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Effects of Administering Ethanolic Extracts of *Datura metel* on Blood Sugar and Serum Protein Levels in Male Albino Rats

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Abstract
Purpose: This study investigated the effects of orally administered extracts of *Datura metel* (leaf, seed and fruit) on blood sugar and serum protein levels. Methods: Thirty-five (35) male Wistar rats were randomly allotted into seven (7) groups and each group had five rats. Each group was administered orally varying amounts of *Datura metel* for one week consecutively according to their body weights. The normal control (group1) received normal saline, groups two and three received leaf extract at low and high doses (300mg/kg bw and 600mg/kg bw) respectively. Groups four and five received seed extract at low and high doses respectively, while groups six and seven received fruit extract at low and high doses respectively. Blood samples were taken at the eighth day from the animals through the heart by cardiac puncture for biochemical analysis. Results: Generally, lower levels of blood sugar were observed in virtually all the groups when compared to the control (71.75±4.57mg/dl), however, group 2 had higher value (76.25±3.86 mg/dl) compared to the control. There were no significant differences ($P>0.05$) among the groups in the levels of protein, albumin and globulins. Lower values were observed for globulins and total protein levels within treatments when high doses of the extracts (leaf, seed and fruits) were administered to the rats. However, the highest level of globulin was recorded for normal control as 30.85±3.75g/l, whereas the highest level of protein was obtained in group 4 (62.60±3.63). Conclusion: The study showed that there were no deleterious effects on the administration of *Datura metel* on the blood/serum biochemical parameters analysed. Recommendation: Further work should be carried out on Datura metel with the view of revealing more information on its nutritional effects and metabolomics.

1. Introduction

Medicinal plants have been identified and used throughout human history. The use of herbs to treat disease is almost universal among non-industrialized society and it is often more affordable than purchasing modern pharmaceuticals. The World Health Organization (WHO) estimates that 80% of the population of African and Asian countries presently use herbal medicine for some aspects of primary health care [1].

In Nigeria, especially in the northern part, *Datura* is found growing as a weed in abandoned farmlands and or dumpsites. The leaves and seeds of the plant are used for

several purposes and in several ways, especially for its psychoactive activities [2]. *Datura metel* is abused by adding its decoction/tincture of leaves/fruits to drinks to achieve a "high", as a substitute for marijuana because it is relatively cheap and readily accessible. All *Datura* plants contain tropane alkaloids (such as scopolamine, hyoscyamine, and atropine), ynagjinhualine A, and five known megastigmane, sesquiterpenes, tannins, phlobatanins, cardiac glycosides, carbohydrates and flavonoids, primarily in their seeds and flowers. Due to the anticholinergic substances it contains, *Datura* intoxication typically produces effects similar to those of an anticholinergic delirium, hyperthermia, sedation, tachycardia, bizarre (mental confusion), and possibly violent behaviour, and severe mydriasis, and pronounced amnesia is another commonly reported effect.

Datura metel with local bengali name Dhutura", is an erect shrub with spreading branches. A perennial herbaceous plant, belonging to the Solanaceae family, it can reach a height of 1.5m. Leaves are simple, alternate, dark green, broadly ovate, shallowly lobed and glabrous. Flowers are large, solitary, and trumpet-shaped with a sweet fragrance usually appreciated in the mornings and evenings, with a wide range of colours, ranging from white to yellow and light to dark purple. The flowers are hermaphrodite and are pollinated by insects. The fruit is in the form of a capsule covered with short spines. *Datura* can tolerate average soil but prefers soil which is rich and moist or even very alkaline soil but hardly survives under shade. It prefers a warm temperature and is distributed in warmer regions of the world [3]. Datura probably is of American origin and widely cultivated in all tropical and subtropical regions for its beautiful flowers [4]. *Datura metel* can also be found in East Asia or India, and it is used in traditional Bangladeshi herbal medicine. In Traditional Chinese Medicine, the flowers of *Datura metel* are known as baimantuoluo and used for skin inflammation and Psoriasis [5]. In Ayurvedic medicine, seeds of *Datura metel* are used to treat skin rashes, ulcers, bronchitis, jaundice and diabetes [6]. In Brazil, seeds are used for tea making which would serve as a sedative and flowers are dried and smoked as cigarettes [7].

In view of extensive traditional utilization of *Datura metel* and considering the fact that limited information is available on its nutritional effects, therefore, there is need to fill this gap, hence, this research was carried out to investigate the effects of administering ethanolic extracts of leaf, seed and fruit on hypoglycemic and serum protein levels in male albino rats.

2. Materials and Methods

2.1. Experimental Animals

Thirty-five male Wistar rats (8 weeks old) were used for the laboratory experiment. They were housed in properly sanitized cages under natural light and dark cycles at room temperature in the animal house of the Department of Biochemistry, Federal University Wukari, Taraba State. The animals were brought from National Veterinary Research Institute (NVRI), Vom, Jos, Plateau State. They were fed for two weeks on rat grower mash in order to acclimatise them environmentally and on feed intended for experimentation. During the experiment, they had access to feed and water *ad libitum.*

2.2. Plant Collection

The plant materials were harvested for five days from a dump site at Wapan-Nghaku (popularly known as T-junction), Wukari Local Government Area of Taraba State. The harvesting took place in the morning between 9.00 and 11.30 a.m. for a period of one week. The leaves, seeds and whole fruit were collected and sun-dried till they are properly dried and then ground into powder.

2.3. Extract Preparation

Seventy per cent (70%) ethanol solution was prepared and used to soak the three plant parts separately.

Three hundred (300) ml of 70% ethanol solution was used to soak 114g of leaf sample 100ml of the solution was used to soak 38g seed, while 110ml was used to soak 48g fruit. The mixtures were then filtered after 48hrs and the filtrate were collected separately. The filtrates were concentrated using a water bath set at 78°C in order to evaporate the ethanol. The concentrated extract was diluted with normal saline at the rate of 1ml per 100mg of extract and stored at room temperature.

2.4. Experimental Design

The animals were grouped into seven (7) and received the extracts as follows:

Group 1- The normal control (they were given normal saline only).
Group 2- Received 300mg/kg body weight of leaf extract.
Group 3- Received 600mg/kg body weight of leaf extract.
Group 4- Received 300mg/kg body weight of seed extract.
Group 5- Received 600mg/kg body weight of seed extract.
Group 6- Received 300mg/kg body weight of fruit extract.
Group 7- Received 600mg/kg body weight of fruit extract.

The extract was administered to the animals orally for seven (7) consecutive days.

2.5. Blood Collection

The animals were starved for 12hrs before sacrifice. On the 8^{th} day, they were anaesthetised, sacrificed and the blood samples collected via cardiac puncture. It was allowed to stand for about 15 mins and then spun in a centrifuge. Serum was separated and used for the biochemical analysis.

2.6. Biochemical Analysis

2.6.1. Determination of Blood Glucose Level

ACCU-CHEK Active (glucometer) test strips was used for quantitative estimation of blood glucose. Blood was collected daily from the rats through tail puncture. It was placed on the

test strip and slotted into the ACCU-CHEK Active glucometer for the reading of blood glucose.

2.6.2. Determination of Serum Proteins

The concentrations of the Total protein, Albumin and Globulin were determined using an auto-analyser: Selectra ProM.

2.7. Measurement of Rat Weight

The weights of the rats were determined with the use of an electronic weighing balance.

2.8. Statistical Analysis

Statistical analysis was carried out with the use of standard Student-T-distribution test: using Statistical package for Social Sciences (SPSS) version 21 and group means were compared for significance at $p \leq 0.05$.

Data were presented as mean ± standard deviation (n=5)

3. Results

Table 1. *Levels of serum proteins, albumin and globulin in experimental rats.*

Parameters	Group 1 (Normal control)	Group 2 (leaf: 300mg/kg bw)	Group 3 (leaf: 600mg/kg bw)	Group 4 (seed: 300mg/kg bw)	Group 5 (seed: 600mg/kg bw)	Group 6 (fruit: 300mg/kg bw)	Group 7 (fruit: 600mg/kg bw)
Total protein (g/l)	60.60 ± 3.80	62.00 ± 2.98	58.85 ± 2.32	62.60 ± 3.63	61.53 ± 2.30	60.75 ± 3.03	60.00±4.30
Albumin (g/l)	29.75 ±2.00	32.00±3.00	35.90 ± 3.64	31.90 ± 4.29	32.15 ± 2.02	31.63 ± 3.09	32.95 ± 4.37
Globulin (g/l)	30.85 ± 3.75	30.00 ± 3.32	22.95 ± 2.89	30.70 ± 6.70	29.38 ± 1.49	29.13 ± 2.85	27.05 ± 3.71

Results represent mean ± standard deviation of group results obtained (n=5).

Table 2. *Levels of blood sugar in experimental rats.*

Parameters	Group 1 (Normal control)	Group 2 (leaf: 300mg/kg bw)	Group 3 (leaf: 600mg/kg bw)	Group 4 (seed: 300mg/kg bw)	Group 5 (seed: 600mg/kg bw)	Group 6 (fruit: 300mg/kg bw)	Group 7 (fruit: 600mg/kg bw)
Blood Sugar (mg/dl)	71.75 ± 4.57^{a}	76.25 ± 3.86^{a}	67.75 ± 3.30^{a}	64.75 ± 6.70^{b}	62.00 ± 6.48^{a}	67.25 ± 3.50^{a}	67.75 ± 4.19^{a}

Results represent mean ± standard deviation of group results obtained (n=5).

Mean in the same row, having different superscript is statistically significant ($P<0.05$) compared with the normal control (group one).

4. Discussion

There were no significant differences ($P>0.05$) among the treatments in the levels of protein, albumin and globulins. However, total protein levels increased non-significantly ($P>0.05$) in groups 2, 4, 5 and 6, but reduced non-significantly in groups 3 and 7 compared with normal control group. The results of this study show that low dose (300mg/kg bw) enhance protein synthesis when compared with group1 (normal control). Effects of different extracts of Datura metel was found to be dose dependent (i.e. the lower the concentrations of the extracts, the higher the protein and globulin levels of the animals). This observation is in agreement with the research carried out by [8] who found that decrease in serum protein in hepatotoxicity state simply indicated the presence of para proteins or decrease in antibody production, whereas higher values were obtained for albumin levels among treatments with high doses. This reduction in serum protein could also be due to deficiency of protein in the plasma, partly due to dietary insufficiency or excessive excretion. The extract of Datura metel leaf (600mg/ kg body weight) has displayed such effects as indicated by non-significant decrease ($P>0.05$) in the total serum proteins of groups 3 and 7 when compared to the control group (table 1). The observed decrease in the total serum protein might have also resulted from the first-pass febrile shock experienced by the animals following administration of the extract [9] had stated that this type of condition could be transient and albumin level may revert to normal.

There were no significant differences ($P>0.05$) in the levels of albumin among treatments as depicted in table 1, however, the lowest value was observed in treatment 1(normal control) with the value 29.75 ±2.00 g/l, while the highest value was recorded for group 3 animals to be 35.90 ± 3.64. It was observed that the effects of the administration of Datura metel extract on experimental rats was dose dependent with higher values of serum albumin being recorded for groups administered with 600 mg/ kg bw, while lower values were obtained for animals administered with low dose of 300mg/ kg bw. This could be that high dose of Datura activated the enzyme responsible for increase albumin synthesis in the liver. Albumin serves in the maintenance of osmotic pressure of the blood and body fluids and transport of inorganic ions, fatty acids and drugs [10]. Therefore, decrease in serum albumin level would affect the metabolism of these substances that are transported by it [10, 11]

There were no significant differences ($P>0.05$) in serum globulin levels among treatments as shown in table 1. However, treatment 1(normal control) was non-significantly higher than all other treatment groups, the lowest value was recorded for group 3 to be 22.95 ± 2.89. The results also showed dose-dependent inverse relationship between the dose of Datura administered and globulin levels determined i.e. higher values of globulins was observed for lower doses Datura metel extract of leaf, seed and fruit administered (300 mg/ kg bw). This observation was antagonistic to the results obtained in this study which showed direct relationship

between dose of extracts administered and levels of albumin determined among the treatments.

It was revealed on table 2 that blood sugar levels generally decreased when compared with normal control (group 1) with exception of group 2 that had higher value of 76.25±3.86 mg/dl which was not significantly different to group 1 but significantly different ($P<0.05$) to group 4 treatment recorded to be 64.75±6.70 mg/dl. This observation of general decrease in the levels of blood sugar among treatment groups could be due to the quantity of the *Datura metel* extract administered to the experimental animals. It also suggests hypoglycaemic condition among the animals. This observation is in agreement with the research carried out by [12], who had similar results. The possible mechanism of action of *Datura metel* could be that it decreases the release of glucagon or increase the secretion of insulin, stimulate directly glycolysis in peripheral tissues, increase glucose removal from blood or reduce glucose absorption from gastrointestinal tract [13]. Also, the hypoglycaemic effect which was observed could be attributable to the flavonoid content and other phytochemical compounds (saponin, tannins, tropane, hyoscyamine, hyoscine, littorine, acetoxytropine, valtropine, fastusine, fastusinine, glycosides) present in *Datura metel* [2].

In conclusion, the study revealed the hypoglycaemic effects of ethanolic extract of *Datura metel* on blood sugar and protein levels in wistar rats. This observation could be applied and translated to human health. The hypoglycaemic effect was observed to be dose dependent. The study showed that there were no deleterious effects on the administration of *Datura metel* at milligram doses on the blood/serum biochemical parameters analysed.

References

[1] Hermann, R. "Protein and the Body". Oklahoma Cooperative Extension Service, Division of Agricultural Sciences and Natural Resources Oklahoma State University, 2009.

[2] Kutama, A. S., Mohammed, A. S., Kiyawa, S. A. Hallucinogenic effect of Datura metel L. leaf extract in albino rats. *Bioscience Research Communication 2010*; 22(4): 215-220.

[3] Drake, L. R., Lin, S., Rayson, G. D., Jackson, P. Chemical modification and metal binding studies of *Datura innoxia. Environ. Sci. Technol. 1996*; 30: 110.

[4] Khaton, M. M., Shaik M. M. Review of Datura metel: a potential medicinal plant. *Global journal of Research on Medicinal plants and Indigenous plants 2012*; 1(4): 123-132.

[5] Wang, Q. H., Xiao, H. B., Yang, B. Y., Yao, F. Y., Kuang, H. X. Studies on pharmacological actions of the effective parts for psoriasis in Flos Daturae (I). Chinese. *J Exp Trad Med Formulae 2008;* 14: 48–51.

[6] Agharkar, S. P. Medicinal Plants of Bombay Presidency. *Scientific Publishers, 1991;* Jodhpur.

[7] Agra, M. F., Baracho, G. S., Nurit, K., Basilioa, L. D., Coelho, V. P. M. Medicinal and poisonous diversity of the flora of "Cariri Paraibano" *Brazil. J Ethnopharmacol 2007;* 111*: 383–395.*

[8] George, N. Antimicrobial activity of Datura innoxia and Datura metel, *Fitoterapia 2009;* 76:118-120.

[9] Roper, N. Churchill Livingstone Pocket Medical Dictionary (14th ed.). Singapore. Longman publishers. Pte. Ltd. 1987; pp9.

[10] Nuhu, A. A. Aliyu, R. Effects of Cassia occidentalis aqueous leaf extract on biochemical markers of tissue damage in rats. *Trop. Journal of Pharmaceutical Research 2008*; 7(4): 1137-1142.

[11] Pasternak C. A. An introduction to Human Biochemistry. Oxford University Press 1979; pp 18-25.

[12] Uchenna, E. O., Onugha, V. O. and Chukwubor, V. O. Evaluation of antidiabetic effect and haematological profile of methanol extract of ceiba pentandra G (Malvaceae) stem bark on alloxan-induced diabetic rats. *African Journal of Pharmacy and Pharmacology 2016*; 10 (28): 584-590.

[13] Raju, K. Elumalai, A., Sridar, A. A review of Biological activities of tropane. Alkaloids. *International J. of Phytopharmacy alkaloids 2013*; 4(2): 71-74.