

## Investigation on Effects of Methanolic and Aqueous Extracts of Seeds of *Datura metel* on Liver of Wistar Rats

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Cellular infiltration; *Datura metel*; Inflammation; Medicinal plants; Traditional medicine

## 1. Abstract

This study investigated the effects of methanolic and aqueous extracts of seeds of *Datura metel* on liver of Wistar rats. *Datura metel* seed is believed to be a medicinal plant widely used in phyto-medicine to cure diseases such as asthma, cough, convulsion and insanity. Various parts of the plant (leaves, seeds, roots and fruits) are used for different purposes in herbal medicine. Fifteen male albino rats were randomly distributed into three groups (A, B and C) with five animals in each group. Group A served as the normal control. Group B and group C animals were administered 400 mg/kg bwt of methanolic and aqueous extracts of *Datura metel* seeds respectively for fourteen days. The extracts were administered through oral route. After administration of the extracts, the animals were starved overnight, anaesthetized with chloroform and sacrificed. Blood samples and liver were collected for biochemical and histological analysis. The result showed that the activities of ALP, AST and ALT increased in the test groups (groups B and C) when compared to the normal control. Also, the concentration of total bilirubin and direct bilirubin increased in the test groups when compared with the control, while total protein and albumin levels reduced in the test groups when compared with the normal control. The results of this study showed that despite the acclaimed medicinal effects of seed of *Datura metel*, the methanolic and aqueous seed extracts can cause liver toxicity and may induce inflammatory cellular infiltration within some regions of the liver.

## 2. Introduction

Medicinal plants are native plants that have at least one of their biochemical components or structural parts such as Flower, leaves, stem, seeds, barks or roots to be used for healing purposes [3]. It is estimated that approximately one quarter of prescribed drugs are plant extracts or active ingredients obtained from plant sources [2]. World Health Organization estimates that about 80% of these people rely almost exclusively on traditional medicine for their primary healthcare needs. Medicinal plants are the “backbone” of traditional medicine, which means more than 3.3 billion people in the less developed countries utilize medicinal plants on a regular basis [2].

*Datura metel* is believed to be a medicinal plant widely used in phyto-medicine to cure diseases such as asthma, cough, convulsion and insanity. According to Imo and Uhegbu (2015), *Datura metel* L. is a member of the plant family Solanaceae. Its common names known are: Thorn apple, Devil’s apple, Jimson weed and Angel’s trumpet. Its local names in Nigeria include: Igbo- Myaramuo; Hausa- Zakami; Yoruba- Apikan [1]. Various parts of the plant (leaves, seeds, roots and fruits) are used for different purposes in herbal medicine. All parts of *Datura metel* (especially the leaves and seed) are believed to have anaesthetic, hallucinogenic, anti-asthmatic, anti-spasmodic, antitussive, narcotic, bronchodilator, hypnotic and mydriatic effects. The leaves are used as a local application for treating rheumatic swellings of the joints, lumbago, sciatica, neuralgia, painful tumors, scabies, eczema, allergy

and glandular inflammations, such as mumps; used externally for earache and smoked to relieve spasmodic asthma. Seeds are used externally for piles [12]. The seeds, leaves and roots are reported to be used in insanity, fever with catarrh, diarrhea, skin diseases and cerebral complications [10]. The aim of the present study is to investigate the effects of methanolic and aqueous extracts of seed of *Datura metel*.

The use of medicinal plants for the treatment and management of ailment as an alternative for synthetic drug have been regular practice in almost every part of the world. Despite positive medicinal effects of plants, it can still elicit a negative effect if taken in large quantity (abuse). *Datura metel* is one of the most medicinal plants abused by youths in Nigerian, especially in northern parts of the country.

### 3. Materials and Methods

#### 3.1. Plants Material

Mature fruit of *Datura metel* was collected in different part of Wukari, Nigeria. The fruits were dried and the seeds removed from the fruits. The seeds were further air-dried and grounded to fine powder and stored in an air-tight container. The powder was macerated using 70% methanol in a clean container for 2 days and filtered. The methanol in the filtrate was eliminated by evaporation and the concentrate was redissolved in normal saline prior to the experiment (modified method of [5]). A second part of the powder was macerated using water in a clean container for 2 days and

filtered. A portion of the filtrate was used to determine the concentration of the extract in the filtrate by eliminating the water.

#### 3.2. Experimental animal

Fifteen (15) Wistar rats were obtained and keep in the experimental animal cages at Department of Biochemistry, Federal University Wukari prior to experiment. The rats were acclimatized for fourteen days before the administration of the extracts.

#### 3.3. Experimental Design

Fifteen male albino rats were randomly distributed into three groups (A, B and C) with five animals in each group. Group A served as the normal control. Group B and group C animals were administered 400 mg/kg bwt of methanolic and aqueous extracts of *Datura metel* seeds respectively for fourteen days. The extracts were administered through oral route. All animals had access to feed and water *ad libitum* throughout the experiment.

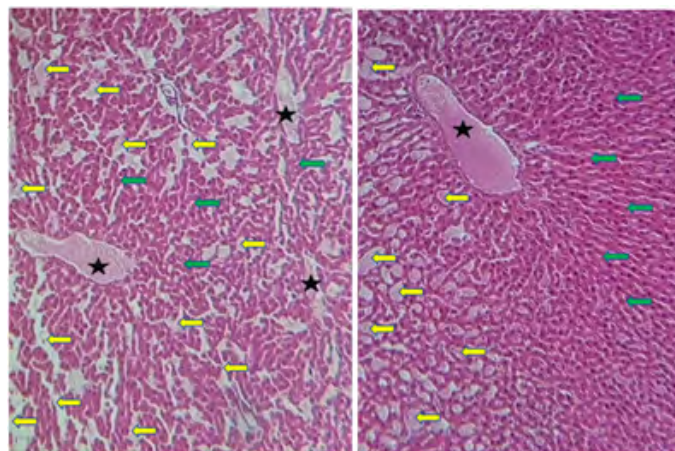
#### 3.4. Blood Collection

After administration of the extracts, the animals were starved overnight, anaesthetized with chloroform and sacrificed. Blood samples were collected by cardiac puncture using a 10 mL hypodermic syringe. The blood samples were dispensed into cleaned plain sample tubes and allowed to clot for about fifteen minutes and centrifuged at 4000 rpm for 10 minutes. The serum was separated from the clot by simple aspiration with pasteur pipette and dispensed into clean tubes for serum biochemical analysis.

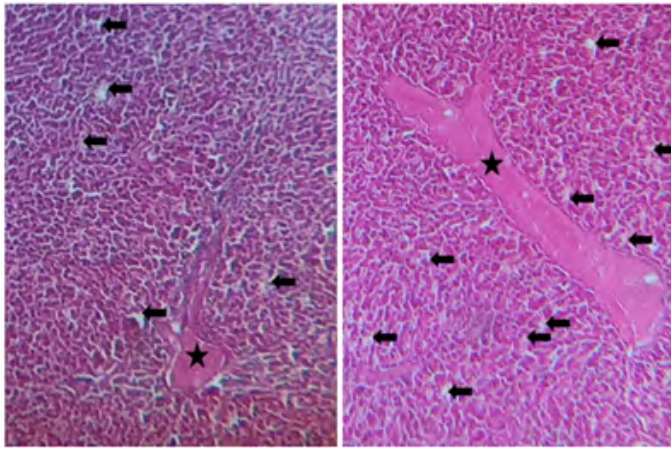
**Table 1:** Levels of selected liver function parameters in albino rats administered with 400 mg/kg of methanolic and aqueous extracts of *Datura metel* seeds

Treatment	ALP (IU)	AST (IU)	TP ( $\mu$ l)	ALB ( $\mu$ l)	TB ( $\mu$ l)	DB ( $\mu$ l)	ALT (IU)
Group A (Normal control)	139.90 $\pm$ 0.42	112.79 $\pm$ 0.43	69.00 $\pm$ 4.53	43.90 $\pm$ 1.84	4.75 $\pm$ 0.35	0.46 $\pm$ 0.06	10.97 $\pm$ 0.83
Group B (Methanolic seed extract)	294.23 $\pm$ 68.85	113.60 $\pm$ 94.66	65.96 $\pm$ 31.62	22.03 $\pm$ 15.35	4.80 $\pm$ 3.72	0.73 $\pm$ 0.38	54.46 $\pm$ 23.88
Group C (Aqueous seed extract)	224.90 $\pm$ 117.37	136.36 $\pm$ 41.92	57.80 $\pm$ 3.55	20.04 $\pm$ 9.23	5.30 $\pm$ 0.56	0.80 $\pm$ 0.40	76.23 $\pm$ 51.32

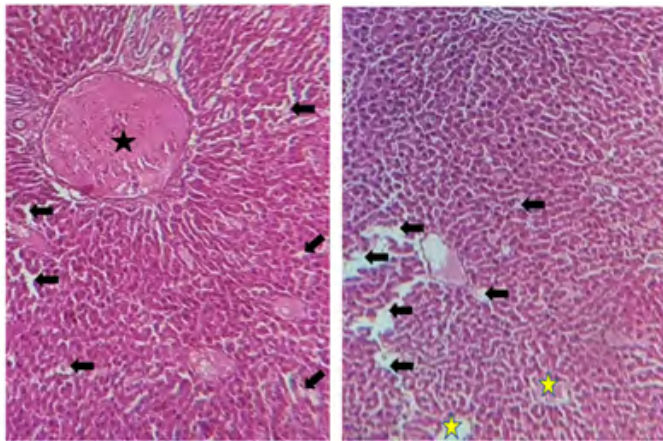
Result is presented as mean  $\pm$  standard deviation (n=5).



**Figure 1:** Photomicrographs of liver section from rat in group A (normal control) showing normal features of the hepatic tissue. Anastomosing hepatocytes with clearly defined nuclei (Green Arrows). Spaces between adjacent hepatocyte chains are as sinusoids (Yellow Arrows). The central veins are clear of congestion (Black Stars).



**Figure 2:** Photomicrographs of liver section from rat in group B (administered 400 mg/kg bw methanolic seed extract of *Datura metel*) showing congestion of the central veins (Black Stars). There is necrosis of the hepatocytes (Black arrows) with partial distortion of the chain-like appearance of the hepatocytes and not clearly defined nuclei.



**Figure 3:** Photomicrographs of liver section from rat in group C (administered 400 mg/kg bw aqueous seed extract of *Datura metel*) showing severe necrosis of the hepatocytes with partial distortion of the chain-like appearance of the hepatocytes and unclear nuclei. The portal vein is congested (Black star), while there is necrosis of the walls of the central veins evident by the disappearance of the blood vessel walls.

### 3.5. Biochemical and Histological Analysis

Serum biochemistry was carried out on each sample. The levels of aspartate transaminase (AST), alkaline phosphatase (ALP), alanine transaminase (ALT), total protein, albumin and bilirubin were determined using auto-analyzer. After the animal sacrifice, the liver of all animals in the three groups were harvested and examined histologically (Stain: Haematoxylin & Eosin). Photomicrographs of the different liver sections were taken.

### 3.6. Biochemical Data

Data were subjected to computation and the group results were presented as mean  $\pm$  standard deviation.

## 4. Results

The result of the biochemical analysis is presented in the table below:

The result showed that the activities of ALP, AST and ALT increased in the test groups (groups B and C) when compared to the normal control. Also, the concentration of total bilirubin and direct bilirubin increased in the test groups when compared with the control, while total protein and albumin levels reduced in the test groups when compared with the normal control.

## 5. Discussion

In Nigeria, herbal healing is still widely practiced in rural as well as urban areas due to shortage of drugs and insufficient means to visit established medical centers. An extract made from the seed, leaves or fruit of some plants are taken orally for the treatment of various diseases [7]. *Datura metel* is a medicinal and psycho-toxic plant use for treatment of some medical conditions in some part of Nigeria with little knowledge about its toxicity. The effect acute, subacute and chronic administration of alkaloid atropines and scopolamines, the main constituents of the active principle of *Datura metel* with toxic properties was studied in male albino rats. *Datura* poisoning is fast becoming a global phenomenon of vast research attention. Enzyme biomarkers from selected tissues and body fluids have been used routinely used to monitor toxicity of plant extracts as well as disease investigation and diagnosis. This approach often helps in identifying tissue-related oxidative assault in experimental animals. Consequently, specific biochemical parameters from the blood are routinely used as indicators to determine the health status of an organism.

Increase in serum ALP could be attributed to possible biliary obstruction [5,8] and dehydration caused by *Datura metel* seed extract. The elevated ALP activities in groups B and C when compared to group A could be possibly due to the effect of the induced methanolic and aqueous extracts, which may be due to the presence of one or more of such components like alkaloids, tannins, saponins, cardiac glycosides, etc. Similarly, high level of serum ALT relative to the control animals suggests that extracts of *Datura metel* may be hepatotoxic. This elevation is a consequence of hepatic injury, resulting in the leakage of enzymes that are normally localized within the hepatocytes. Although, a high level of AST does not always signify liver damage, but an elevation in serum ALT is always an indication of a problem with the liver since it is a specific biomarker of liver damage. ALT, ALP and AST are specific bio-indicators associated with hepatotoxicity. Hepatic injury is usually detected by significant alteration in the normal serum level of these enzymes [5, 8]. The activity of ALT increased in the test animals when compared with the normal control. The aqueous extract caused more elevation of the activity of ALT than the methanolic seed extracts. This showed that the concentration of both extracts (at the dose administered) may cause liver toxicity and could possibly alter certain liver function. This result is in agreement with the result of the liver histological analysis of the test animals. The activity of AST did not change significantly in the test groups when compared with the normal control.

Total protein and albumin values slightly decreased in the test groups when compared with the normal control. This showed that the chemical constituents of the methanolic and aqueous seed extracts at the dose used in this study may have interfered with protein synthesis of the test animals, thereby decreasing the synthesis of proteins. Liver damage and its synthetic functions such as protein synthesis may be assessed using serum protein level [11], since the hepatocytes are mostly responsible for synthesizing most proteins distributed in the plasma [5]. The result therefore suggests that the liver function may have been negatively interfered with which may cause it not to be functioning properly. Total bilirubin and direct bilirubin increased in the test groups when compared with the normal control. This predicts that more hemoglobin may have been destroyed or reduction in the rate of elimination of bilirubin from the body system of the test animals.

Photomicrographs of some of the liver sections from rats administered the methanolic and aqueous seed extracts showed evidence of inflammatory cellular infiltration when compared to the control.

## 6. Conclusion

The results of this study showed that despite the acclaimed medicinal effects of seeds of *Datura metel*, the methanolic and aqueous seed extracts can cause liver toxicity and may induce inflammatory cellular infiltration within some regions of the liver.

## References

1. Abdullahi M, Muhammad G, Abdulkadir NU. Medicinal and Economic Plants of Nupe Land. Nigeria: Jube Evans Book and Publications. 2003; 234.
2. Davidson-Hunt I. Ecological ethnobotany: stumbling toward new practices and paradigms. MASA J. 2000; 16: 1–13.
3. Fu Y, Si Z, Li P, Li M, Zhao H, Jiang L, et al. Acute psychoactive and toxic effects of *D. metel* on mice explained by <sup>1</sup>H NMR based metabolomics approach. Metab Brain Dis. 2017.
4. Godofredo S. *Datura metel*/Plants for a Future: Database. Talong Punay. Philippine Alternative Medicine. 2011.
5. Imo C, Uhegbu FO, Ifeanchi NG, Egbeigwe O, Ezekwe AS. Biochemical and histological changes associated with methanolic leaf extract of *Gongronema latifolium* in acetaminophen-induced hepatic toxicity in Wistar Albino rats. Int J Biomol Biomed. 2014; 4(2): 1–7.
6. Imo C, Uhegbu FO. Phytochemical Analysis of *Gongronema Latifolium* Benth Leaf Using Gas Chromatographic Flame Ionization Detector. Int. J. Chem. Bio. Mol. Sci. 2015; 1(2): 60-68.
7. Imo C, Arowora KA, Ezeonu CS, Ikwebe J, Yakubu OE, Imo NG, et al. Biochemical and histological effects of ethanolic extracts of fruits of *Xylopiya aethiopia* and seeds and leaves of *Piper guineense* on liver and kidney function in male albino rats. Future Journal of Pharmaceutical Sciences. 2021; 7: 35.
8. Imo C, Uhegbu FO, Imo CK, Ifeanchi NG. Ameliorating effect and haematological activities of methanolic leaf extract of *Gongronema latifolium* in acetaminophen induced hepatic toxicity in wistar albino rats. Int J Biosci. 2013; 3(11): 183–188.
9. Imo C, Uhegbu FO, Imo NG, Arowora KA, Kukoyi AJ, Zachariah SS, et al. Effects of Ethanolic Extracts of *Datura metel* Parts on Liver Function of Male Albino Rats. FUW Trends in Science & Technology Journal. 2017; 2(2): 848 – 852.
10. Khaton MM, Shaik MM. Review on *Datura metel*: a potential medicinal plant. GJRMI. 2012; 1(4): 123-132.
11. Nair SP. Protective effect of Tefroli- a polyherbal mixture (tonic) on cadmium chloride-induced hepatotoxic rats. Pharmacognosy Magazine. 2006; 2(6): 112–128.
12. Yusuf M, Begum J, Hoque MN, Chowdhury JU. Medicinal Plants of Bangladesh. Chittagong, Bangladesh: BCSIR. 2009: 794.