

# Effect of Methanol Root Extract of *Datura Metel* on Liver Function and Hematological Indices in Albino Rats

Ahmed Gana<sup>1\*</sup>, Yusuf Haruna<sup>2</sup>, Cosmos Moki Elinge<sup>3</sup>, Ahmed Attahiru<sup>4</sup>

<sup>1,2,3,4</sup>Department of Pure and Applied Chemistry, Kebbi State University of Science and Technology, Aliero, Nigeria

**Abstract:** For over the past decades plants have been a vital source of drug substance which has been a resurgence of interest to researchers for natural materials as potential alternative for the treatment and management of several diseases. *Datura metel* belongs to the family Solanaceae, a shrub-like annual herb commonly known as devil's trumpet. Because of the high cost of some synthetic drugs, some especially the youth have turned to consuming of plants materials to reach their desire. The roots of *Datura metel* have been used as pain resistant during traditional customs, as such, its toxic effect needs to be investigated for its safety. The root of *Datura metel* was extracted by cool maceration using methanol. (25) Rats were used for the sub-chronic toxicity study and were divided into five (5) groups of 5 rats each. Group 1 served as the control and received distilled water only while groups 2 to 5 were administered with 100 mg/kg, 200 mg/kg, 400 mg/kg and 800 mg/kg of the extract respectively. Alkaline Phosphatase and Total Bilirubin in all the treated groups showed no significant difference ( $P > 0.05$ ) when compared to the normal control. Albumin, Aspartate Amino Transferase, Alanine Amino Transferase and Direct Bilirubin concentrations significantly decreased across all the treated groups when compared to the normal control. There were no significant differences ( $P > 0.05$ ) in packed cell volume and Mean Cell Hemoglobin Concentration in the groups administered with the extract when compared to the normal control group. From the results obtained, it can be concluded that methanol root extract of *Datura metel* is potentially safe.

**Keywords:** *Datura*, methanol, plant, rats, root.

## 1. Introduction

Over the years, there has been a resurgence of interest in the research of natural materials as a source of potential drug substance [1]. Plants have great potential for the treatment and management of some diseases and have been used world wide for the treatment of several diseased conditions. Most countries are now applying native medicinal strategies that involve the use of herbal drugs and remedies. Many have incorporated plants as a source of medicinal agents into their primary modality of health care [2]. However, all substances are potential poisons since all of them can cause injury or death following excessive exposure. Medicinal plants from ancient times have been used in almost all cultures as a source of

medicine. They are considered to be the backbone of traditional medicine and are widely used to treat acute and chronic diseases [3]. Medicinal herbs have their use as medicament based simply on a traditional folk use that has been perpetuated along several generations. With the increase in the use of herbal medicines a thorough scientific investigation of these plants is of importance, based on the need to validate their usage [4]. *Datura metel* is a shrub-like annual herb known as devil's trumpet. *Datura metel* grows in the wild in all the warmer regions of the world, such as India and is cultivated worldwide for its chemical and ornamental properties [5]. Its indigenous names in Nigeria include: Igbo – Myaramuo; Hausa – babanjubji; Yoruba – Apikan [6]. In many parts of Nigeria, especially in the northern part, *Datura metel* is found growing as a weed in abandoned farmlands and/or dumpsites, but it is sometimes cultivated. Different parts (leaves and seeds) of the plant can be used for many purposes.

## 2. Materials and Methods

### A. Sample collection

*Datura metel* plant was collected from Aliero metropolis in a polythene bag and taken to the Department of Plant Science and Biotechnology of Kebbi State University of Science and Technology, Aliero (KSUSTA) for identification. The plant was identified by Prof. Dharmendra Singh and a sample specimen was kept with voucher number 282.

### B. Sample preparation

The plant root was sort-out and rinsed with water to remove soil particles. The root was cut into small pieces and dried under shade in natural condition for three weeks. After complete drying, the root was pounded into fine powder using mortar and pestle, then sieved and stored in a sealed container in a refrigerator.

### C. Experimental animal

Twenty five (25) healthy adult albino rats of both sexes with weight between 120 to 210g were used for this study. They were obtained from Usman Danfodio University, Sokoto. The rats

\*Corresponding author: [gana78079@gmail.com](mailto:gana78079@gmail.com)

were housed in ventilated plastic cages. They were allowed to acclimatize for 7 days with free access to commercial animal feed and water.

#### D. Extraction technique

The Methanol extract was prepared by soaking 100 grams of the sample in 400ml of 99.8 % methanol for 72 days, then the soaked sample was filtered using Whatman No.1 filter paper, the filtrate was evaporated using rotary evaporator at 40°C.

#### E. Sub-chronic toxicity studies

Sub-chronic toxicity study was carried out in five groups of 5 rats each, designated as group 1,2,3,4 and 5. Group 1 serve as the control which were given distilled water 5 ml/kg while group 2 to 5 were orally administered daily with MREDM at dose of 100 mg/kg, 200 mg/kg, 400 mg/kg and 800 mg/kg respectively for a period of 28 days. The groups of the animals were feed with ad libitum and distilled water. At the end of 28 days all the animals were sacrificed and blood was collected into non-heparinized tubes which were allowed to stand for at least 15min to enable collection of serum which was used for liver function test and blood collected in heparinized tubes was used for hematological analysis.

### 3. Results and Discussion

organs in the body [8]. This calls for caution in the use of medicinal plants of which the use is presently on the increase due to easy availability, affordability, accessibility, and promising efficacy comparable to the often high cost and adverse effects of standard synthetic drug agents [9]. The serum biochemical tests are frequently used in diagnostic diseases of hearts, liver, kidney and cardiovascular system etc. When an herbal product is ingested, the body interacts with it in an attempt to get rid of any harmful toxins, especially if the body cannot convert the foreign substance into cellular components [10]. These are commonly manifested by changes in enzyme levels and other cell components. The liver is a key organ regulating homeostasis within the body by various functions. The liver occupies the pivotal position in the body, plays an essential role in drug and xenobiotic metabolism and also in maintaining the biological equilibrium of the organism [11]. In this present study the ALB, AST, ALT and DB concentration significantly decreased across all the treated groups when compared to the normal control. This decrease was however not dose dependent but randomly. Decrease in AST and ALT is normal and indicates the protective and ameliorative effect of the methanol root extract of *D. Metel*. Its protective activity indicates that hepatic tissue damage was repaired and plasma membrane stabilized and this could be attributed to the presence of flavonoids and alkaloids in the extract. This is consistent with

Table 1  
Effect of Methanol Root Extract of *Datura metel* on biomarkers of liver function on albino Rats

	Distilled water	MREDM			
Parameters	Control (5ml/kg)	100 mg/kg	200 mg/kg	400 mg/kg	800 mg/kg
TP (G/l)	82.60±1.39 <sup>ab</sup>	80.80±1.03 <sup>ab</sup>	85.20±2.60 <sup>b</sup>	81.20±2.02 <sup>ab</sup>	78.20±1.61 <sup>a</sup>
ALB (G/l)	58.80±1.66 <sup>c</sup>	51.40±3.15 <sup>a</sup>	54.80±2.25 <sup>ab</sup>	50.60±0.87 <sup>a</sup>	54.60±2.79 <sup>ab</sup>
TB (mg/dL)	0.68±0.05 <sup>a</sup>	0.70±0.05 <sup>a</sup>	0.64±0.21 <sup>a</sup>	0.58±0.04 <sup>a</sup>	0.68±0.02 <sup>a</sup>
DB (mg/dL)	0.56±0.06 <sup>c</sup>	0.16±0.03 <sup>a</sup>	0.34±0.02 <sup>b</sup>	0.43±0.03 <sup>b</sup>	0.44±0.03 <sup>b</sup>
AST (U/L)	144.00±6.04 <sup>b</sup>	117.80±2.34 <sup>a</sup>	142.00±3.78 <sup>b</sup>	128.00±12.26 <sup>ab</sup>	110.00±3.57 <sup>a</sup>
ALT (U/L)	42.20±1.44 <sup>c</sup>	37.40±4.76 <sup>b</sup>	40.40±4.76 <sup>b</sup>	26.80±0.37 <sup>b</sup>	30.60±3.05 <sup>a</sup>
ALP (U/L)	25.80±2.23 <sup>a</sup>	31.20±1.50 <sup>a</sup>	31.00±1.60 <sup>a</sup>	31.00±3.01 <sup>a</sup>	27.80±2.63 <sup>a</sup>

Values are presented as mean ± standard error of mean (n = 5 per group). Values having the same superscript in the same column are not significantly different. (P<0.05) analysed by one-way ANOVA followed by Duncan's multiple comparison test. AST-Aspartate Amino Transferase, ALT- Alanine Amino Transferase, ALP- Alkaline Phosphatase, ALB- Albumin, TP- Total Protein, TB- Total Bilirubin and DB- Direct Bilirubin, MREDM-Methanol Root Extract of *Datura Metel*

Table 2  
Effect of Methanol Root Extract of *Datura metel* on Haematological Indices on Albino Rats

	Distilled water	MREDM			
Parameters	Control (5ml/kg)	100 mg/kg	200 mg/kg	400 mg/kg	800 mg/kg
RBC (10 <sup>12</sup> /L)	4.25±0.42 <sup>a</sup>	4.09±0.76 <sup>a</sup>	5.15±0.59 <sup>ab</sup>	4.64±0.01 <sup>a</sup>	6.82±0.91 <sup>b</sup>
MCHC (g/dL)	31.88±2.24 <sup>a</sup>	32.70±1.64 <sup>a</sup>	33.84±1.42 <sup>a</sup>	42.04±2.85 <sup>a</sup>	41.78±1.86 <sup>a</sup>
MCH (pg)	21.64±0.79 <sup>a</sup>	25.44±1.21 <sup>b</sup>	24.62±1.17 <sup>ab</sup>	28.94±1.05 <sup>c</sup>	27.72±1.02 <sup>bc</sup>
MCV (fL)	66.62±1.74 <sup>ab</sup>	73.22±2.45 <sup>b</sup>	75.36±3.35 <sup>b</sup>	71.36±2.79 <sup>b</sup>	62.52±3.48 <sup>a</sup>
HGB (g/dL)	10.50±0.17 <sup>ab</sup>	13.10±0.32 <sup>ab</sup>	15.37±0.78 <sup>ab</sup>	18.07±5.16 <sup>b</sup>	9.54±2.19 <sup>a</sup>
PCV (%)	29.16±2.74 <sup>a</sup>	27.24±5.98 <sup>a</sup>	36.38±3.79 <sup>a</sup>	36.30±1.00 <sup>a</sup>	26.06±1.70 <sup>a</sup>
PLT(x10 <sup>9</sup> /L)	126.20±9.51 <sup>a</sup>	161.60±1.12 <sup>b</sup>	127.64±1.17 <sup>a</sup>	123.40±1.09 <sup>a</sup>	170.40±9.37 <sup>b</sup>
WBC(x10 <sup>9</sup> /L)	6.56±0.32 <sup>a</sup>	22.06±0.63 <sup>d</sup>	36.16±0.68 <sup>c</sup>	8.05±0.29 <sup>b</sup>	9.90±0.09 <sup>c</sup>

Values are presented as mean ± standard error of mean (n = 5 per group). Values having the same superscript in the same column are not significantly different (P<0.05) analysed by one-way ANOVA followed by Duncan's multiple comparison test. RBC- Red Blood Count, MCHC-Mean Cell Haemoglobin Concentration, MCH- Mean Cell Haemoglobin, MCV- Mean Corpuscular Volume, HGB- Haemoglobin, PCV- Packed Cell Volume, PLT- Platelets, WBC- White Blood Count, MREDM-Methanol Root Extract of *Datura Metel*.

#### A. Discussion

Medicinal plants have been the basis of treatment of various diseases in African traditional medicine as well as other forms of treatment from diverse cultures of the world [7]. Most of the potent medicinal plants have relatively no toxic or adverse effects when used by humans, while some are very toxic to both humans and animals with the potential of damaging certain

the findings of [12]. Who revealed Significant (p<0.05) reduction was observed in the ALT activity of all the test groups when compared with group 2 (paracetamol group). However no significant increase in TB and ALP concentration in all the treated groups when compared with the control (P>0.05). This is in consistent with findings of [12]. Who revealed a non-significant (p>0.05) increase of ALP activity in all the test

groups (*Prosopis africana* seed extract) when compared with the control groups. This result suggests that the extract was able to regenerate the damaged hepatic cells with time. The lack of significant alterations in these indicators of liver damage suggests that sub-chronic administration of MREDM have no effect on hepatocyte function. Hence there was no significant difference ( $P > 0.05$ ) in the serum concentration of total bilirubin in the groups administered with the extract when compared with the control indicating that the conjugating ability of the liver was not affected. This is in agreement with the findings of [13]. Which he reported that ethanol extract of the leaves of *Datura stramonium* did not cause significantly raised in AST, ALT and bilirubin in the rats at the doses administered. This suggests that MREDM at the doses administered is likely non hepatotoxic. Hematological status is one of the important ways for the diagnosis of root cause of disease [14]. Hematological disorders include a wide range of abnormal conditions indicating the profile of blood parameters, due to changes in metabolism [15]. Alterations in blood parameters may be due to changes in cellular integrity, membrane permeability of cells or even due to exposure to toxic chemicals [16]. In this study, PCV shows no significant difference in the treaded group compared to the control. The non-significant change in the parked cell volume in all the groups treated with MREDM shows that the extract did not course dehydration, cell destruction or suppress bone marrow production. This is in agreement with the findings of [17]. which revealed in study of Effects of nutrition on hematology of rabbits, that the Hematological parameters HB and PCV were also not significantly affected by nutrition. On assaying the MCHC, MCV and HGB there is no significant alteration compared to control. The lack of significant change in these parameters is an indication that MREDM did not course thalassemia and hypochromic microcytic anemia. This is in agreement with the findings of [18]. In which he reported that HB content, MCV and MCH did not differ significantly among the groups.

In this research no significant change in PLT and RBC was observed in the MREDM treated groups when compared to the normal control. Platelets helps initiate repair of walls of blood vessels and are also considered as an acute phase reactant to infection or inflammation [19]. This agrees with the findings of [20]. In Toxicological evaluation of the aqueous extract of *Felicia muricata* Thunb leaves in Wistar rats. This suggests that the chemical constituents of the MREDM did not cause thrombocytopenia and anemia. However increase in red blood cells counts in the test animals compared to the control animals also support the ability of the plant materials in supporting or enhancing the animals' immune system. However there is significant increase in the White blood cell count in all the treated groups when compared to the normal control ( $P < 0.05$ ). Increase in WBC count may be due to enhancement of WBC production and decrease in its removal from the circulation in an attempt to defend the system [21]. Thus this could also be as a result of the body in its mechanism fighting the foreign compounds. This is in line with the findings of [22]. where he reported that the higher WBC in WAD goat treaded with seed extract of *Datura stramonium* suggested a well-developed

immune system in the WAD goats that proffer good health.

#### 4. Conclusion

The lack of significant alteration in the serum and hematological parameters gives an insight on the safety of the MREDM. However, the MREDM is apparently not harmful and deleterious but must be used with caution when taken at higher doses (concentration) over a longer period of time.

#### References

- [1] Manas K.M, B. Pratyusha and N. Debjani. Phytochemicals–biomolecules for prevention and treatment of human diseasesa review *Int J Sci Eng Res*, 3 (7), pp. 1-32, 2012.
- [2] Imo C. and Uhegbu, F. O. Renal Protective Effect of Ethanolic Leaf Extract of *Gongronema latifolium* Benth in Acetaminophen-induced Renal Toxicity in Male Albino Rats. *Chemical Science International Journal*, 1-10, 2015.
- [3] Cragg MG and Newman DJ. Natural product drug discovery in the next millennium. *Pharmaceutical Biology*; 39: 8-17, 2001.
- [4] Ababayehu, A., Mammo, F and Kibret, B. Isolation and characterization of terpene from leaves of *Croton macrostachyus* (Bissana). *Journal of Medicinal Plants Research*, 10 (19), pp. 256-269, 2016.
- [5] Sumedhan, V., Soumya, M. C and Sinimol, T. P. Review on Upavishas of clinical significance. *Journal of Ayurveda and Integrated Medical Sciences*, 5(1),194-205,
- [6] Imo C., Arowora, K. A., Ezeonu, C. S., Yakubu, O. E., Nwoku, C. D., Azubuike, N. C and Sallah, Y. G. Effects of. ethanolic extracts of leaf, seed and fruit of *Datura metel* L. on kidney function of male albino rats. *Journal of Traditional and Complementary Medicine*, 9(4), 271-277, 2019.
- [7] Abera B. Medicinal plants used in traditional medicine by Oromo people, Ghimbi District, Southwest Ethiopia. *Journal of ethnobiology and ethno medicine*, 10(1), 1-15, 2014.
- [8] Rajeh, M. A. B., Kwan, Y. P., Zakaria, Z., Latha, L. Y., Jothy, S. L and Sasidharan, S. Acute toxicity impacts of *Euphorbia hirta* L extract on behavior, organs body weight index and histopathology of organs of the mice and *Artemia salina*. *Pharmacognosy Research*, 4(3), 170, 2012.
- [9] Okoye, T. C., Uzor, P. F., Onyeto, C. A., & Okereke, E. K. (2014). Safe African medicinal plants for clinical studies. In *Toxicological Survey of African Medicinal Plants* (pp. 535-555). Elsevier.
- [10] Muhammed, A. O., Adekomi, D. A and Tijani, A. A. Effects of aqueous crude leaf extract of *Senecio bialfrae* on the histology of the frontal cortex, kidney, liver and testis of male sprague dawley rats. *Scientific Journal of Biological Sciences*, 1(1), 13-18, 2012.
- [11] Turroni, S., Brigidi, P., Cavalli, A and Candela, M. Microbiota–host transgenomic metabolism, bioactive molecules from the inside: Miniperspective. *Journal of medicinal chemistry*, 61(1), 47-61, 2018.
- [12] Manokaran, S., Jaswanth, A., Sengottuvelu, S., Nandhakumar, J., Duraisamy, R., Karthikeyan, D and Mallegaswari, R. (2008). Hepatoprotective activity of *Aerva lanata* Linn. against paracetamol induced hepatotoxicity in rats. *Research journal of pharmacy and technology*, 1(4), 398-400, 2008.
- [13] Gidado, A., Zainab, A. A., Hadiza, M. U., Serah, D. P., Anas, H. Y and Milala, M. A. Toxicity studies of ethanol extract of the leaves of *Datura stramonium* in rats. *African journal of biotechnology*, 6(8), 2007.
- [14] Mitchell A. J., Chan, M., Bhatti, H., Halton, M., Grassi, L., Johansen, C., and Meader, N. Prevalence of depression, anxiety, and adjustment disorder in oncological, hematological, and palliative-care settings: a meta-analysis of 94 interview-based studies. *The lancet oncology*, 12(2), 160-174, 2011.
- [15] Benedito-Palos, L., Ballester-Lozano, G. F., Simó, P., Karalazos, V., Ortiz, Á. Calduch-Giner, J and Pérez-Sánchez, J. Lasting effects of butyrate and low FM/FO diets on growth performance, blood haematology/biochemistry and molecular growth-related markers in gilthead sea bream (*Sparus aurata*). *Aquaculture*, 454, 8-18, 2016.
- [16] Farag, M. R and Alagawany, M. Erythrocytes as a biological model for screening of xenobiotics toxicity. *Chemico-biological interactions*, 279, 73-83, 2018.
- [17] Etim, N. N., Enyenihi, G. E., Akpabio, U and Offiong, E. E. Effects of nutrition on haematology of rabbits: a review. *European Scientific Journal*, 10(3), 2014.

- [18] Antai, A. B., Ofem, O. E., Ikpi, D. E., Ukafia, S and Agiang, E. A. Phytochemistry and some haematological changes following oral administration of ethanolic root extract of *Gonglonema latifolium* in rats. *Nigerian Journal of Physiological Sciences*, 24(1), 2009.
- [19] Edet, A. E., Patrick, E. E and Eseyin, A. O. Hematological parameters of alloxan induced diabetic rats treated with ethanol extracts and fractions of *Nauclea lafiloia* leaf. *European Scientific Journal*, 9(27), 2013.
- [20] Ashafa, A. O. T., Yakubu, M. T., Grierson, D. S and Afolayan, A. J. Toxicological evaluation of the aqueous extract of *Felicia muricata* Thunb. leaves in Wistar rats. *African Journal of Biotechnology*, 8(6), 2009.
- [21] Yakubu, M.T. and Afolayan, A.J. Effect of aqueous extract of *Bulbine natalensis* Baker stem on haematological and serum lipid profile of male Wistar rats. *Indian Journal of Experimental Biology*, 47:283-288, 2009.
- [22] Fatoba, T. A., Adeloye, A. A and Soladoye, A. O. (2013). Effect of *Datura stramonium* seed extracts on haematological parameters of West African dwarf (WAD) bucks European. *J Exp Biol*, 3, 1-6, 2013.