being more potent.
Source of support: Nil.

REFERENCES


