

## Effect of Aqueous Roots Extract of *Datura metel* Linn on Liver Function Indices in Female Albino Rats

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### Abstract

The effect of *Datura metel* aqueous root extract at the doses of 50, 100, and 200mg/kg body weight on some marker enzymes and liver function indices in Wistar female albino rats were determined. The extract was administered for twenty eight (28) days. The liver function indices as well as some marker enzymes activity were determined using the standard methods. The activities of alkaline phosphatase, aspartate transaminase, alanine transaminase significantly decreased ( $P \leq 0.05$ ) in liver at all the doses of the extract treated groups when compared with the control group. Whereas it shows a significant increase ( $P \leq 0.05$ ) in aspartate transaminase and alanine transaminase in the serum at all the doses of the extract treated groups, furthermore, alkaline phosphatase significantly increased ( $P \leq 0.05$ ) at 50 and 100mg/kg body weight and significantly decreased ( $P \leq 0.05$ ) at 200mg/kg body weight extract treated groups when compared with the control group. However, the results also revealed a significant increase ( $P \leq 0.05$ ) in serum total protein concentration at 100 and 200mg/kg body weight, whereas there was no significant difference ( $P \geq 0.05$ ) at 50mg/kg body weight extract treated groups when compared with control group. Similarly, serum globulin concentration increased significantly ( $P \leq 0.05$ ) at all the doses of the extract treated groups when compared with the control group. In contrast, there was significant decrease ( $P \leq 0.05$ ) in serum albumin and direct bilirubin concentrations at all doses of the extract treated groups when compared with the control group. It also revealed significant decrease ( $P \leq 0.05$ ) at 100 and 200mg/kg body weight and a significant increase ( $P \leq 0.05$ ) at 50mg/kg body weight in serum indirect bilirubin concentration when compared with the control group. In conclusion this finding indicate that the plant has

hepatotoxic effect on liver as revealed in the alteration of the liver function indices and some marker enzymes analyzed.

**Keywords:** *Plant extract, protein, enzymes, hepatotoxic.*

### 1. Introduction

Hepatic injury induced by different types of environmental toxins and hepatotoxic agents have been recognized as major health problems worldwide for decades (Jan *et al.*, 2008). A variety of medications have been associated with acute liver injury. Before implicating a particular substance, history should include careful listing of all agents taken, the time period involved, and the quantity ingested. Drugs other than acetaminophen rarely cause dose-related toxicity such as *Datura metel* root extract. Most examples of idiosyncratic drug hepatotoxicity occur within the first 6 months after drug initiation (Guyton and Hall, 1996). A potentially hepatotoxic medication that has been used continually for more than 1 to 2 years is unlikely to cause *de novo* liver damage. Certain herbal preparations and other nutritional supplements have been found to cause liver injury (Stedman, 2002).

The leaves, seeds and roots of *Datura metel* are widely used in herbal medicine as anesthetic, antispasmodic, bronchodilator and as hallucinogenic (Duke and Ayensu, 1985 and Dabur *et al.*, 2004). A variety of phytochemicals have been found to occur in *Datura metel*. These phytoconstituents comprises alkaloids, flavonoids, phenols, tannins, saponins and sterols. The solanaceous alkaloids hyoscyamine and scopolamines have been isolated from *Datura metel* Linn (Chopra *et al.*, 1986, Oliver-Bever, 1986). Local findings have shown that all the different parts of the plants either in the fresh form or in the sun-dried

powdered form are used for its psychoactive property in South-Western Nigeria. Literatures have also shown that *Datura metel Linn* is one of the most commonly abused local plants all over the world. Report of Drug Abuse in Nigeria by the United Nations Office on Drugs and Crime in 2007, showed 0.4% use of *Datura metel Linn* out of the various narcotics and psychotropic substances use in Nigeria

## 2. Material and Methods

### 2.1 Plant material and identification

The *Datura metel* plants was collected from Marina Area Aliero Local Government Kebbi State, Nigeria, The plant sample was identified and authenticated at Botany Unit, Department of Biological Sciences, Kebbi State University of Science and Technology, Aliero were voucher number is given 282.

### 2.2 Chemicals

Assay kits for alanine transaminase, aspartate transaminase, alkaline phosphatase, total protein, albumin and bilirubin were obtained from Randox Laboratories, Co-Atrim, UK. All other reagents used were of analytical grade and were prepared in volumetric flask using all glass distilled water in the laboratory.

### 2.3 Preparation of the plant extract

The fresh root of *Datura metel* were washed thoroughly with tap water, slide in to smaller pieces and shade dried. The dried sample was then grounded with mortal and pestle, the powder sample was then stored in a plastic container and later used for the extraction process.

45g of the dried powder of sample was extracted in 150 mL distilled water for 72 hours at room temperature. The extract was filtered using muslin cloths, and the resulting filtrate was concentrated on steam bath to give a yield of 8.2g of the residue (brownish-black slurry). This was reconstituted in distilled water to give the required doses of 50mg, 100mg and 200mg/kg body weight used for administration to the experimental animals (Nwinuka *et al.*, 2005).

### 2.4 Experimental animal

Twenty four (24) apparently healthy female Wister albino rats weighing between 100-170g were purchased from Biological Garden Usman Danfodio University Sokoto. The animals were kept in animal house of the Laboratory, Department of Biochemistry Kebbi State University of Science and Technology Aliero. The animals were they are allowed to acclimatize with the environment for (2) weeks and they were fed with growers mash product of vital feed and water.

### 2.5 Animal grouping and extract administration

The Wister female albino rat were randomly grouped in to four (4) groups of six (6) rats each and administered as follows

GROUP 1: The control group received distilled water

GROUP 2: The test group received 50mg/kg body weight of the extract

GROUP 3: The test group received 100mg/kg body weight of the extract

GROUP 4: The test group received 200mg/kg body weight of the extract

After grouping, the test groups were administered with the extracts for a period of twenty eight (28 days) once daily according to their body weight and 24 hours after the last dose all the rats were scarified by anesthesia, using chloroform. Incision was made quickly in the neck region to collect blood in to the labeled tubes. The collected blood was centrifuge at 3000rpm for 10mins; the serum was then collected, stored under refrigerator and later used for liver function analysis. The liver was then removed and placed in a 0.25M sucrose solution. The liver was then homogenized using pre-cooled mortar and pestle. The liver homogenate was then centrifuged at 3000rpm for 5mins; the supernatant was removed and later used for enzymes analysis.

### 2.6 Enzyme assay

The activities of the enzymes were assayed from the liver and serum. Alkaline phosphatase (ALP) activity was determined according to the method described by Burtis and Ashwood, (1999) using reagent kit, while aspartate transaminase (AST) and alanine transaminase (ALT) activities were determined according to the method described by Reitman and Frankling, (1957).

### 2.7 Liver function indices determination

The concentration of the liver function indices were assayed from the serum. The serum total protein concentration was determined by biuret colorimetric reaction as described by Tietz, (1995), The serum albumin concentration was determined by Bromocresol green colorimetric reaction as described by Burtis and Ashwood, (1999), Globulin was determined from the values of difference between the serum total protein and albumin as described by Panagan, (2001) while the serum total and direct bilirubin concentration were determined by colorimetric method as described by Tietz, (1995).

### 2.8 Statistical analysis

Data were expressed as the means  $\pm$ SD of six (6) replicate. Significant differences between the means were determined using one-way analysis of variance (ANOVA) and Duncan multiple range test (DMRT) at 5% confidence limit using a software SPSS VERSION 17.0.

## 3. Results

### 3.1 Effect of the extract administration on serum marker enzymes

Administration of the extract at all the doses of the extract treated groups when compared with the control group significantly decreased ( $P \leq 0.05$ ) and significantly increased ( $P \leq 0.05$ ) the activity of aspartate transaminase in liver and serum respectively (Figure 1). The extract administration at all the doses of the extract treated groups when compared with the control group also significantly decreased ( $P \leq 0.05$ ) and significantly increased ( $P \leq 0.05$ ) the activity of alanine transaminase in liver and serum respectively (Figure 2). Similarly, administration of the extract at all the doses of the extract treated groups when compared with the control group significantly decreased ( $P \leq 0.05$ ) and significantly increased ( $P \leq 0.05$ ) the activity of alkaline phosphatase in liver and serum respectively (Figure 3).

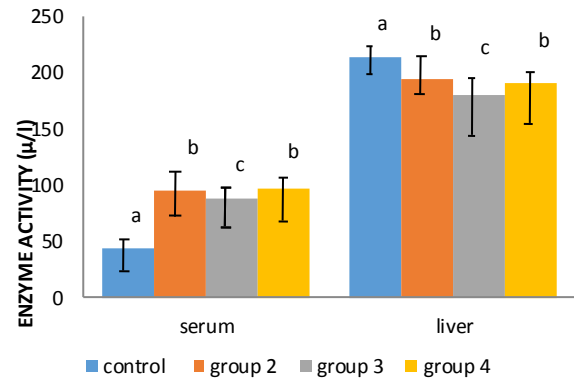


Fig. 1: AST activity in the liver and serum of Wister albino rats administered with *Datura metel Linn* aqueous root extract.

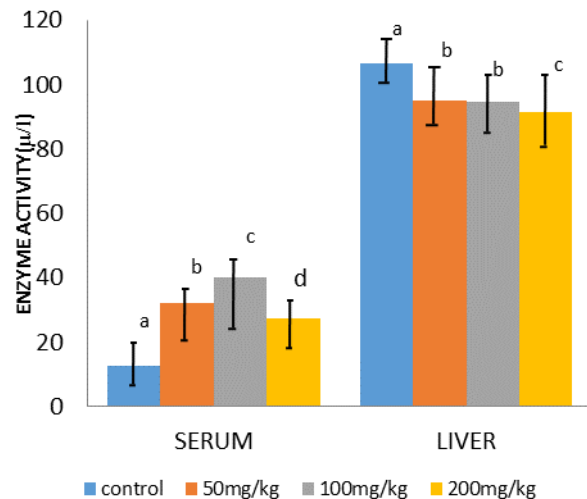


Fig. 2: ALT activity in the liver and serum of Wister female albino rats administered with *Datura metel Linn* aqueous root extract.

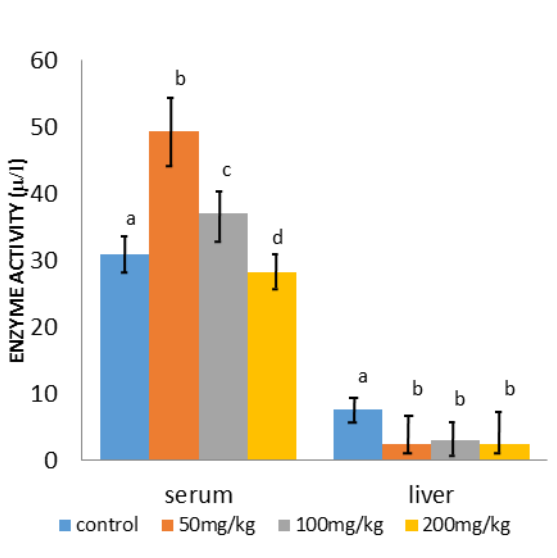


Fig 3: ALP activity in the liver and serum of Wister albino rats administered with *Datura metel Linn* aqueous root extract.

### 3.2 Effect of extract on liver function indices in Wister female albino rats.

Administration of the extract at 50, 100 and 200mg/kg body weight also revealed significantly increased ( $P < 0.05$ ) in total protein and globulin concentration of the serum at all the doses of the extract treated groups when compared with the control group. In contrast serum albumin concentration significantly decreased at all the doses of the extract treated groups when compared with the control group. Similarly, serum total bilirubin concentration significantly decreased ( $P < 0.05$ ) at 100 and 200 mg/kg body weight. However, concentration of direct bilirubin significantly decreased ( $P < 0.05$ ) at all the doses of the extract treated groups when compared with the control group, whereas indirect bilirubin concentration significantly increased ( $P < 0.05$ ) at 50mg/kg body weight and significantly decreased ( $P < 0.05$ ) at 100 and 200 mg/kg body weight when compared with the control group (Table 1).

Table 1: Serum liver function indices in Wister albino rats administered with *Datura metel* aqueous root extract.

Parameters	Group 1(control)	Group2 (50mg/kg bw)	Group3 (100mg/kg bw)	Group4 (200mg/kg bw)
T.Protein	67.00±3.29 <sup>a</sup>	68.33±1.03 <sup>a</sup>	70.00 ± 0.00 <sup>b</sup>	72.50 ± 0.55 <sup>c</sup>
Albumin	38.50 ± .55 <sup>a</sup>	31.67±1.0 <sup>b</sup>	29.00 ± 1.10 <sup>c</sup>	28.00 ± 1.10 <sup>c</sup>
Globulin	28.50±2.74 <sup>a</sup>	36.66±2.0 <sup>b</sup>	41.00 ± 1.10 <sup>c</sup>	44.50 ± 0.55 <sup>d</sup>
T.Bilirubin	0.37 ± 0.05 <sup>a</sup>	0.37 ± 0.05 <sup>a</sup>	0.23 ± 0.05 <sup>b</sup>	0.23 ± 0.05 <sup>b</sup>
D.Bilirubin	0.20 ± 0.00 <sup>a</sup>	0.13 ± 0.05 <sup>b</sup>	0.10 ± 0.00 <sup>b</sup>	0.13 ± 0.05 <sup>b</sup>
Ind.Bilirubin	0.17 ± 0.05 <sup>a</sup>	0.24 ± 0.00 <sup>a</sup>	0.13 ± 0.05 <sup>a</sup>	0.10 ± 0.00 <sup>a</sup>

Value are presented as mean ± SD of six (6) replicate.

<sup>a-d</sup>Test values carrying different superscripts alphabets are statistically significance at ( $p < 0.05$ ).

### 4. Discussion

Alteration in the concentration of liver function indices indicate the liver problems because is the liver that produce most of the plasma protein in the body, thereby making a measure of the amount of the protein in the blood very useful in the determination of the liver functions (Guyto and Hall,1996).

The significant increase in the serum total protein in the (Table 1), although the increase is at 100 and 200mg/kg body weight. This may be seen in chronic inflammation or infections as a result of dehydration, viral hepatitis or HIV, they may be cause by bone marrow disorder such as myeloma (Mayo, 2002). A change in the serum proteins may also indicates that there is a liver disease, such as nephrotic syndrome, large area burns, malignant tumor, thyroid function hyperthyroidism, long-term chronic fever and poor nutrition (Jan *et al.*, 2008). The observed increased may be attributed to increase in synthetic ability of the liver caused by the extract. The significant decreased in the serum albumin (Table 1) at all the doses, may be as a result of mal-nutrition, which may lead to the serious complication such as nephritic syndrome and cirrhosis of liver (Satyanarana and Chakrapani, 2006). The significant increase in



the serum globulin (Table 1) at all the doses may be seen when infection or inflammation is present, globulin concentration increase visibly in nephritic due to the loss of majority of the low molecular weight proteins in the urine, syndrome kalaazar, schistosomiasis, collagen sex diseases and chronic infections (Panagan, 2001). This may also be attributed to increase synthetic ability of the liver following extract administration. The significant decreased in the serum total bilirubin concentration observed at 100 and 200mg/kg body weight (Table 1) may be attributed to the inability of the hydrophobic bilirubin to diffused through the liver cell membrane in to the intestine to be excreted, leading to a condition known as cholestasis (Guyton and Hall, 1996). The significant decreased in the direct bilirubin concentration in the serum indicate that the duration for the administration at the doses used is not enough to cause any short or long term liver illness (Bunke,1996). The insignificant difference on the indirect bilirubin in the serum suggests that the rate of red blood cell distruction is not significant (Bunke, 1996).

The determination of different enzyme activities such as AST, ALT and ALP have been found to be of ultimate important in the assessment of liver damage or necrosis, thereby releasing the enzymes into the circulation thus increased their activities in the serum (Hashemi *et al.*, 2008). The significance decreased in liver AST activity in the present study (Figure 1), could be attributed to liver cirrhosis, degeneration of hepatic cells and dysfunction of liver (Karen, 2003). However, the corresponding significant increase in serum AST activity revealed that liver cells necrosis as a mechanism over cholestasis which leads to the leakage of the enzyme from the liver to the serum (White *et al.*, 1999). Similarly, the significant decreased in liver ALT activity and its corresponding increase in serum ALT activity in the present study (Figure 2), may indicate that the extract have remarkable effect on the integrity of the liver at

the concentration used. It may also suggest cardiac and skeletal muscle injury during inflammation and tissue damage which caused the enzyme to leak out of the liver in to the blood (Paul and Giboney, 2001). The significant decrease in live ALP activity in the present study (Figure 3) may indicate liver damage such as intrahepatic, cholestasis or infiltrative disease of the liver (Domar *et al.*, 1992). Similarly, the corresponding significant increase in serum ALP activity may be due to the leakage of the enzyme from mass of damage tissue and destroyed cell membrane (Grove *et al.*, 1998).

## 5. Conclusions

The overall results of the present study indicates hepatotoxic effect of *Datura metel Linn* aqueous root extract which might diminish or weaken the liver function on the treated groups as observed in the alteration of marker enzymes and some liver function indices shown in the analysis. Therefore, the consumption of the aqueous root extract of *Datura metel Linn* may be detrimental to the life of organisms.

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