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### **Effect of *Jatropha tanjorensis* J.I. Ellis and Soroja Leaves in Rabbits: Biochemistry and Ultrasonography**

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**Abstract:** Toxicological study of *Jatropha tanjorensis* leaves was conducted by evaluating changes in weight, biochemical and ultrasonographic parameters of rabbits that have been administered varying concentrations (0, 5, 10 and 25%) of the ground leaves mixed with feed-mash for a period of 30 days. There was no significant difference ( $p < 0.05$ ) in weight of rabbits. Renal function tests revealed that there was a significant reduction of serum urea concentration in the male rabbits ( $p < 0.05$ ) from 38.33 in group C to 18.33 in group D. This suggests that the amount of *J. tanjorensis* plant powder used in this study could interfere positively with the filtration function of the kidney in rabbits. The ultrasound picture of kidney, heart and spleen showed no significant change from the control, where as there was reduction in the size of the liver with increased echogenicity when compared with the control. This may be an indication of hepatic toxicity

**Key words:** Serum biochemistry, renal and kidney function tests, ultrasonography, rabbits, *Jatropha tanjorensis*

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### **INTRODUCTION**

An increasing reliance on the use of medicinal plants in the industrialised societies has been traced to the extraction and development of many drugs and chemotherapeutics from these plants as well as from traditionally used herbal remedies (UNESCO, 1998). A large and increasing number of patients use medicinal herbs or seek the advice of their physician regarding their use (O'Hara *et al.*, 1998). Without doubts, the benefits derived from using medicine obtained from plants are that they are relatively safer than synthetic alternative by offering profound therapeutic benefits and more affordable treatment (Iwu *et al.*, 1999).

There has been a number of research carried out in toxicologically studies (Idu *et al.*, 2006; Oyewole *et al.*, 2007; Ozolua *et al.*, 2007). Increasing interest in medicinal herbs has increased scientific scrutiny of their therapeutic potentials and safety thereby providing physicians with data to help patients make wise decisions before using them (O'Hara *et al.*, 1998).

*Jatropha tanjorensis* belongs to the family Euphorbiaceae and it shows intermediacy in phenotypic characters between *J. gossypifolia* and *J. curcas* (Prabakaran and Sujatha, 1999). It is commonly called hospital too far, Catholic vegetable, Iyana-ipaja, lapalapa (Iwalewa *et al.*, 2005).

In Nigeria, the leaf of *J. tanjorensis* has been used locally, consumed as a vegetable and it is popular as a natural remedy against diabetes in this region (Olayiwola *et al.*, 2004). Recent claims have it that the plant is no longer safe for use and that it could be toxic to organs in the body, although few reports on its pharmacological values and toxicological effects have been documented (Ehimwenma and Osagie, 2007).

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Against this backdrop our intention in this study was to quantify some biochemical measured effects- body weights, organ weights, liver function, kidney function and ultrasonographic findings in order to examine the response of animals during administration of safe dosage of the plant's powder. This study has accessed the toxic effect of *J. tanjorensis* on biochemical and ultrasonographic analysis in rabbits.

## **MATERIALS AND METHODS**

### **Collection, Harvesting and Preparation of *J. tanjorensis***

The leaf of *J. tanjorensis* was identified by Prof. Macdonald Idu of Botany Department, University of Benin. Samples were collected in the month of March, 2007 from a home garden in BDPA, Ugbowo, Benin City, Nigeria. Harvesting was done by using a sharp knife with hands properly protected with gloves to avoid the milky latex that exudes from the plant, which causes irritation and itching on contact with the skin. The harvested leaves were air-dried at room temperature for 2 days then further dried in an oven at 40°C for 24 h. The crispy leaves were ground into powder and preserved in moisture-free, airtight laboratory containers for further use.

### **Experimental Rabbits**

Forty rabbits (male and female) weighing between 1.3 and 1.5 kg were bought from Aduwawa Market in Benin City and acclimatized in the Microbiology Animal House, University of Benin for 2 weeks maintaining 12 h light/12 h dark and room temperature (27°C). The rabbits were divided by sex into 4 groups of 5 animals per cage. They were provided with commercial feed-mash and water *ad libitum*. Marker pen was used to distinctly label each animal for easy identification.

### **Administration of *J. tanjorensis* Leaf Powder**

*J. tanjorensis* powder was mixed with commercial feed and administered to the rabbit treatment groups viz., 5:95, 10:90 and 25:75% of plant to feed-mash representing groups B, C and D, respectively, while the control (group A) was administered feed-mash only. Physical characteristics such as agility, appetite and eye color were closely observed through out the period. The average weekly weight of rabbits in each group was recorded.

### **Collection of Blood Samples**

After the 5th week period, blood samples were collected through the marginal ear vein of each rabbit with small needles and 5 mL of the blood sample was kept in lithium heparin bottles and taken to the laboratory. The serum biochemical examination was carried out using (Vitros DT 60  $\text{\textcircled{D}}$  Chemistry System) and the following parameters were measured: creatinine total protein, sodium, potassium, calcium alanine aminotransferase, aspartate aminotransferase, urea, alkaline phosphatase, carbon dioxide, conjugated and total bilirubin.

### **Ultrasonography**

After the 5th week period, the animals were taken for ultrasonography in diagnostic laboratory in Benin City, Nigeria. The rabbits were scanned with an ultrasound machine after a generous amount of ultrasound gel was applied to the chest and abdominal regions of the rabbits on the ventral surface. The lungs, spleen, kidney (Right and left), heart and liver were identified. Snap shots of the organs were taken and printed out for proper analysis.

### **Statistics**

The mean, standard deviation and standard error and the level of significance for the differences between means were calculated by students test SPSS 10. The level of significance was at  $p \leq 0.05$ .

## RESULTS AND DISCUSSION

Table 1 report on physical observations in experimental rabbits. Only the female groups B, C and D had moderate appetite for the feed preparation when compared with the control and other treatment groups.

Table 2 shows there was no significant difference in average body weight between the treatment groups and the control and between treatments.

Liver function test (Table 3) shows there was no significant difference ( $p>0.05$ ) in the values of total bilirubin, conjugated bilirubin, total protein, alanine aminotransferase and aspartate aminotransferase between the control and treated groups and between the treated groups.

Table 4 shows there was a significant increase ( $p<0.05$ ) in urea level from  $38.33\pm 2.20$  to  $18.33\pm 9.28$  in male groups C and D, respectively in the renal function analysis. Other parameters did not alter significantly ( $p>0.05$ ).

Table 5 shows radiological observations in the male rabbits. There was no abnormal alteration of heart, kidneys and spleen sizes in treatment groups compared with the control. Bradycardia was however recorded in group D.

The treatments did not interfere markedly with agility and eye colour of the rabbits (Table 1). Although the male treatments groups had equally high appetite throughout the period, female groups B, C and D showed less preference for the feed compared with the control. Intake of the plant had no significant alteration on the weights of the rabbits irrespective of the sex (Table 2).

Beck *et al.* (1994) reported that bilirubin level reduction indicates improvement in health conditions. In the present study, the liver function test revealed that the bilirubin level of all the rabbits were within normal range, as non of the recorded alterations were of any statistical significance (Table 3). Idu *et al.* (2006) had a similar result in the study of the effect of *Stachytarpheta jamaicensis* on Wistar Rat.

Table 1: Effect of *J. tanjorensis* on physical activities of rabbits

Treatments	Agility	Eye colour	Appetite	Concentration (g)	
				Feed-mash	<i>J. tanjorensis</i>
<b>Male</b>					
Group A	Normal	Normal	+++	200	0
Group B	Normal	Normal	+++	190	10
Group C	Normal	Normal	+++	180	20
Group D	Normal	Normal	+++	150	50
<b>Female</b>					
Group A	Normal	Normal	+++	200	0
Group B	Normal	Normal	++	190	10
Group C	Normal	Normal	++	180	20
Group D	Normal	Normal	++	150	50

+++ = High appetite, ++ = Moderate appetite

Table 2: Effect of intake of *J. tanjorensis* leaves on the average body weights of rabbits

Treatments	Weight (g)				
	Week 1	Week 2	Week 3	Week 4	Week 5
<b>Male</b>					
Group A	1.43±0.35a	1.57±0.15a	1.73±0.21a	1.70±0.22a	1.80±2.00a
Group B	1.70±0.17a	1.60±0.10a	1.67±0.25a	1.63±0.12a	1.70±0.10a
Group C	1.26±0.25a	1.37±0.25a	1.50±0.20a	1.53±0.25a	1.60±0.20a
Group D	1.33±0.42a	1.10±0.46a	1.23±0.45a	1.00±0.92a	1.07±0.97a
<b>Female</b>					
Group A	1.53±0.15a	1.50±0.10a	1.67±0.58a	1.60±0.00a	1.13±0.98a
Group B	1.63±2.23a	1.43±0.12a	1.57±0.15a	1.53±0.21a	1.57±0.15a
Group C	1.33±0.35a	1.23±0.15a	0.93±0.81a	0.97±0.84a	1.67±0.23a
Group D	1.43±.38a	1.50±0.26a	1.60±0.35a	1.60±0.26a	1.57±0.15a

Mean±SD with similar superscript within a row are not significantly different,  $p>0.05$

Table 3: Effect of intake of *J. tanjorensis* leaves on liver function in rabbits

Treatments	Concentration (%)			
	0	5	10	25
	Group A (control)	Group B	Group C	Group D
<b>Male</b>				
Tbil (mg dL <sup>-1</sup> )	0.37±0.09a	1.01±0.24a	0.87±0.45a	0.40±0.20a
Cb (mg dL <sup>-1</sup> )	0.18±0.04a	0.53±0.12a	0.43±0.22a	0.20±0.10a
Ast (μL)	302.00±227.25a	161.33±57.24a	113.33±16.01a	51.00±26.84a
Alt (μL)	292.33±136.77a	176.33±46.38a	164.67±6.12a	92.33±46.43a
Tp	4.03±0.50a	4.03±1.17a	4.00±0.87a	2.40±1.22a
<b>Female</b>				
Tbil (mg dL <sup>-1</sup> )	0.97±0.49a	1.10±0.91a	0.53±0.29a	0.17±0.08a
Cb (mg dL <sup>-1</sup> )	0.67±0.52a	0.55±0.45a	0.27±0.15a	0.83±0.04a
Ast (μL)	4.67±2.35a	47.66±27.14a	82.67±47.24a	175.33±87.99a
Alt (μL)	59.00±32.23a	96.67±57.52a	132.33±22.52a	141.00±18.77a
Tp	88.00±51.39a	4.10±2.06a	4.97±0.46a	5.33±0.35a

Mean±SE with similar superscript within a row are not significantly different, p>0.05; Mean±standard error with different superscripts within a row are significantly different, p<0.05; Tp-total protein; Alt-alanine aminotransferase; Ast-aspartate aminotransferase, Cb and Tbil-conjugated and total bilirubin

Table 4: Effect of intake of *J. tanjorensis* leaves on renal function of rabbit

Treatments	Concentration (%)			
	0	5	10	25
	Group A (control)	Group B	Group C	Group D
<b>Male</b>				
Urea	25.83±0.83ab	26.67±3.33ab	38.33±2.20b	18.33±9.28a
Na <sup>+</sup> (mmO <sub>4</sub> )	139.33±1.33a	133.00±3.46a	139.67±3.53a	89.67±45.32a
K <sup>+</sup> (mm)	3.06±0.32a	4.43±0.41a	3.73±2.95a	4.90±0.68a
Cl (mm dL <sup>-1</sup> )	97.33±1.45a	99.33±1.67a	100.00±2.64a	70.33±35.31a
Cr	1.10±0.06a	1.23±0.07a	0.87±0.43a	0.73±0.43a
AKpO <sub>4</sub>	19.00±0.58a	13.67±4.18a	16.00±1.53a	10.67±5.61a
<b>Female</b>				
Urea	18.33±9.17a	25.00±12.58a	30.83±0.83a	25.00±2.50a
Na <sup>+</sup> (mmO <sub>4</sub> )	87.33±43.97a	86.67±43.58a	3.33±1.67a	137.33±1.20a
K <sup>+</sup> (mm)	3.20±1.60a	2.83±1.54a	3.77±0.29a	4.30±0.40a
Cl (mm dL <sup>-1</sup> )	66.67±33.41a	67.67±33.86a	102.33±2.19a	104.67±0.88a
Cr	0.97±0.49a	0.87±0.45a	1.00±0.10a	1.00±0.10a
AKopO <sub>4</sub>	3.23±1.73a	6.67±3.38a	16.00±1.53a	15.33±1.86a

Mean±Standard error with similar superscript within a row are not significantly different at p>0.05; Mean±Standard error with different Superscript within a row are significantly different at p<0.05; Cr-Creatinine, Na-sodium, K-Potassium, Urea, Akpo4-alkaline phosphatase

Table 5: Radiological observations of male rabbits

Treatments	Heart rate (bt/min) and	Liver size (cm)	Kidney size Lt and Rt (cm)	Spleen size (cm)
	Heart size (cm)			
Group A (control)	(231) and (4.1×1.9)	7.6×4.8	2.9×1.3(Lt) and 3.2×1.4(Rt)	3.1×3.6
Group B	(240) and (3.7×1.8)	3.1×2.0	2.8×1.6(Lt) and 2.7×1.5(Rt)	3.1×1.7
Group C	(164) and (4.1×2.4)	3.4×2.3	3.4×1.4(Lt) and 3.3×1.4(Rt)	3.7×3.2
Group D	(267) and (3.7×2.3)	5.5×3.7	3.2×1.5(Lt) and 2.4×1.2(Rt)	4.0×2.1

It has been revealed that Plasma ALT and Ast activities are markers of hepatocellular damage (Oduola *et al.*, 2007; Price and Stevens, 1993). In this study the plant had no such deleterious effect as Alt and Ast levels in treatment groups were not significantly different compared with the controls (Table 3).

Electrolytes, creatinine and urea are markers of kidney function (Oduola *et al.*, 2007), while increase in alkaline phosphatase has been reported to be an indication of bone or liver disease (Price and Stevens, 1993). At the end of this study, it was observed that the plasma level of Na<sup>+</sup>, K<sup>+</sup>, AKpO<sub>4</sub> and creatinine were not affected significantly by the intake of the plant in both sexes (Table 4).

It has earlier been said that the elevation of serum urea could interfere with the filtration function of the kidney (Ijeh and Ukwani, 2007). It is of interest to note that higher concentration of *J. tanjorensis* significantly decreased the serum urea level in the male group from  $38.33 \pm 2.20$  in group C to  $18.33 \pm 9.28$  in group D, an indication that the plant is not nephrotoxic (Oduola *et al.*, 2007).

Radiological investigation showed that the highest dosage lowered the heart rate of the rabbits significantly resulting in bradycardia (Table 5). Lower concentrations generally had no significant radiological relevance.

In conclusion, the intake of this plant (*J. tanjorensis*) cannot be said to have marked adverse effect on most of the vital organs investigated in this study. However, further research is recommended to determine the effects of higher concentrations on the activity of the heart probably through isolated organ test.

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