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Toxicological Effects of *Jatropha Tanjorensis* Aqueous Leaf Extract on Kidney and Liver in Wistar Rats

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ABSTRACT

Background: The leaves of are employed traditionally in the treatment of anaemia, diabetes and cardiovascular diseases. Many consumers of *Jatropha tanjorensis* leaves claim that the leaves are nutritious and it possesses nutraceutical properties that promote good health. This study investigated the toxic effect of aqueous leaf extract of *Jatropha tanjorensis* on liver and kidney functions in Wistar rats. **Methodology:** The extracts was orally administered at doses of 250mg/kg, 500mg/kg and 700mg/kg body weight daily for 28 days after which kidney and liver function indicators were measured in the serum. Liver enzymes were estimated using RANDOX test kits protocol. **Results:** Measurement of organ weight index revealed that aqueous leaf extract of *Jatropha tanjorensis* caused no statistically significant increase (P>0.05) in kidney and liver weights in rats. The extract caused significant elevation of serum alanine aminotransferase (ALT), aspartate aminotransferase (AST) and protein in the group administered 700mg/kg. A significant increase in serum creatinine and urea was also observed in rats administered with 700mg/kg of the extract. **Conclusion:** These results suggest that administration of 700mg/kg of *Jatropha tanjorensis* leaf extract may disrupt protein metabolism function of the liver and can also interfere negatively with the filtration capacity of the kidney resulting in renal and hepatic dysfunction.

Keyword; *Jatropha tanjorensis*, Liver toxicity, Renal toxicity

INTRODUCTION

Jatropha tanjorensis is a member of the Euphorbiaceae family, locally called "hospital too far" or "Catholic vegetable" in southern Nigeria. *Jatropha tanjorensis* is a native of Central America and has become naturalized in many tropical and subtropical countries, including Africa, India and North America [5]. The leaves of the plant are a source of edible leafy vegetable and taken as a tonic in herbal

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medicine, with the claim that it increases blood volume. Traditionally, decoction of the leaves is used to treat anaemia (as a haematinic agent), diabetes, skin diseases, malaria, and cardiovascular diseases[14] *Jatropha tanjorensis* has been vastly studied due to its potential health benefits, availability and affordability. Phytochemical analysis of the leaves showed the presence of flavonoids, tannins, terpenoids, saponins and cardiac glycosides[2,11] These phytochemical ingredients have hypolipidemic and antioxidant properties andhas been shown to exert positive effects on serum lipid profile in albino rats[9, 15] Reports also showed that *Jatropha tanjorensis* is rich in antioxidant nutrients like phosphorus, selenium, zinc and vitamins C[1,5,11] .The latex of Jatropha *tanjorensis* contains alkaloids including Jatrophine, Jatropham and Curcin which possesses anticancerous properties. It is also used externally against skin diseases. Although plant-based natural medicines are popularly acclaimed to be safe, scientists advocate for proper toxicological studies in other to ensure safety in the use of natural medicines[8,9, 10].

Toxicity is the undesirable property of any drug or chemical capable of producing injurious or detrimental effects on a living organism.The toxic effect caused by a drug is similar in man and some other animals, a premise for the use of animal models in toxicological studies[6]

Liver function test (LFT) is commonly used in clinical practices to screen for liver diseases, monitor the progress of a known disease and determine the effects of potentially hepatotoxic drugs[3] .It also helps in detecting hepatocellular necrosis but is considered a less specific biomarker enzyme for hepatocellular injury[4] as it can also signify abnormalities in heart, muscle, brain or kidney[3,9,13] . Renal function tests are usually required to assess the normal functioning units of the kidney - the nephron. Urea is the major nitrogen containing metabolic product of protein catabolism[11] .This study investigated the toxic effect of aqueous leaf extract of *Jatropha tanjorensis* on liver and kidney functions in Wistar rats.

MATERIALS AND METHODS

Plant

The leaves of *Jatropha tanjorensis* were obtained at the National Institute of Pharmaceutical Research and Development (NIPRD), Abuja. The plant was identified and given a voucher number as *Jatropha tanjorensis* by Botany Department, Bingham University, Karu. The harvested leaves were air-dried for 2 days then further dried in an oven at 40 °C for 24 hours. before grinding. The ground leaves were preserved in moisture-free, airtight laboratory containers for further use.

Animals

Male albino rats (n= 20) of Wistar strain weighing 100-150 grams were obtained from the Institute of Veterinary Research Vom, Plateau State Nigeria. They were maintained under standard laboratory conditions at the Animal Care Unit in the Faculty of Basic Medical Sciences, Bingham University, Nasarawa State and were fed with standard rat chow and tap water given *ad libitum.*

Methodology

The rats were divided into four groups. Each group consisted of five animals. Group A served as the control group, Group B, C and D were used as the treatment groups. The rats were given their normal feed and water *ad libitum, while g*roup B, C and D rats were given 250 mg, 500 mg, and 750 mg per kilogram body weight (mg/kg b. wt.) respectively of the *Jatropha tanjorensis* leaf extract daily for 14 days.

Serum biochemical analysis Estimation of Alanine aminotransferase (ALT), Aspartate aminotransferase (AST) and Alkaline phosphatase (ALP) were carried out using Randox test kits. The lipid profile as well as serum total protein and albumin content were assayed using standard diagnostic kit (Randox kit, Randox Laboratories, UK).

Determination of total protein:

Total protein was determined calorimetrically using Randox assay kitas described by Lowry *et al*, (1951).The principle of this test is that, in an alkaline medium, protein reacts with the copper in the Biuret reagent causing an increase in absorbance. The increase in the absorbance, at 540nm (530-570nm or with Green/Yellow filter) due to formation of the coloured complex, is directly proportional to the concentration of protein. Procedures: Briefly, Biuret reagent (1ml) was added to each test tube containing 0.02ml of serum, 0.02ml of standard and 0.02ml of distilled water (blank), the content in each of the test tube was mixed, incubated for 10 minutes under room temperature. The absorbance was read at 540nm in a spectrophotometer

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Determination of Creatinine

The colorimetric method was used to determine serum creatinine concentration, according to Bertelsand Bohmer[5] using Randox assay kits. Assay principle: Creatinine present in the serum or urine reacts with alkaline picrate to form a colored complex. The rate of formation of colored complex is directly proportional to creatinine concentration. This rate of reaction (intensity of color produced) is measured photometrically at 510nm and is compared with that of the standard.

Determination of the Serum Urea Concentration

Principle: The serum urea concentration was determined using urea Randox assay kit. Urea in serum is hydrolyzed to ammonia in the presence of urease. The ammonia formed is then measured photometrically by Berthelot's reaction[7]. Urea + H2O2NH3+CO2NH3+ Hypochlorite + Phenol Indophenols (blue compound).

Procedure: Reagent 1 (100µl) containing 10µl sample, 10µl standard reagent and 10µl distilled water (blank), the content in each of the test tube was mixed and incubated at 37oC for 10minutes, 2.5ml of reagent 2 containing dilute phenol and reagent 3 containing dilute sodium hypochlorite and sodium hydroxide were added to each of the test tube, and the content of the test tube was mixed immediately and incubated for 15minutes. The absorbance of the test sample (A sample) and standard (A standard) were read against blank at 500nm in a spectrophotometer. The liver and kidneys, were removed and their weights. The relative liver and kidney weights were determined using the formula: Relative organ weight= Organ weight/Body weightx100

Statistical analysis

Data obtained were presented as mean ± SEM and analyzed using one way analysis of variance (ANOVA). The variant means were separated post-hoc using the least significance difference (LSD) method. Significance was accepted at $P < 0.05$

RESULTS

Measurement of organ weight index revealed that aqueous leaf extract of *Jatropha tanjorensis did* not significantly increase ($P<0.05$) kidney and liver weights in rats

Table 1, shows the body weight changes in rats

Table 1: Body weight changes in rats Treated with Jatropha tanjorensis Leaves extract for 14 day

Group	Initial body weight (Kg)	Final body weight (Kg)	Percentage change in body weight (%)
Control	123.2 ± 12.4	112.0 ± 14.9	7.0 ± 7.6
X (250mg/kg)	115.8 ± 2.8	127.0 ± 14.0	7.1 ± 9.7
Y (500mg/kg)	119.0 ± 2.4	146.6 ± 5.4	8.7 ± 3.4
Z(700mg/kg)	126.4 ± 3.4	128.2 ± 14.9	7.0 ± 7.8

treated with leaf extract of *J. tanjorensis.* The percentage changes in body weight was not significantly ($p>0.05$) different in the 250mg/kg, 500mg/kg and 700mg/kg group, compared with the normal control group.

Table 2: Effect of Ethanol leaves extract of *jatrophatan jorensis* on liver function of male albino Wistar rat

Groups	**Concentration mg/kg body Weight**	**AST (µl)**	**ALT (µl)**	**ALP (µl)**
	Control	210.2± 2.1	129.2 ± 0.8	110.8 ± 1.4
X	250 Mg/kg	355.4±2.1	132.5±1.2	116. 3 ± 0.5
Y	500 mg/kg	319.2± 2.2	138.4±1.3	113.5 ± 1.7
Z	700 mg/kg	355. 1 ± 2.6	149.9± 1.9	124.8 ± 0.2

Values are given as Mean ± SEM n=5.Values are significantly different from Control at $P < 0.05$ Table 2 shows the effect of methanolic leaf extract of Jatropha tanjorensis on biochemical parameters of wstar rats. AST, ALT and ALP recorded a significant increase ($p<0.05$) in the 700mg/kg treated groups when compared with the control group ($p<0.05$).

Table 3: Kidney function indices of Wistar rats administered leaf e xtracts of Jatropha tanjorensis

Groups	Concentration mg/kg body Weight	Creatinine (mg/dl)	Urea (mg/dl)	**Protein** (gm/dl)
	Control	2.62± 0.1	113± 1.4	68.4±3.1
X	250 Mg/kg	2.76± 0.2	111± 0.6	67.4±5.8
Y	500 mg/kg	2.86± 0.1	113± 2.0	69.0±6.4
Z	700 mg/kg	2.94± 0.2	117.0 ±0.3	71.0±4.9

There was a significant increase in the concentration of urea, creatinine and protein in the 700mg/kg group compared with the normal control group.

DISCUSSION

It was observed that the values of AST, ALT and ALP was significantly ($p<0.05$) increased in the 700mg/kg group, treated with the extract compared with the control group.

Elevation in AST, ALT and ALP in the 700mg/kg treated with *J. tanjorensis* leaves compared to the control group. This is in line with the findings of Oluwole et al. (2012) who reported an elevation of ALT and AST, ALP of the rats given the extract o*f J. tanjorensis*.

The biochemical indices evaluated in the study are useful parameter to indicate impairment in the functional capacity of the kidney. Renal function tests are usually required to assess the normal functioning units of the kidney - the nephron. Urea is the major nitrogen containing metabolic product of protein catabolism[7]. The significant increase in serum urea concentration following the administration of aqueous leaf extracts of *Jathropha tanjorensis* at 700mg/kg doses may be attributed to improvement in the physiological excretion of urea caused by the extract in this study. Serum creatinine is an important indicator of renal health because it is an easily measured by-product of muscle metabolism that is excreted unchanged by the kidneys. If the filtration in the kidneys is deficient creatinine blood levels rise. The consistency of endogenous creatinine production and its release into the body fluids at a constant rate and constancy of plasma levels of creatinine 24 hours of the day, makes creatinine a useful endogenous substance where clearance may be measured as an indication of creatinine content[7] .The significant increase in serum creatinine following the administration aqueous extracts of *Jathropha tanjorensis* may be an indication of glomerular and tubular mass dysfunction. Renal damage reduces the functioning of the tubular mass and may seriously affect the regulatory function of the kidney.

CONCLUSION

These results suggest that administration of 700mg of *Jatropha tanjorensis* leaf extract may disrupt protein metabolism function of the liver and also interfered negatively with the filtration capacity of the kidney which might result in renal and hepatic dysfunction. Caution should be encouraged in the use of *Jathropha tanjorensis* to avoid the toxic effect it may have on the liver and kidney, especially at a concentration of 700mg.

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